CALPUFF 用户手册

1 CALPUFF 模型系统介绍

1.1 系统简介

CALPUFF 为非定常三维拉格朗日烟团输送模式。CALPUFF 采用烟团函数分割方法，垂直坐标采用地形追随坐标，水平结构为等间距的网格，空间分辨率为一至几百公里，垂直不等距分为 30 多层。污染物包括 SO2、NOx、CmHn、O3、CO、NH3、PM10（TSP）、Black Carbon，主要包括污染物之排放、平流输送、扩散，干沉降以及湿沉降等物理与化学过程。CALPUFF 模型系统可以处理连续排放源、间断排放情况，能够追踪质点在空间与时间上随流场的变化规律。考虑了复杂地形动力学影响、斜坡流、FROUND 数影响及发散最小化处理。

CALPUFF 模拟系统，包括诊断风场模型 CALMET、高斯烟团扩散模型 CALPUFF 和后处理软件 CALPOST 三部分。CALPUFF 模式可运用于静风、复杂地形等非定常条件。其中 CALMET 利用质量守衡原理对风场进行诊断，输出包括逐时风场、混合层高度、大气稳定度（PGT 分类）、各种微气象参数等。

CALPOST 为计算结果后处理软件，对 CALPUFF 计算的浓度进行时间分配处理，并计算出干（湿）沉降通量、能见度等。

1.2 CALPUFF 基本原理

CALPUFF 基本原理为高斯烟团模式，利用在取样时间内进行积分的方法来节约计算时间，输出主要包括地面和各指定点的污染浓度烟团分裂利用采样函数方法对烟团的空间轨迹、浓度分布进行描述；烟云抬升采用 Briggs 抬升公式（浮力和动量抬升），考虑稳定层结中部分烟云穿透，过渡烟云抬升等因素。CALPUFF 基本方程:

$$C = \frac{Q}{2\pi\sigma_x\sigma_y} g \exp[\frac{-d_a^2}{(2\sigma_x^2)}]\exp[\frac{-d_c^2}{(2\sigma_y^2)}]$$

CALPUFF 面源烟羽抬升方程：连续性方程、动量方程、能量方程如下式:

$$\frac{d}{ds}(\rho U_{sc} r^2) = 2r\alpha\rho_a |U_{sc} - U_a \cos\varphi| + 2r\beta\rho_a |U_a \sin\varphi|$$

$$\frac{d}{ds}(\rho U_{sc} r^2 (u - U_a)) = -r^2 \rho w \frac{dU_a}{dz}$$

$$\frac{d}{ds}(\rho U_{sc} r^2 w) = g r^2 (\rho_a - \rho)$$

CALPUFF 扩散参数计算公式:

近地层: $\sigma_v = u_* \left[4 + 0.6(-h/L)^{2/3}\right]^{1/2}$

$$\sigma_w = u_* \left[1.6 + 2.9(-h/L)^{2/3}\right]^{1/2}$$

混合层: $\sigma_v = (3.6u_*^2 + 0.35w_*^2)^{1/2}$

$$\sigma_w = (1.2u_*^2 + 0.35w_*^2)^{1/2}]$$

CALPUFF 干沉降计算公式:

阻尼公式: $v_d = F / \chi_s$

气体: $v_d = (r_a + r_d + r_c)^{-1}$

颗粒物: $v_d = (r_a + r_d + r_a r_d v_g)^{-1} + v_g$

湿沉降计算公式: $\chi_{t+dt} = \chi_t \exp[-\Lambda\Delta t]$, $\Lambda = \lambda(R/R_l)$

式中 r_a, r_d, r_c 分别为近地层、沉降层（准层流层）植被层的阻尼系数，v_g 为重力沉降系数。

1.3 CALMET 基本原理

CALMET 对客观分析场（MM5 预测输出气象要素、常规监测的地面与高空气象要素）进行地形动力学、倾斜流、热动力学等诊断分析。以发散最小化原理求解三维风场，根据湍流参数化方法，计算湍流尺度参数。

$$\frac{du}{dx} + \frac{dv}{dy} + \frac{dw}{dz} = 0$$

CALMET 稳定: $h = \min\left[0.4(u_* L / f)^{0.5},\ 2400u_*^{1.5}\right]$

中性: $h = \frac{\sqrt{2}u_*}{(fN_B)^{0.5}}$、

不稳定（Carson 方法）：$h_{t+dt}=\left[h_t^2+\frac{2Q_h(1+E)dt}{\psi_l\rho c_p}-\frac{2d\theta_t h_t}{\psi_l}\right]^{1/2}+\frac{d\theta_{t+dt}}{\psi_l}$

1.4 CALPUFF 数据需求

1.4.1 地球物理资料

地表粗糙度、土地使用类型、地形高程、植被代码。其中：计算区域网格点地形高程数据包括两个要素：UTM 国家坐标（相对坐标）、地形高程（空间分辨率可达 0.9km）。计算区域的空间分辨率可以高于地形数据的分辨率。地形计算时，采用地形追踪坐标，通过六点差值获取计算区域中网格点的高程值。地表粗糙度、土地使用类型、植被代码可以来自国土资源部有偿的或美国地调局免费的数据。这种数据通过 GIS 系统进行转化后，可直接使用。其中地表粗糙度、土地使用类型、植被代码、地形高程数据都以矩阵格式输入。

表 1　土地使用类型、地表粗糙度、植被代码一览表

土地使用类型	下垫面类型	地表粗糙度	反射率	Bowen 比	土壤热通量	植被冠层热通量	植被代码
10	城市、建筑用地	1.0	0.18	1.5	0.25	0.0	0.2
20	农田（未灌溉）	0.25	0.15	1.0	0.15	0.0	3.0
-20	农田（灌溉)	0.25	0.15	0.5	0.15	0.0	3.0
30	牧场	0.05	0.25	1.0	0.15	0.0	0.5
40	森林	1.0	0.10	1.0	0.15	0.0	7.0
51	小流域	0.001	0.10	0.0	1.0	0.0	0.0
54	海湾、河口	0.001	0.10	0.0	1.0	0.0	0.0
55	大流域	0.001	0.10	0.0	1.0	0.0	0.0
60	湿地	1.0	0.10	0.5	0.25	0.0	2.0
61	森林湿地	1.0	0.1	0.5	0.25	0.0	2.0
62	非森林湿地	0.05	0.1	0.1	0.25	0.0	1.0
70	荒漠地带	0.20	0.30	1.0	0.15	0.0	0.05

80	冻土地带	0.20	0.30	0.5	0.15	0.0	0.0
90	终年冰雪地带		0.70	0.5	0.15	0.0	0.0

1.4.2 气象资料

CALMET 需要输入评价范围内的气象背景初猜场，之后进行地形动力、倾斜流、地形阻挡作用的调整得到第一步的气象要素场，用评价范围内的地面和探空常规气象观测资料对第一步气象要素场进行订正，得到最终的评价范围气象要素诊断场。

（1）气象背景初猜场:

CALMET 气象背景初猜场由 MM5 模型输出的物理量场提供。采用最近一年的 NCEP 气象要素分析场和模型计算区域内地面和探空常规气象观测资料，用 MM5 中尺度模型进行数值模拟计算，输出逐小时的气象要素场。MM5 模拟输出的气象要素场包括：气压，高度，温度，风速 U 分量，风速 V 分量，相对湿度和水汽混合比、云水混合比、冰雪混合比、Graupel 混合比。NCEP 每日 4 次的气象要素分析场资料：1000pha，925 pha，850 pha，700 pha，600 pha，500 pha 各高度层上的位势高度、温度、露点、风的东西向分量，风的南北向分量，以及地面气压，海平面气压，地面温度。

（2）常规探空气象资料：1000hpa，925hpa，850hpa，700hpa，500hpa 各高度层上的位势高度，温度，露点，风向，风速。

（3）常规地面观测气象资料：风速、风向、气温、云量、云底高度、地面气压、相对湿度，降水量，降水类型。

（4）全球海洋天气报资料：海面上每日 4 次全球海洋天气报资料包括纬度，经度，气温，露点，风，气压、马士顿号、海表层温度。

1.4.3 污染源资料

CALPUFF 可以处理点源、线源、面源、体积源。考虑干湿沉降、建筑物下洗等因素。源的数据格数与 AERMOD 一致。可以输入随时间变化的排放清单，数据格式与 AERMOD 一致。

1.5 CALPUFF 模型系统运行环境与执行方式

Windows XP/2000操作系统、内存256M以上、硬盘30G以上。在CALPUFF.INP、

CALMET.INP、CALPOST.INP脚本文件中，用户根据数据资料对以上参数进行设置、修改即可生成用户的脚本执行文件。CALPUFF模型系统的三个模块均在DOS提示符下运行。执行顺序与令命格式如下:

CALMET.EXE>CALMET.INP

CALPUFF.EXE>CALPUFF.INP

CALPOST.EXE>CALPOST.INP

1.6 CALMET 输入数据文件格式

（1）SUR.DAT地面站气象数据文件格式:

第一行: 起始时间: 年日时 ，终止时间: 年日时 时区 台站数目

第二行: 台站编号

第三行: 年日时

第四行: 风速、风向、混合层高度、低云、温度、相对湿度、台站气压、降雨代码

(2) PPER.DAT高空数据文件格式:

第一行: 起始时间: 年日时; 终止时间: 年日时、顶层气压、原始数据类型

第二行: 数据类型、台站编号、年月日时、高空总层数、提取层数

第三行: 气压、位势高度、温度（K）、风向、风速

（3）PRECIP.DAT降雨数据文件格式:

第一行: 起始时间: 年日时、终止时间: 年日时、时区、台站数量

第二行: 台站编码

第三行: 年、日、时、降雨量（mm/hr）

（4）GEO.DAT地球物理数据文件格式:

第一行: 头端信息字符串

第二行: 网格数、空间分辨率、起点坐标、时区、NX、NY、DGRIDKM、XORIGRKM、YORIGRKM、IUTMZN

第三行: 土地使用类型LAND USE DATA CATEGORIES（1新、0默认值）

第四行: 网格矩阵;
地形高程;
地表特征参数。

1.7 CALPUFF 模型系统技术文档、脚本文件、软件等获取方式

可登陆http://www.src.com/verio/download/download.htm

2 CALPUFF 模型的基本操作

使用 CALPUFF Pro 有两个方法。一是直接操作系统的集成图形用户界面 GUI；二是改写系统各模块的控制流文件。

2.1 集成图形界面

CALPUFF Pro(ver6.0)有一个集成的图形用户界面 GUI（图 2-1）。这个界面已将全系统的前处理、模拟模块和后处理模块，以及各类工具模块、图形模块集中到一个窗口中，从这里可直接进入各子模块的操作窗口，从而控制整个系统的全部功能。所有子模块也都分别有相应的图形窗口，无须了解控制流文件的格式，因此建议初学者用这个图形界面进行操作，不用去了解控制流文件的格式。

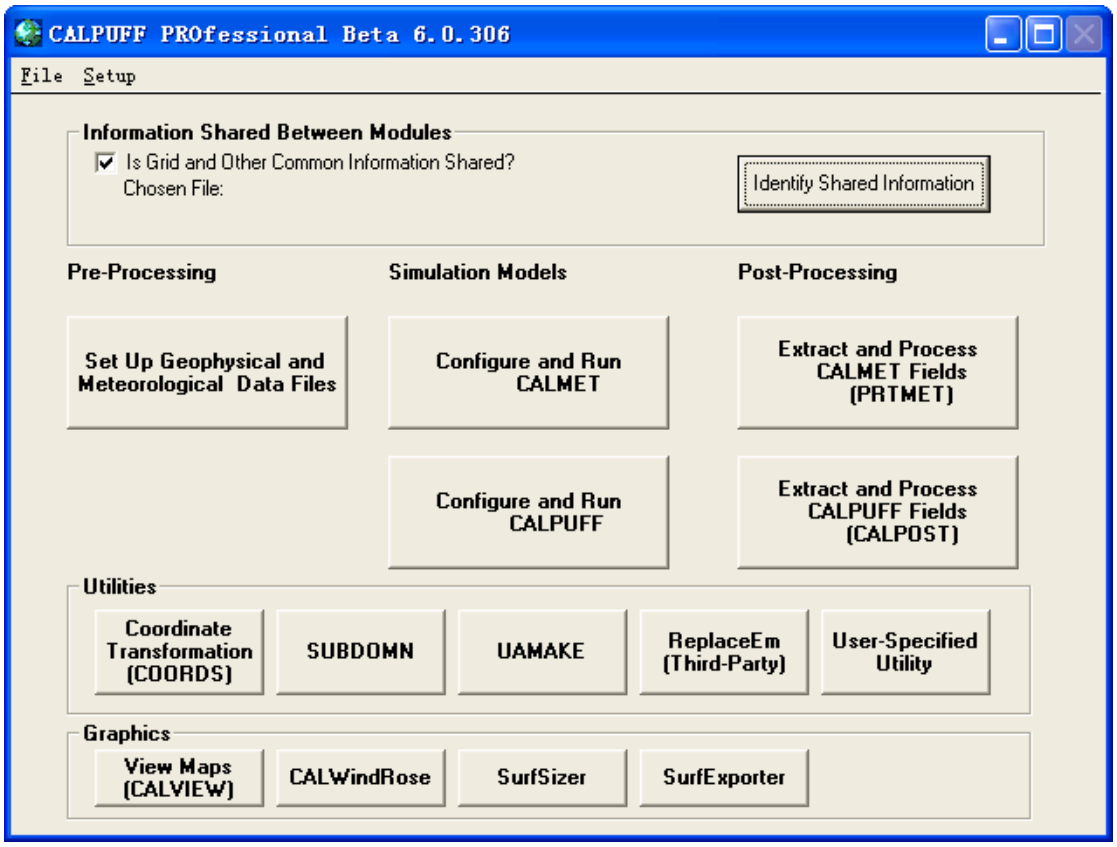

图 2-1 CALPUFF PRO 的集成图形界面

操作的顺序一般按图中从上到下从左到右的原则。

一般先定义整个系统的公用信息（须要选上“网格和其它信息作为公用”这个选项），如工作目录、气象网格大小和位置、时区、坐标投影方法等。这些信息将在所有子模块里被引用，无须重新输入。

点击各子模块按钮进入相应子模块。子模块都有一些类似的界面和通用的操作方法。CALPUFF PRO 一个子典型子模块的图形界面如图 2-2 所示。在子模块里输入数据可采用两种方式：采用“Input”菜单下的“Sequential”，即顺序输入的方式，按即提示逐步输入所需的参数。第二方式是采用“Input”菜单下各相应子菜单，直接输入所选步骤的数据。一般来说，先采用顺序法输入全部数据，再采用选择某一项的方法来修改。输入完成后，按“RUN”菜单来运行，结果保存在给定文件中。有错误时程序将停止运行，并弹出信息，可进行修正后再运行。可按“HELP”菜单进入该模块的帮助系统查找有关信息。另外，子模块的“Setup”

可以设置让程序从一个已有的控制流文件开始，修改其中一些选项就行，而不必建一个全新的控制流文件，这样可以大大减少重复操作。

前处理模块：设置地球物理和气象数据文件。设定原始数据文件和运行参数，生成能被 CALPUFF 模型使用的地球物理数据文件(GEO.DAT)以及 CALMET 运行所需的地表气象数据文件（SURF.DAT）、探空气象文件（UP.DAT）、降雨数据文件（PRECIP.DAT）和海面气象数据文件（SEA.DAT）。

气象处理模块 CALMET：用图形方式输入气象模块控制流文件，运行调试并生成 CALPUFF 所需的气象文件 CALMET.DAT。输出数据为一个给定的多高度层网格的三维气象场，包括风、云、温度、降雨等参数。

扩散计算模块 CALPUFF：用图形方式输入扩散模块控制流文件，运行调试并生成预测点的浓度、干沉、湿沉通量和可见度等结果。主要包括输入输出文件名称、模拟时间、化学属性、污染源、复杂地形和预测点几个部分。

气象后处理模块：由于 CALMET 输出的是一个二进制的文件，可以用这个后处理模块对这个文件取出有关数据进行查看、检验和分析。CALMET 还可以输出 List 文件，是一文本结果，它不能被 CALPUFF 使用，但便于直接查看。

扩散输出后处理模块：对 CALPUFF 生成的四个结果（浓度、干沉、湿沉和可见度），按一定时段进行查看、分析。

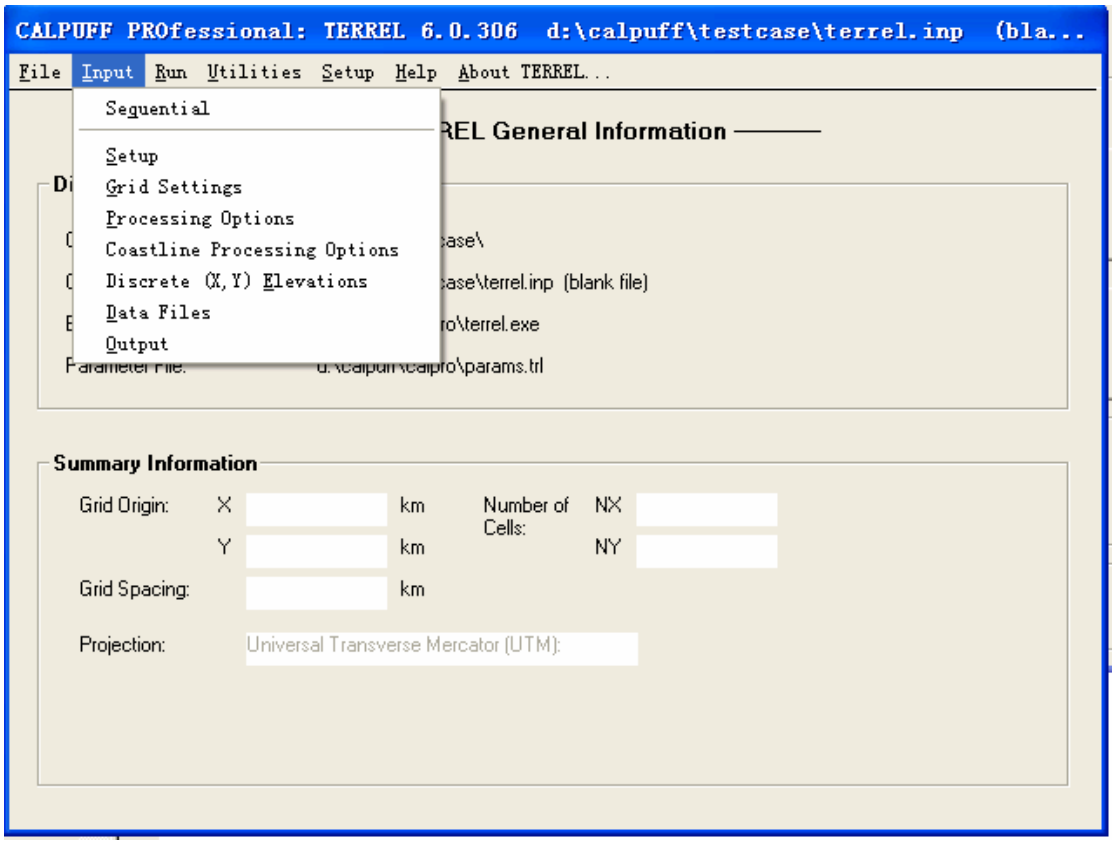

图 2-2 CALPUFF PRO 一个子典型子模块的图形界面

2.1.1 气象处理模块 CALMET

首先用 input 菜单生成一个 calmet.inp 控制流文件，再运行 run 生成 calpuff 所需的气象文件。

(1)setup

设置 calmet 的工作目录，calmet 控制流文件名称等。控制流文件可新生成，也可引入一个已有的，再进行修改。

(2)坐标及网格和地表文件的设置：可用 import shared grid data 输入一个坐标及三维网格定义文件，也可用 grid settings 进入一个设置窗口。在这里要设置坐标投影方法，及网格原点、三维网格行列层数，并给定地表情况的地球物理数据文件(GEO.DAT)。GEO.DAT 可用预处理工具中的 MAKEGEO 生成。也可直接生成。其格式见第 6 章。

投影方法：一般可用 UTM，计算范围很大要考虑地球曲率时须采用 LCC（一般 500km 以上情况）。投影格式缺省取 WGS-84。

UTM zone 分 60 区，从西经 180 开始，一直往东到东径 180 度，每隔 6 度为一区。对于每个 UTMzone，X 坐标以其中间子午线设为 500,000m，向东为增加，向西为减少。Y 坐标为赤道为 0m,向北为正 Y 值。对于北京，为东经 116 度，UTM zone 为 30+int(116/6)+1=50，北半球取 N。

如果采用 LCC 或 TTM，则需要输入

（此段内容需地理系知识）

定义气象网格西南角坐标（x,y）km，网格步长（DGRIDKM），网格行列层设置（NX、NY、NZ）；每层到地表的高度（ZFACE）。

(3)Run information: 设置标题（一到三级），气象时段（起止或长度），气象所用时区（北京时间为 UTC+0800），及其它计算选项（可用缺省值）。其中 Run options 中第二项为采用的气象数据来源（NOOBS）。如果 NOOBS=0，则所有气象资料采用有关气象站数据；NOOBS=1，则地面和水面采用气象站数据，高空采用 MM5/M3D 计算结果；NOOBS=2，则所有气象资料采用 MM4/MM5/M3D 计算结果。

(4)mixing height parameters: 定义混合层计算相关参数。可以都用缺省值。

(5)temperature and RH parameters: 温度和相对湿度相关参数。数据来源，如果 NOOBS=0，则一般选气象站观察值。地表温度可用某一个序号的地表站的观察值，同样上空温度递减率也可用某一序号的高空站的一定垂直高度(如 200m)的温度梯度。他们也可读入经预处理（地面和高空站）的结果文件 DIAG.dat。

其它参数一般可用缺省值。

(6)wind field: 风场设置。

首先设置 options。

风场生成模式：一是目标分析法；二是诊断风场法（DWM）。目标分析法，就是用所有气象观测站的数据内插出气象网格的数据（直接生成 step1 的结果）。诊断风场法则要从初猜场，进行地形、坡风、闭合效应、三维散度最小化调整（即 step1）。对 step1 的结果进行 step2 后，生成最终风场。

如果有 MM4/MM5 或 CSUMM 计算结果的网格风场，则可以当作 DWM 方法的初猜场，或目标分析法的 STEP1 结果。对于目标分析法，MM4/MM5 结果也可作视作观测值读入。

如果有经预处理气象文件 DIAG.dat，则可定义其名称（在初猜场定义中可用作初猜场）。

如果没有 MM4/MM5 或 CSUMM 结果作为初猜场，需要进入 initial guess 设置初猜场。从这里可以定义初猜场是从外部 DIAG.dat 读入，还是内部生成。如果内部生成，可以均匀场(uniform)，选一个探空站序号和垂直平均长度；也可选择不均匀场，这时将用不同站点各层的观测值内插出气象场（若在 option 中选了用地面外延 surface wind extroplation,则这里内插时同时考虑地面站的数据，并可进入 biases 输入各层中高空探测数据占的权重）。

Step1, 各参数一般取缺省值。其中地形影响半径 TERRAD 可取 1~10km。

Step2, 设置气象计算网格插值方法。一般应选上“使用不同影响半径”，对地面、高空和水面设定不同影响半径，在这个半径内无有效数据，则找出最近的气象站替代。 一般可高 RMAX1, RMAX2, RMAX2 为 100,500,500km；RMIN 为 2km。对初猜场与观测值的权重影响半径，可设 R1，R2 值（一般 R2>R1）。

定义 Barriers。Barriers 是一种插值界限，定义两个点的一条线，影响高度可从地面到最高层，在这条线不同侧的气象计算点，只能用同侧的站点数据来插值。例如，一个山谷站点的观测值只用于山谷内，山谷外的气象网格点不能用这个山谷站的数据来插值，就可以为这个山谷站设一些 Barriers。Barriers 不是必选项。

湖泊水域(lakes breeze): 如果计算区域有大面积水域，可对水域内的网格点采取优化插值方法。定义每一个水域在计算网格上的起止行、列，水域岸线的起止坐标，及在水域内的站点数（地面和高空总和）及每个站台的 ID。Lakes breeze 不是必选项。

(7)设置气象站及数据文件 Mete data。分别设置地面、探空、降水、水面站的情况。比如地面站，要定义气象数据文件 surf.dat（这个文件包括全部站的观测数据，其格式可用 SMERGE 工具来生成），并用表格方式输入全部地面站的 ID，坐标，时区，测风高等数据。

(8)输出选项 Output options: 定义输出结果的文件名称，格式。可定 Cloud 和 List File 属性。List File 保存 CALMET 的计算选项和输入的参数，以及一些网格化数据。

CALMET 需要至少一个地面站（逐时）和一个探空站（每天至少两次）的气象观测资料。

所有地表气象观测站数据按规定的格式放在 SURF.DAT 文件中。

以及 CALMET 运行所需的地表气象数据文件（SURF.DAT）、探空气象文件（UP.DAT）、降雨数据文件（PRECIP.DAT）和海面气象数据文件（SEA.DAT）。

2.1.2 扩散计算模块 CALPUFF

首先用 input 菜单生成一个 calpuff.inp 控制流文件，再运行 run 生成计算结果。

(1)setup

设置工作目录，控制流文件名称等。控制流文件可新生成，也可引入一个已有的，再进行修改。

(2)网格设置：可用 import shared grid data 输入气象网格文件，也可在 grid settings 设置。在这里要气象网格的有关数据，以及计算网格的范围。气象网格的有关参数应完全按 calmet 中的有关设置，与其输入一致。计算网格的范围应在气象网格的内部，不能超出气象网格的边界。为了减少气象网格的边界影响效应，计算范围一般要在气象网格内部，离气象网格边界有一缓冲距离。

(3)Run information: 主要是设置计算时间的起止。这个时间应是相关 calmet 计算时间的全部或一部分。

(4 污染物（species）：定义参与计算的污染物及其属性参数。系统本身库中已带有 16 个污染物及相应参数，如果要计算的污染物在这个库里，只要选取即可；否则需要在污染物库中添加这个污染物及其参数，再选取。

(5)污染源:。可分别输入点、面、体、线、Boundary condition 五种污染源参数及污染物排放参数。Boundary condition（边界条件源，BC 源）是在考虑预测范围边界的流入通量时的一个因素。

污染物排放参数：可用表格输入各源各污染物的排放率（单位可选）。如果污染物排放是变化的，可定义变化系数。污染物排放变化可以是全年 24 小时周期的、以月为周期的、以季度 24 小时为周期的、以风速和稳定度为周期的、以温度为周期的。

(6)预测点: 包括网格点、任意点及复杂地形特定网格（CTSG 网格）。所有预测点都应在（2）中网格设置的计算范围之内。预测网格点是计算网格范围的一部分或全部，通过 Nesting 因子设置，可以比计算网格（即气象网格）更密或更粗，比如 Nesting 因子=2，则预测网格密度是计算网格的两倍。

(7)模型选项

气象和土地利用类型：气象数据格式，可以 CALMET 的输出结果也或以是 AERMET 的结果。城市地面类型的范围，及参数设置。如果用 AERMET 的气象数据，则要输入单个气象站的参数（因 AERMET 只用一个气象站数据）。风速幂指数，可直接输入或采用列表中城市 1、城市 2 或农村的缺省值。静风的上限风速。

烟羽抬升：有四个模型选项。考虑烟羽抬升过渡期（弯曲抬升段）；考虑烟囱本身的下洗作用；考虑排放口以上的垂直风速切变；考虑烟羽的部分穿透。

扩散选项：烟羽模型：烟团或分段烟羽。高级变量设置：烟羽最大长度；烟团分割控制参数设置；积分控制参数。烟团释放速率、取样频率、移动速率的上限。扩散参数 σ y、σ z 及各稳定度的风速 σ v、σ w 的下限。风廓线近场垂直分布方式：均匀或高斯分布。建筑物下洗转变点。

地形选项：地形调整的方法及相关系数。若选择“部分烟羽路径调整”，则要输入各稳定度下的烟羽路径系数。如果选择对孤立山体采用 CTSG 网格（复杂地形特定网格），则可以采用屏幕输入或从 CTDM 文件读入的方式输入地形和预测点相关数据。

(8)输出设置

设置结果文件名称： CONCENTRATIONS(浓度)、DRY FLUXES（干沉）、WET FLUXES

（湿沉）、RH（相对湿度，可见度）、Fogging Potential(起雾概率)。

输入结果可以用 Binary（二进制，可以压缩并节省间）文件格式，也可以是 ListFile(文本格式)。对 ListFile 除输入名称外，要设定污染物输出的单位。可以选择保存的时间间隔 Print Interval。每种污染物是否输出浓度、沉降等可在 Species Output 表格中设置。

(9)沉降选择

在这里，对每一个已选择的污染物，设置是否考虑干沉、湿沉。如果要考虑，可以进一步设置相关参数。如：颗粒物干沉降：GEOMETRIC MASS MEAN DIAMETER（几何平均直径）、粒子比重。湿沉降参数设置：去除系数、Liquid Precip（液态降水量）、固态降水量等。

(10)化学反应和转换

设置化学参数：

臭氧输入选项（MOZ=0 或 1）；臭氧月浓度序列（BCKO3）；氨月浓度序列（BCKNH3）；夜间 SO2、Nox 亏损率（RNITE1、RNITE2）；HNO3 转化率（RNITE3）；H2O2 输入选项（MH2O2）；H2O2 月浓度序列（BCKH2O2）；二次生成有机气溶胶模块参数输入（BCKPMF、OFRAC、VCNX）。

2.1.3 输出后处理模块 CALPOST

（1）运行设置（Processing options）：起止时间（或全部数据时间），时间间隔（每隔 N 个时间取出数据，比如计算结果是每小时浓度，时间间隔为 1，则取出每小时数据，时间间隔为 2，则每隔一小时取出数据）。预测点：可以从网格点、任意点中选择全部或部分点参与处理。源的贡献。坐标缩放。背景浓度（相应预测点的逐小时监测浓度）。

（2）数据格式（Data）：要处理的数据类型（浓度，干沉通量，湿沉通量，总沉或能见度）。污染物名称。数据文件名（这个文件是 CALPUFF 的计算结果文件）。如果要计算能见度，则要设置大量相关参数和算法选项。

（3）输出设置（Output options）：设置平均时间，浓度单位。输出内容选项有，可有最大 50 个数据，各点四个级别的数据（例如第 1，2，3，4 大的数据），超标率。选择输出的时间（日期）。要输出成绘图文件，设置名称、格式及其它参数。

2.2 改写控制流文件

CALPUFF Pro 系统的三大部份都有自己的控制流文件，通过修改这些控制流文件中的相关参数，然后运行各部分执行程序，从而得到所需的计算结果。

控制流文件都有相近的格式，为了使用方便，相当多的篇幅只是用于说明和注释。使用

时只要修改两个执行提示符！之间的有关内容即可，而两个*之间的内容则认为是注释而忽略。比如下文：

```
INPUT GROUP: 0 -- Input and Output File Names


Subgroup (a)
------------
Default Name  Type          File Name
------------  ----          ---------
GEO.DAT       input    ! GEODAT=GEO.DAT       !
SURF.DAT      input    ! SRFDAT=SURF.DAT      !
CLOUD.DAT     input    * CLDDAT=              *
PRECIP.DAT    input    * PRCDAT=              *
WT.DAT        input    * WTDAT=               *

CALMET.LST    output   ! METLST=CALMET.LST     !
CALMET.DAT    output   ! METDAT=CALMET.DAT    !
PACOUT.DAT    output   * PACDAT=             *
```

上文为 Calmet 控制流第 0 组的第 a 分组，定义主要输入输出文件名称。如果地表气象文件不是 SURF.DAT，而是 Surface.txt，则改成 SRFDAT=SURFACE.DAT 即可。

每一个 GROUP 的结尾处，有一个 NOTES，会对本组内的格式和注意事项进行说明。

各控制流文件格式的详细说明，请参见以下章节。

3 CALPUFF 控制流文件格式

CALPUFF 模型系统以控制流脚本文件执行程序模块。控制流文件 CALPUFF.INP 通过命令输入计算参数，选择物理过程，输出浓度、干湿沉降通量及能见度计算结果。控制流文件 CALPUFF.INP 包括模拟区域参数设置：区域左下角坐标、东西南北向网格数、垂直层数、网格空间分辨率、LAMBERT 投影、时区；模拟时间设置：起始时间（年月日时）、终止时间（年月日时）、计算时间；污染源参数设置：源的类型及参数；化学反应机理选择；干湿沉降参数设置；CALMET 输出的三维、二维、微物理参数文件选择；风廓线与大气稳定度计算方法设置；烟羽抬升物理过程选择（建筑物下系、烟羽部分穿透、垂直风剪切作用等）；扩散计算模式设定方法选择；边界条件选择；接受点参数设置。每组控制令命以“!END!”结束。

3.1 CALPUFF 控制流文件实例

```
CALPUFF test case run - 3 point sources
24-Hour Simulation using CALMET met. data
```

```
Gridded receptors on 17x17 20-km met grid
--------------- Run title (3 lines) ------------------------------------

                    CALPUFF MODEL CONTROL FILE
                    --------------------------

------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names

--------------
Default Name  Type          File Name
------------  ----          ---------
CALMET.DAT    input    ! METDAT =CALMET.DAT   !
    or
ISCMET.DAT    input    * ISCDAT =             *
    or
PLMMET.DAT    input    * PLMDAT =             *
    or
PROFILE.DAT   input    * PRFDAT =             *
SURFACE.DAT   input    * SFCDAT =             *
RESTARTB.DAT  input    * RSTARTB=             *
------------------------------------------------------------------------------
-
CALPUFF.LST   output   ! PUFLST =CALPUFF.LST  !
CONC.DAT      output   ! CONDAT =CALPUFF.CON     !
DFLX.DAT      output   * DFDAT  =             *
WFLX.DAT      output   * WFDAT  =             *

VISB.DAT      output   * VISDAT =             *
TK2D.DAT      output   * T2DDAT =             *
RHO2D.DAT     output   * RHODAT =             *
RESTARTE.DAT  output   * RSTARTE=             *
------------------------------------------------------------------------------
-
Emission Files
--------------
PTEMARB.DAT   input    * PTDAT  =             *
VOLEMARB.DAT  input    * VOLDAT =             *
BAEMARB.DAT   input    * ARDAT  =             *
LNEMARB.DAT   input    * LNDAT  =             *
------------------------------------------------------------------------------
-
Other Files
```

```
----------
OZONE.DAT      input    * OZDAT  =            *
VD.DAT         input    * VDDAT  =            *
CHEM.DAT       input    * CHEMDAT=            *
H2O2.DAT       input    * H2O2DAT=            *
HILL.DAT       input    * HILDAT=            *
HILLRCT.DAT    input    * RCTDAT=            *
COASTLN.DAT    input    * CSTDAT=            *
FLUXBDY.DAT    input    * BDYDAT=            *
BCON.DAT       input    * BCNDAT=            *
DEBUG.DAT      output   * DEBUG =            *
MASSFLX.DAT    output   * FLXDAT=            *
MASSBAL.DAT    output   * BALDAT=            *
FOG.DAT        output   * FOGDAT=            *
------------------------------------------------------------------------------
-
All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case      ! LCFILES = F !
         F = UPPER CASE
NOTE: (1) file/path names can be up to 70 characters in length


Provision for multiple input files
----------------------------------

     Number of CALMET.DAT files for run (NMETDAT)
                                   Default: 1       ! NMETDAT =   1   !

     Number of PTEMARB.DAT files for run (NPTDAT)
                                   Default: 0       ! NPTDAT =  0  !

     Number of BAEMARB.DAT files for run (NARDAT)
                                   Default: 0       ! NARDAT =  0  !

     Number of VOLEMARB.DAT files for run (NVOLDAT)
                                   Default: 0       ! NVOLDAT =  0  !

!END!

------------
Subgroup (0a)
------------
```

```
  The following CALMET.DAT filenames are processed in sequence if NMETDAT>1

Default Name  Type          File Name
------------  ----          ---------
 none         input    * METDAT=     *   *END*


------------------------------------------------------------------------------
-

INPUT GROUP: 1 -- General run control parameters
--------------

    Option to run all periods found
    in the met. file     (METRUN)   Default: 0       ! METRUN =   0  !

         METRUN = 0 - Run period explicitly defined below
         METRUN = 1 - Run all periods in met. file

     Starting date:    Year   (IBYR)  --    No default   ! IBYR  =  1988  !
                       Month  (IBMO)  --    No default   ! IBMO  =  7  !
                       Day    (IBDY)  --    No default   ! IBDY  =  7  !
     Starting time:    Hour   (IBHR)  --    No default   ! IBHR  =  0  !
                       Minute (IBMIN) --    No default   ! IBMIN =  0  !
                       Second (IBSEC) --    No default   ! IBSEC =  0  !

     Ending date:      Year   (IEYR)  --    No default   ! IEYR  =  1988  !
                       Month  (IEMO)  --    No default   ! IEMO  =  7  !
                       Day    (IEDY)  --    No default   ! IEDY  =  8  !
     Ending time:      Hour   (IEHR)  --    No default   ! IEHR  =  0  !
                       Minute (IEMIN) --    No default   ! IEMIN =  0  !
                       Second (IESEC) --    No default   ! IESEC =  0  !

     (These are only used if METRUN = 0)

     Base time zone        (XBTZ) -- No default       ! XBTZ= 5.0  !
     The zone is the number of hours that must be
     ADDED to the time to obtain UTC (or GMT)
     Examples: PST = 8., MST = 7.
               CST = 6., EST = 5.

     Length of modeling time-step (seconds)
     Equal to update period in the primary
     meteorological data files, or an
```

```
integer fraction of it (1/2, 1/3 ...)
Must be no larger than 1 hour
(NSECDT)                          Default:3600     ! NSECDT =  3600  !
                                  Units: seconds

Number of chemical species (NSPEC)
                                  Default: 5       ! NSPEC =  1   !

Number of chemical species
to be emitted  (NSE)              Default: 3       ! NSE =  1   !

Flag to stop run after
SETUP phase (ITEST)               Default: 2       ! ITEST =  2   !
(Used to allow checking
of the model inputs, files, etc.)
      ITEST = 1 - STOPS program after SETUP phase
      ITEST = 2 - Continues with execution of program
                  after SETUP

Restart Configuration:

   Control flag (MRESTART)        Default: 0       ! MRESTART =  0   !

      0 = Do not read or write a restart file
      1 = Read a restart file at the beginning of
          the run
      2 = Write a restart file during run
      3 = Read a restart file at beginning of run
          and write a restart file during run

   Number of periods in Restart
   output cycle (NRESPD)          Default: 0       ! NRESPD =  0   !

      0 = File written only at last period
     >0 = File updated every NRESPD periods

Meteorological Data Format (METFM)
                                  Default: 1       ! METFM =  1   !

      METFM = 1 - CALMET binary file (CALMET.MET)
      METFM = 2 - ISC ASCII file (ISCMET.MET)
      METFM = 3 - AUSPLUME ASCII file (PLMMET.MET)
      METFM = 4 - CTDM plus tower file (PROFILE.DAT) and
                  surface parameters file (SURFACE.DAT)
```

```
          METFM = 5 - AERMET tower file (PROFILE.DAT) and
                      surface parameters file (SURFACE.DAT)

     Meteorological Profile Data Format (MPRFFM)
            (used only for METFM = 1, 2, 3)
                                    Default: 1       ! MPRFFM =  1   !

          MPRFFM = 1 - CTDM plus tower file (PROFILE.DAT)
          MPRFFM = 2 - AERMET tower file (PROFILE.DAT)

     PG sigma-y is adjusted by the factor (AVET/PGTIME)**0.2
     Averaging Time (minutes) (AVET)
                                    Default: 60.0    ! AVET = 60. !
     PG Averaging Time (minutes) (PGTIME)
                                    Default: 60.0    ! PGTIME = 60. !


!END!


------------------------------------------------------------------------------

INPUT GROUP: 2 -- Technical options
--------------


     Vertical distribution used in the
     near field (MGAUSS)                Default: 1     ! MGAUSS =  1   !
        0 = uniform
        1 = Gaussian

     Terrain adjustment method
     (MCTADJ)                           Default: 3     ! MCTADJ =  1   !
        0 = no adjustment
        1 = ISC-type of terrain adjustment
        2 = simple, CALPUFF-type of terrain
            adjustment
        3 = partial plume path adjustment

     Subgrid-scale complex terrain
     flag (MCTSG)                       Default: 0     ! MCTSG =  0   !
        0 = not modeled
        1 = modeled
```

```
Near-field puffs modeled as
elongated slugs? (MSLUG)              Default: 0     ! MSLUG =  1   !
   0 = no
   1 = yes (slug model used)

Transitional plume rise modeled?
(MTRANS)                              Default: 1     ! MTRANS =  1   !
   0 = no  (i.e., final rise only)
   1 = yes (i.e., transitional rise computed)

Stack tip downwash? (MTIP)            Default: 1     ! MTIP =  1  !
   0 = no  (i.e., no stack tip downwash)
   1 = yes (i.e., use stack tip downwash)

Method used to simulate building
downwash? (MBDW)                      Default: 1     ! MBDW =   1  !
   1 = ISC method
   2 = PRIME method

Vertical wind shear modeled above
stack top? (MSHEAR)                   Default: 0     ! MSHEAR =  0  !
   0 = no  (i.e., vertical wind shear not modeled)
   1 = yes (i.e., vertical wind shear modeled)

Puff splitting allowed? (MSPLIT)      Default: 0     ! MSPLIT =  0  !
   0 = no (i.e., puffs not split)
   1 = yes (i.e., puffs are split)

Chemical mechanism flag (MCHEM)       Default: 1     ! MCHEM =  0   !
   0 = chemical transformation not
       modeled
   1 = transformation rates computed
       internally (MESOPUFF II scheme)
   2 = user-specified transformation
       rates used
   3 = transformation rates computed
       internally (RIVAD/ARM3 scheme)
   4 = secondary organic aerosol formation
       computed (MESOPUFF II scheme for OH)

Aqueous phase transformation flag (MAQCHEM)
(Used only if MCHEM = 1, or 3)        Default: 0     ! MAQCHEM =  0   !
   0 = aqueous phase transformation
       not modeled
```

```
   1 = transformation rates adjusted
       for aqueous phase reactions

Wet removal modeled ? (MWET)          Default: 1     ! MWET =  0   !
   0 = no
   1 = yes

Dry deposition modeled ? (MDRY)       Default: 1     ! MDRY =  0   !
   0 = no
   1 = yes
   (dry deposition method specified
    for each species in Input Group 3)


Gravitational settling (plume tilt)
modeled ? (MTILT)                     Default: 0     ! MTILT =  0   !
   0 = no
   1 = yes
   (puff center falls at the gravitational
    settling velocity for 1 particle species)

Restrictions:
    - MDRY  = 1
    - NSPEC = 1  (must be particle species as well)
    - sg    = 0  GEOMETRIC STANDARD DEVIATION in Group 8 is
                 set to zero for a single particle diameter

Method used to compute dispersion
coefficients (MDISP)                  Default: 3     ! MDISP =  3   !

   1 = dispersion coefficients computed from measured values
       of turbulence, sigma v, sigma w
   2 = dispersion coefficients from internally calculated
       sigma v, sigma w using micrometeorological variables
       (u*, w*, L, etc.)
   3 = PG dispersion coefficients for RURAL areas (computed using
       the ISCST multi-segment approximation) and MP coefficients in
       urban areas
   4 = same as 3 except PG coefficients computed using
       the MESOPUFF II eqns.
   5 = CTDM sigmas used for stable and neutral conditions.
       For unstable conditions, sigmas are computed as in
       MDISP = 3, described above.  MDISP = 5 assumes that
       measured values are read
```

```
Sigma-v/sigma-theta, sigma-w measurements used? (MTURBVW)
(Used only if MDISP = 1 or 5)          Default: 3     ! MTURBVW =  3  !
   1 = use sigma-v or sigma-theta measurements
       from PROFILE.DAT to compute sigma-y
       (valid for METFM = 1, 2, 3, 4, 5)
   2 = use sigma-w measurements
       from PROFILE.DAT to compute sigma-z
       (valid for METFM = 1, 2, 3, 4, 5)
   3 = use both sigma-(v/theta) and sigma-w
       from PROFILE.DAT to compute sigma-y and sigma-z
       (valid for METFM = 1, 2, 3, 4, 5)
   4 = use sigma-theta measurements
       from PLMMET.DAT to compute sigma-y
       (valid only if METFM = 3)

Back-up method used to compute dispersion
when measured turbulence data are
missing (MDISP2)                       Default: 3     ! MDISP2 =  3  !
(used only if MDISP = 1 or 5)
   2 = dispersion coefficients from internally calculated
       sigma v, sigma w using micrometeorological variables
       (u*, w*, L, etc.)
   3 = PG dispersion coefficients for RURAL areas (computed using
       the ISCST multi-segment approximation) and MP coefficients in
       urban areas
   4 = same as 3 except PG coefficients computed using
       the MESOPUFF II eqns.

[DIAGNOSTIC FEATURE]
Method used for Lagrangian timescale for Sigma-y
(used only if MDISP=1,2 or MDISP2=1,2)
(MTAULY)                               Default: 0     ! MTAULY =  0  !
   0 = Draxler default 617.284 (s)
   1 = Computed as Lag. Length / (.75 q) -- after SCIPUFF
  10 < Direct user input (s)              -- e.g., 306.9


[DIAGNOSTIC FEATURE]
Method used for Advective-Decay timescale for Turbulence
(used only if MDISP=2 or MDISP2=2)
(MTAUADV)                              Default: 0     ! MTAUADV =  0  !
   0 = No turbulence advection
   1 = Computed (OPTION NOT IMPLEMENTED)
```

```
  10 < Direct user input (s)   -- e.g., 300


Method used to compute turbulence sigma-v &
sigma-w using micrometeorological variables
(Used only if MDISP = 2 or MDISP2 = 2)
(MCTURB)                              Default: 1     ! MCTURB =  1  !
   1 = Standard CALPUFF subroutines
   2 = AERMOD subroutines

PG sigma-y,z adj. for roughness?      Default: 0     ! MROUGH =  0  !
(MROUGH)
   0 = no
   1 = yes

Partial plume penetration of          Default: 1     ! MPARTL =  0  !
elevated inversion?
(MPARTL)
   0 = no
   1 = yes

Strength of temperature inversion     Default: 0     ! MTINV =  0  !
provided in PROFILE.DAT extended records?
(MTINV)
   0 = no (computed from measured/default gradients)
   1 = yes

PDF used for dispersion under convective conditions?
                                      Default: 0     ! MPDF =  0  !
(MPDF)
   0 = no
   1 = yes

Sub-Grid TIBL module used for shore line?
                                      Default: 0     ! MSGTIBL = 0  !
(MSGTIBL)
   0 = no
   1 = yes

Boundary conditions (concentration) modeled?
                                      Default: 0     ! MBCON = 0  !
(MBCON)
   0 = no
   1 = yes, using formatted BCON.DAT file
```

```
   2 = yes, using unformatted CONC.DAT file

Note:  MBCON > 0 requires that the last species modeled
       be 'BCON'.  Mass is placed in species BCON when
       generating boundary condition puffs so that clean
       air entering the modeling domain can be simulated
       in the same way as polluted air.  Specify zero
       emission of species BCON for all regular sources.

Individual source contributions saved?
                                    Default: 0     ! MSOURCE = 0  !
(MSOURCE)
   0 = no
   1 = yes


Analyses of fogging and icing impacts due to emissions from
arrays of mechanically-forced cooling towers can be performed
using CALPUFF in conjunction with a cooling tower emissions
processor (CTEMISS) and its associated postprocessors.  Hourly
emissions of water vapor and temperature from each cooling tower
cell are computed for the current cell configuration and ambient
conditions by CTEMISS. CALPUFF models the dispersion of these
emissions and provides cloud information in a specialized format
for further analysis. Output to FOG.DAT is provided in either
'plume mode' or 'receptor mode' format.

Configure for FOG Model output?
                                    Default: 0     ! MFOG =  0   !
(MFOG)
   0 = no
   1 = yes  - report results in PLUME Mode format
   2 = yes  - report results in RECEPTOR Mode format


Test options specified to see if
they conform to regulatory
values? (MREG)                      Default: 1     ! MREG =  0   !

   0 = NO checks are made
   1 = Technical options must conform to USEPA
       Long Range Transport (LRT) guidance
                  METFM    1 or 2
                  AVET     60. (min)
```

```
                    PGTIME   60. (min)
                    MGAUSS   1
                    MCTADJ   3
                    MTRANS   1
                    MTIP     1
                    MCHEM    1 or 3 (if modeling SOx, NOx)
                    MWET     1
                    MDRY     1
                    MDISP    2 or 3
                    MPDF     0 if MDISP=3
                             1 if MDISP=2
                    MROUGH   0
                    MPARTL   1
                    SYTDEP   550. (m)
                    MHFTSZ   0


!END!


------------------------------------------------------------------------------

INPUT GROUP: 3a, 3b -- Species list
-------------------

------------
Subgroup (3a)
------------

  The following species are modeled:

! CSPEC =          SO2 !         !END!

                                                        Dry
OUTPUT GROUP
    SPECIES                 MODELED                 EMITTED            DEPOSITED
NUMBER
     NAME                   (0=NO,   1=YES)         (0=NO,   1=YES)         (0=NO,
(0=NONE,
   (Limit: 12                                                          1=COMPUTED-GAS
1=1st CGRUP,
    Characters                                                    2=COMPUTED-PARTICLE
2=2nd CGRUP,
    in length)                                          3=USER-SPECIFIED)     3=
```

etc.)

! SO2 = 1, 1, 0,
0 !

!END!

Note: The last species in (3a) must be 'BCON' when using the boundary condition option (MBCON > 0). Species BCON should typically be modeled as inert (no chem transformation or removal).

Subgroup (3b)

The following names are used for Species-Groups in which results for certain species are combined (added) prior to output. The CGRUP name will be used as the species name in output files. Use this feature to model specific particle-size distributions by treating each size-range as a separate species. Order must be consistent with 3(a) above.

INPUT GROUP: 4 -- Map Projection and Grid control parameters

Projection for all (X,Y):

Map projection
(PMAP) Default: UTM ! PMAP = UTM !

UTM : Universal Transverse Mercator
TTM : Tangential Transverse Mercator
LCC : Lambert Conformal Conic
PS : Polar Stereographic
EM : Equatorial Mercator
LAZA : Lambert Azimuthal Equal Area

```
False Easting and Northing (km) at the projection origin
(Used only if PMAP= TTM, LCC, or LAZA)
(FEAST)                    Default=0.0     ! FEAST  = 0.000  !
(FNORTH)                   Default=0.0     ! FNORTH = 0.000  !

UTM zone (1 to 60)
(Used only if PMAP=UTM)
(IUTMZN)                   No Default      ! IUTMZN =  19   !

Hemisphere for UTM projection?
(Used only if PMAP=UTM)
(UTMHEM)                   Default: N      ! UTMHEM = N  !
    N   :  Northern hemisphere projection
    S   :  Southern hemisphere projection

Latitude and Longitude (decimal degrees) of projection origin
(Used only if PMAP= TTM, LCC, PS, EM, or LAZA)
(RLAT0)                    No Default      ! RLAT0 = 0N  !
(RLON0)                    No Default      ! RLON0 = 0N  !

    TTM :  RLON0 identifies central (true N/S) meridian of projection
           RLAT0 selected for convenience
    LCC :  RLON0 identifies central (true N/S) meridian of projection
           RLAT0 selected for convenience
    PS  :  RLON0 identifies central (grid N/S) meridian of projection
           RLAT0 selected for convenience
    EM  :  RLON0 identifies central meridian of projection
           RLAT0 is REPLACED by 0.0N (Equator)
    LAZA:  RLON0 identifies longitude of tangent-point of mapping plane
           RLAT0 identifies latitude of tangent-point of mapping plane

Matching parallel(s) of latitude (decimal degrees) for projection
(Used only if PMAP= LCC or PS)
(XLAT1)                    No Default      ! XLAT1 = 0N  !
(XLAT2)                    No Default      ! XLAT2 = 0N  !

    LCC :  Projection cone slices through Earth's surface at XLAT1 and XLAT2
    PS  :  Projection plane slices through Earth at XLAT1
           (XLAT2 is not used)

---------
Note:  Latitudes and longitudes should be positive, and include a
       letter N,S,E, or W indicating north or south latitude, and
       east or west longitude.  For example,
```

```
        35.9  N Latitude  =  35.9N
        118.7 E Longitude = 118.7E


   Datum-region
   ------------

   The Datum-Region for the coordinates is identified by a character
   string.  Many mapping products currently available use the model of the
   Earth known as the World Geodetic System 1984 (WGS-84).  Other local
   models may be in use, and their selection in CALMET will make its output
   consistent with local mapping products.  The list of Datum-Regions with
   official transformation parameters is provided by the National Imagery and
   Mapping Agency (NIMA).

   NIMA Datum - Regions(Examples)

-------------------------------------------------------------------------------
   WGS-84    WGS-84 Reference Ellipsoid and Geoid, Global coverage (WGS84)
   NAS-C     NORTH AMERICAN 1927 Clarke 1866 Spheroid, MEAN FOR CONUS (NAD27)
   NAR-C     NORTH AMERICAN 1983 GRS 80 Spheroid, MEAN FOR CONUS (NAD83)
   NWS-84    NWS 6370KM Radius, Sphere
   ESR-S     ESRI REFERENCE 6371KM Radius, Sphere

   Datum-region for output coordinates
   (DATUM)                    Default: WGS-84    ! DATUM = NAS-C  !


METEOROLOGICAL Grid:

   Rectangular grid defined for projection PMAP,
   with X the Easting and Y the Northing coordinate

         No. X grid cells (NX)      No default     ! NX =  17   !
         No. Y grid cells (NY)      No default     ! NY =  17   !
      No. vertical layers (NZ)      No default     ! NZ =  6    !

       Grid spacing (DGRIDKM)       No default     ! DGRIDKM = 20.0 !
                                    Units: km

           Cell face heights
               (ZFACE(nz+1))        No defaults
                                    Units: m
 ! ZFACE = .0, 20.0, 50.0, 100.0, 500.0, 2000.0, 3300.0 !
```

```
    Reference Coordinates
   of SOUTHWEST corner of
        grid cell(1, 1):

    X coordinate (XORIGKM)     No default     ! XORIGKM = 120.0 !
    Y coordinate (YORIGKM)     No default     ! YORIGKM = 4570.0 !
                              Units: km
```

COMPUTATIONAL Grid:

The computational grid is identical to or a subset of the MET. grid. The lower left (LL) corner of the computational grid is at grid point (IBCOMP, JBCOMP) of the MET. grid. The upper right (UR) corner of the computational grid is at grid point (IECOMP, JECOMP) of the MET. grid. The grid spacing of the computational grid is the same as the MET. grid.

```
   X index of LL corner (IBCOMP)      No default     ! IBCOMP =  1   !
            (1 <= IBCOMP <= NX)

   Y index of LL corner (JBCOMP)      No default     ! JBCOMP =  1   !
            (1 <= JBCOMP <= NY)


   X index of UR corner (IECOMP)      No default     ! IECOMP =  17   !
            (1 <= IECOMP <= NX)

   Y index of UR corner (JECOMP)      No default     ! JECOMP =  17   !
            (1 <= JECOMP <= NY)
```

SAMPLING Grid (GRIDDED RECEPTORS):

The lower left (LL) corner of the sampling grid is at grid point (IBSAMP, JBSAMP) of the MET. grid. The upper right (UR) corner of the sampling grid is at grid point (IESAMP, JESAMP) of the MET. grid. The sampling grid must be identical to or a subset of the computational grid. It may be a nested grid inside the computational grid. The grid spacing of the sampling grid is DGRIDKM/MESHDN.

```
   Logical flag indicating if gridded
   receptors are used (LSAMP)         Default: T     ! LSAMP = T !
```

```
        (T=yes, F=no)

       X index of LL corner (IBSAMP)      No default     ! IBSAMP =  1   !
        (IBCOMP <= IBSAMP <= IECOMP)

       Y index of LL corner (JBSAMP)      No default     ! JBSAMP =  1   !
        (JBCOMP <= JBSAMP <= JECOMP)


       X index of UR corner (IESAMP)      No default     ! IESAMP =  17   !
        (IBCOMP <= IESAMP <= IECOMP)

       Y index of UR corner (JESAMP)      No default     ! JESAMP =  17   !
        (JBCOMP <= JESAMP <= JECOMP)


      Nesting factor of the sampling
       grid (MESHDN)                      Default: 1     ! MESHDN =  1  !
       (MESHDN is an integer >= 1)

!END!

------------------------------------------------------------------------------


INPUT GROUP: 5 -- Output Options
--------------
                                          *                        *
    FILE                       DEFAULT VALUE            VALUE THIS RUN
    ----                       -------------            --------------

  Concentrations (ICON)              1                  !  ICON =  1   !
  Dry Fluxes (IDRY)                  1                  !  IDRY =  0   !
  Wet Fluxes (IWET)                  1                  !  IWET =  0   !
  2D Temperature (IT2D)              0                  !  IT2D =  0   !
  2D Density (IRHO)                  0                  !  IRHO =  0   !
  Relative Humidity (IVIS)           1                  !  IVIS =  0   !
   (relative humidity file is
    required for visibility
    analysis)
  Use data compression option in output file?
  (LCOMPRS)                          Default: T         ! LCOMPRS = T !
```

```
*
 0 = Do not create file, 1 = create file


 QA PLOT FILE OUTPUT OPTION:

    Create a standard series of output files (e.g.
    locations of sources, receptors, grids ...)
    suitable for plotting?
    (IQAPLOT)                      Default: 1        !  IQAPLOT =  1   !
      0 = no
      1 = yes

 DIAGNOSTIC MASS FLUX OUTPUT OPTIONS:

    Mass flux across specified boundaries
    for selected species reported?
    (IMFLX)                        Default: 0        ! IMFLX =  0  !
      0 = no
      1 = yes (FLUXBDY.DAT and MASSFLX.DAT filenames
               are specified in Input Group 0)

    Mass balance for each species
    reported?
    (IMBAL)                        Default: 0        ! IMBAL =  0  !
      0 = no
      1 = yes (MASSBAL.DAT filename is
           specified in Input Group 0)


 LINE PRINTER OUTPUT OPTIONS:

    Print concentrations (ICPRT)   Default: 0        ! ICPRT =  1   !
    Print dry fluxes (IDPRT)       Default: 0        ! IDPRT =  0   !
    Print wet fluxes (IWPRT)       Default: 0        ! IWPRT =  0   !
    (0 = Do not print, 1 = Print)

    Concentration print interval
    (ICFRQ) in timesteps           Default: 1        ! ICFRQ =  24   !
    Dry flux print interval
    (IDFRQ) in timesteps           Default: 1        ! IDFRQ =  1   !
    Wet flux print interval
    (IWFRQ) in timesteps           Default: 1        ! IWFRQ =  1   !
```

```
      Units for Line Printer Output
      (IPRTU)                          Default: 1         ! IPRTU =  1   !
                      for              for
                  Concentration    Deposition
          1 =         g/m**3          g/m**2/s
          2 =        mg/m**3         mg/m**2/s
          3 =        ug/m**3         ug/m**2/s
          4 =        ng/m**3         ng/m**2/s
          5 =      Odour Units

      Messages tracking progress of run
      written to the screen ?
      (IMESG)                          Default: 2         ! IMESG =  2   !
        0 = no
        1 = yes (advection step, puff ID)
        2 = yes (YYYYJJJHH, # old puffs, # emitted puffs)


    SPECIES (or GROUP for combined species) LIST FOR OUTPUT OPTIONS

                 ---- CONCENTRATIONS ----    ------ DRY FLUXES ------    ------ WET
FLUXES ------   -- MASS FLUX --
   SPECIES
   /GROUP        PRINTED?  SAVED ON DISK?   PRINTED?  SAVED ON DISK?   PRINTED?
SAVED ON DISK?   SAVED ON DISK?
   -------              -------------------------      -------------------------
------------------------   ---------------
!          SO2 =      1,             1,             0,             0,             0,
0,           0   !

  Note:  Species BCON (for MBCON > 0) does not need to be saved on disk.


    OPTIONS FOR PRINTING "DEBUG" QUANTITIES (much output)

      Logical for debug output
      (LDEBUG)                                 Default: F     ! LDEBUG = F !

      First puff to track
      (IPFDEB)                                 Default: 1     ! IPFDEB =  1  !

      Number of puffs to track
      (NPFDEB)                                 Default: 1     ! NPFDEB =  10  !
```

```
       Met. period to start output
       (NN1)                                    Default: 1     ! NN1 =  10   !

       Met. period to end output
       (NN2)                                    Default: 10    ! NN2 =  10  !

!END!

------------------------------------------------------------------------------


INPUT GROUP: 6a, 6b, & 6c -- Subgrid scale complex terrain inputs
-------------------------

---------------
Subgroup (6a)
---------------
       Number of terrain features (NHILL)       Default: 0     ! NHILL =  0   !

       Number of special complex terrain
       receptors  (NCTREC)                      Default: 0     ! NCTREC =  0   !

       Terrain and CTSG Receptor data for
       CTSG hills input in CTDM format ?
       (MHILL)                                  No Default     ! MHILL =  2   !
       1 = Hill and Receptor data created
           by CTDM processors & read from
           HILL.DAT and HILLRCT.DAT files
       2 = Hill data created by OPTHILL &
           input below in Subgroup (6b);
           Receptor data in Subgroup (6c)

       Factor to convert horizontal dimensions  Default: 1.0   ! XHILL2M = .0 !
       to meters (MHILL=1)

       Factor to convert vertical dimensions    Default: 1.0   ! ZHILL2M = .0 !
       to meters (MHILL=1)

       X-origin of CTDM system relative to      No Default     ! XCTDMKM = 0 !
       CALPUFF coordinate system, in Kilometers (MHILL=1)

       Y-origin of CTDM system relative to      No Default     ! YCTDMKM = 0 !
       CALPUFF coordinate system, in Kilometers (MHILL=1)
```

! END !

Subgroup (6b)
---

1 **
HILL information

HILL NO.	XC (km)	YC (km)	THETAH (deg.)	ZGRID (m)	RELIEF (m)	EXPO 1 (m)	EXPO 2 (m)	SCALE 1 (m)	SCALE 2 (m)	AMAX1 (m)	AMAX2 (m)

Subgroup (6c)

COMPLEX TERRAIN RECEPTOR INFORMATION

XRCT (km)	YRCT (km)	ZRCT (m)	XHH

1
Description of Complex Terrain Variables:
XC, YC = Coordinates of center of hill
THETAH = Orientation of major axis of hill (clockwise from North)
ZGRID = Height of the 0 of the grid above mean sea level
RELIEF = Height of the crest of the hill above the grid elevation
EXPO 1 = Hill-shape exponent for the major axis
EXPO 2 = Hill-shape exponent for the major axis
SCALE 1 = Horizontal length scale along the major axis
SCALE 2 = Horizontal length scale along the minor axis
AMAX = Maximum allowed axis length for the major axis
BMAX = Maximum allowed axis length for the major axis

XRCT, YRCT = Coordinates of the complex terrain receptors
ZRCT = Height of the ground (MSL) at the complex terrain Receptor
XHH = Hill number associated with each complex terrain receptor (NOTE: MUST BE ENTERED AS A REAL NUMBER)

**

NOTE: DATA for each hill and CTSG receptor are treated as a separate input subgroup and therefore must end with an input group terminator.

INPUT GROUP: 7 -- Chemical parameters for dry deposition of gases

SPECIES NAME	DIFFUSIVITY (cm**2/s)	ALPHA STAR	REACTIVITY	MESOPHYLL RESISTANCE (s/cm)	HENRY'S LAW COEFFICIENT (dimensionless)

!END!

INPUT GROUP: 8 -- Size parameters for dry deposition of particles

For SINGLE SPECIES, the mean and standard deviation are used to compute a deposition velocity for NINT (see group 9) size-ranges, and these are then averaged to obtain a mean deposition velocity.

For GROUPED SPECIES, the size distribution should be explicitly specified (by the 'species' in the group), and the standard deviation for each should be entered as 0. The model will then use the deposition velocity for the stated mean diameter.

SPECIES	GEOMETRIC MASS MEAN	GEOMETRIC STANDARD

```
       NAME            DIAMETER                  DEVIATION
                        (microns)                 (microns)
      ______      ________________        _________________

!END!

------------------------------------------------------------------------------


INPUT GROUP: 9 -- Miscellaneous dry deposition parameters
-------------

     Reference cuticle resistance (s/cm)
     (RCUTR)                          Default: 30    !  RCUTR = 30.0 !
     Reference ground resistance  (s/cm)
     (RGR)                            Default: 10    !    RGR = 10.0 !
     Reference pollutant reactivity
     (REACTR)                         Default: 8     ! REACTR = 8.0 !

     Number of particle-size intervals used to
     evaluate effective particle deposition velocity
     (NINT)                           Default: 9     !   NINT =  9  !

     Vegetation state in unirrigated areas
     (IVEG)                           Default: 1     !   IVEG =  1   !
        IVEG=1 for active and unstressed vegetation
        IVEG=2 for active and stressed vegetation
        IVEG=3 for inactive vegetation

!END!

------------------------------------------------------------------------------


INPUT GROUP: 10 -- Wet Deposition Parameters
--------------

                    Scavenging Coefficient -- Units: (sec)**(-1)

       Pollutant      Liquid Precip.       Frozen Precip.
       _________      ______________       ______________
```

```
!END!

------------------------------------------------------------------------------


INPUT GROUP: 11 -- Chemistry Parameters
---------------

     Ozone data input option (MOZ)     Default: 1            ! MOZ =  0   !
     (Used only if MCHEM = 1, 3, or 4)
        0 = use a monthly background ozone value
        1 = read hourly ozone concentrations from
            the OZONE.DAT data file

     Monthly ozone concentrations
     (Used only if MCHEM = 1, 3, or 4 and
      MOZ = 0 or MOZ = 1 and all hourly O3 data missing)
     (BCKO3) in ppb                    Default: 12*80.
     !  BCKO3 = 30.00, 30.00, 30.00, 30.00, 30.00, 30.00, 30.00, 30.00, 30.00, 30.00,
30.00, 30.00 !

     Monthly ammonia concentrations
     (Used only if MCHEM = 1, or 3)
     (BCKNH3) in ppb                   Default: 12*10.
     !  BCKNH3 = 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00,
1.00 !

     Nighttime SO2 loss rate (RNITE1)
     in percent/hour                   Default: 0.2          ! RNITE1 = .2 !

     Nighttime NOx loss rate (RNITE2)
     in percent/hour                   Default: 2.0          ! RNITE2 = 2.0 !

     Nighttime HNO3 formation rate (RNITE3)
     in percent/hour                   Default: 2.0          ! RNITE3 = 2.0 !

     H2O2 data input option (MH2O2)    Default: 1            ! MH2O2 =  1   !
     (Used only if MAQCHEM = 1)
        0 = use a monthly background H2O2 value
        1 = read hourly H2O2 concentrations from
            the H2O2.DAT data file
```

Monthly H2O2 concentrations
(Used only if MQACHEM = 1 and
MH2O2 = 0 or MH2O2 = 1 and all hourly H2O2 data missing)
(BCKH2O2) in ppb Default: 12*1.
! BCKH2O2 = 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00 !

--- Data for SECONDARY ORGANIC AEROSOL (SOA) Option
(used only if MCHEM = 4)

The SOA module uses monthly values of:
Fine particulate concentration in ug/m^3 (BCKPMF)
Organic fraction of fine particulate (OFRAC)
VOC / NOX ratio (after reaction) (VCNX)
to characterize the air mass when computing
the formation of SOA from VOC emissions.
Typical values for several distinct air mass types are:

Month	1 Jan	2 Feb	3 Mar	4 Apr	5 May	6 Jun	7 Jul	8 Aug	9 Sep	10 Oct	11 Nov	12 Dec
Clean Continental												
BCKPMF	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
OFRAC	.15	.15	.20	.20	.20	.20	.20	.20	.20	.20	.20	.15
VCNX	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.
Clean Marine (surface)												
BCKPMF	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
OFRAC	.25	.25	.30	.30	.30	.30	.30	.30	.30	.30	.30	.25
VCNX	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.
Urban - low biogenic (controls present)												
BCKPMF	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.
OFRAC	.20	.20	.25	.25	.25	.25	.25	.25	.20	.20	.20	.20
VCNX	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
Urban - high biogenic (controls present)												
BCKPMF	60.	60.	60.	60.	60.	60.	60.	60.	60.	60.	60.	60.
OFRAC	.25	.25	.30	.30	.30	.55	.55	.55	.35	.35	.35	.25
VCNX	15.	15.	15.	15.	15.	15.	15.	15.	15.	15.	15.	15.
Regional Plume												
BCKPMF	20.	20.	20.	20.	20.	20.	20.	20.	20.	20.	20.	20.

```
         OFRAC  .20  .20  .25  .35  .25  .40  .40  .40  .30  .30  .30  .20
         VCNX    15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.

      Urban - no controls present
         BCKPMF 100. 100. 100. 100. 100. 100. 100. 100. 100. 100. 100. 100.
         OFRAC  .30  .30  .35  .35  .35  .55  .55  .55  .35  .35  .35  .30
         VCNX     2.   2.   2.   2.   2.   2.   2.   2.   2.   2.   2.   2.

      Default: Clean Continental
      !  BCKPMF = 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00,
1.00 !
      !  OFRAC  = 0.15, 0.15, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20,
0.15 !
      !  VCNX   = 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00,
50.00, 50.00, 50.00 !


!END!


-------------------------------------------------------------------------------


INPUT GROUP: 12 -- Misc. Dispersion and Computational Parameters
---------------

      Horizontal size of puff (m) beyond which
      time-dependent dispersion equations (Heffter)
      are used to determine sigma-y and
      sigma-z (SYTDEP)                                  Default: 550.    ! SYTDEP =
5.5E02 !

      Switch for using Heffter equation for sigma z
      as above (0 = Not use Heffter; 1 = use Heffter
      (MHFTSZ)                                          Default: 0       ! MHFTSZ =
0   !

      Stability class used to determine plume
      growth rates for puffs above the boundary
      layer (JSUP)                                 Default: 5      ! JSUP =  5   !

      Vertical dispersion constant for stable
      conditions (k1 in Eqn. 2.7-3)  (CONK1)     Default: 0.01    ! CONK1 = .01 !
```

```
     Vertical dispersion constant for neutral/
     unstable conditions (k2 in Eqn. 2.7-4)
     (CONK2)                                  Default: 0.1    ! CONK2 = .1 !

     Factor for determining Transition-point from
     Schulman-Scire to Huber-Snyder Building Downwash
     scheme (SS used for Hs < Hb + TBD * HL)
     (TBD)                                    Default: 0.5    ! TBD = .5 !
        TBD < 0   ==> always use Huber-Snyder
        TBD = 1.5 ==> always use Schulman-Scire
        TBD = 0.5 ==> ISC Transition-point

     Range of land use categories for which
     urban dispersion is assumed
     (IURB1, IURB2)                           Default: 10     ! IURB1 =  10  !
                                                       19     ! IURB2 =  19  !

     Site characterization parameters for single-point Met data files ---------
     (needed for METFM = 2,3,4,5)

        Land use category for modeling domain
        (ILANDUIN)                              Default: 20     ! ILANDUIN =
20  !

        Roughness length (m) for modeling domain
        (ZOIN)                                  Default: 0.25   ! ZOIN = .25 !

        Leaf area index for modeling domain
        (XLAIIN)                                Default: 3.0    ! XLAIIN = 3.0 !

        Elevation above sea level (m)
        (ELEVIN)                                Default: 0.0    ! ELEVIN = .0 !

        Latitude (degrees) for met location
        (XLATIN)                                   Default: -999.   ! XLATIN =
-999.0 !

        Longitude (degrees) for met location
        (XLONIN)                                   Default: -999.   ! XLONIN =
-999.0 !

     Specialized information for interpreting single-point Met data files -----

        Anemometer height (m) (Used only if METFM = 2,3)
```

```
        (ANEMHT)                                  Default: 10.     ! ANEMHT = 10.0 !

        Form of lateral turbulance data in PROFILE.DAT file
        (Used only if METFM = 4,5 or MTURBVW = 1 or 3)
        (ISIGMAV)                                   Default: 1       ! ISIGMAV =
1  !
            0 = read sigma-theta
            1 = read sigma-v

        Choice of mixing heights (Used only if METFM = 4)
        (IMIXCTDM)                                  Default: 0       ! IMIXCTDM =
0  !
            0 = read PREDICTED mixing heights
            1 = read OBSERVED mixing heights

     Maximum length of a slug (met. grid units)
     (XMXLEN)                                  Default: 1.0     ! XMXLEN = 1.0 !

     Maximum travel distance of a puff/slug (in
     grid units) during one sampling step
     (XSAMLEN)                                 Default: 1.0     ! XSAMLEN = 1.0 !

     Maximum Number of slugs/puffs release from
     one source during one time step
     (MXNEW)                                     Default: 99      ! MXNEW =
99   !

     Maximum Number of sampling steps for
     one puff/slug during one time step
     (MXSAM)                                   Default: 99      ! MXSAM =  5    !

     Number of iterations used when computing
     the transport wind for a sampling step
     that includes gradual rise (for CALMET
     and PROFILE winds)
     (NCOUNT)                                    Default: 2       ! NCOUNT =
2    !

     Minimum sigma y for a new puff/slug (m)
     (SYMIN)                                   Default: 1.0     ! SYMIN = 1.0  !

     Minimum sigma z for a new puff/slug (m)
     (SZMIN)                                   Default: 1.0     ! SZMIN = 1.0  !
```

Default minimum turbulence velocities sigma-v and sigma-w
for each stability class over land and over water (m/s)
(SVMIN(12) and SWMIN(12))

	LAND						WATER					
Stab Class :	A	B	C	D	E	F	A	B	C	D	E	F
Default SVMIN :	.50,	.50,	.50,	.50,	.50,	.50,	.37,	.37,	.37,	.37,	.37,	.37
Default SWMIN :	.20,	.12,	.08,	.06,	.03,	.016,	.20,	.12,	.08,	.06,	.03,	.016

! SVMIN = 0.500, 0.500, 0.500, 0.500, 0.500, 0.500, 0.370, 0.370, 0.370, 0.370, 0.370, 0.370!
! SWMIN = 0.200, 0.120, 0.080, 0.060, 0.030, 0.016, 0.200, 0.120, 0.080, 0.060, 0.030, 0.016!

Divergence criterion for dw/dz across puff
used to initiate adjustment for horizontal
convergence (1/s)
Partial adjustment starts at CDIV(1), and
full adjustment is reached at CDIV(2)
(CDIV(2)) Default: 0.0,0.0 ! CDIV = .01, .01 !

Minimum wind speed (m/s) allowed for
non-calm conditions. Also used as minimum
speed returned when using power-law
extrapolation toward surface
(WSCALM) Default: 0.5 ! WSCALM = .5 !

Maximum mixing height (m)
(XMAXZI) Default: 3000. ! XMAXZI = 3000.0 !

Minimum mixing height (m)
(XMINZI) Default: 50. ! XMINZI = 50.0 !

Default wind speed classes --
5 upper bounds (m/s) are entered;
the 6th class has no upper limit
(WSCAT(5)) Default :
ISC RURAL : 1.54, 3.09, 5.14, 8.23, 10.8

```
(10.8+)

                              Wind Speed Class :  1     2     3     4     5
                                                 ---   ---   ---   ---   ---
                                        ! WSCAT = 1.54, 3.09, 5.14, 8.23, 10.80 !

     Default wind speed profile power-law
     exponents for stabilities 1-6
     (PLX0(6))                          Default   : ISC RURAL values
                                        ISC RURAL : .07, .07, .10, .15, .35, .55
                                        ISC URBAN : .15, .15, .20, .25, .30, .30

                                 Stability Class :  A      B      C      D      E
F
                                                   ---    ---    ---    ---    ---
---
                                         ! PLX0 = 0.07, 0.07, 0.10, 0.15, 0.35,
0.55 !

     Default potential temperature gradient
     for stable classes E, F (degK/m)
     (PTG0(2))                          Default: 0.020, 0.035
                                           ! PTG0 = 0.020,   0.035 !

     Default plume path coefficients for
     each stability class (used when option
     for partial plume height terrain adjustment
     is selected -- MCTADJ=3)
     (PPC(6))                     Stability Class :  A     B     C     D     E
F
                                    Default
PPC : .50,  .50,  .50,  .50,  .35,  .35
                                                   ---    ---    ---    ---    ---
---
                                         !  PPC = 0.50, 0.50, 0.50, 0.50, 0.35,
0.35 !

     Slug-to-puff transition criterion factor
     equal to sigma-y/length of slug
     (SL2PF)                               Default: 10.        ! SL2PF = 5.0 !

     Puff-splitting control variables -----------------------

       VERTICAL SPLIT
```

```
      -------------

      Number of puffs that result every time a puff
      is split - nsplit=2 means that 1 puff splits
      into 2
      (NSPLIT)                          Default:   3        ! NSPLIT =  3  !

      Time(s) of a day when split puffs are eligible to
      be split once again; this is typically set once
      per day, around sunset before nocturnal shear develops.
      24 values: 0 is midnight (00:00) and 23 is 11 PM (23:00)
      0=do not re-split    1=eligible for re-split
      (IRESPLIT(24))                    Default:  Hour 17 = 1
      !  IRESPLIT = 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0 !

      Split is allowed only if last hour's mixing
      height (m) exceeds a minimum value
      (ZISPLIT)                            Default: 100.        ! ZISPLIT =
100.0 !

      Split is allowed only if ratio of last hour's
      mixing ht to the maximum mixing ht experienced
      by the puff is less than a maximum value (this
      postpones a split until a nocturnal layer develops)
      (ROLDMAX)                         Default: 0.25       ! ROLDMAX = 0.25 !


      HORIZONTAL SPLIT
      ----------------

      Number of puffs that result every time a puff
      is split - nsplith=5 means that 1 puff splits
      into 5
      (NSPLITH)                         Default:   5        ! NSPLITH =  5  !

      Minimum sigma-y (Grid Cells Units) of puff
      before it may be split
      (SYSPLITH)                        Default:  1.0       ! SYSPLITH = 1.0 !

      Minimum puff elongation rate (SYSPLITH/hr) due to
      wind shear, before it may be split
      (SHSPLITH)                        Default:  2.        ! SHSPLITH = 2.0 !

      Minimum concentration (g/m^3) of each
```

```
       species in puff before it may be split
       Enter array of NSPEC values; if a single value is
       entered, it will be used for ALL species
       (CNSPLITH)                          Default:  1.0E-07    ! CNSPLITH =
1.0E-07 !

     Integration control variables ----------------------

       Fractional convergence criterion for numerical SLUG
       sampling integration
       (EPSSLUG)                           Default:   1.0e-04   ! EPSSLUG =
1.0E-04 !

       Fractional convergence criterion for numerical AREA
       source integration
       (EPSAREA)                           Default:   1.0e-06   ! EPSAREA =
1.0E-06 !

       Trajectory step-length (m) used for numerical rise
       integration
       (DSRISE)                        Default:   1.0      ! DSRISE = 1.0 !

       Boundary Condition (BC) Puff control variables -----------------------

       Minimum height (m) to which BC puffs are mixed as they are emitted
       (MBCON=2 ONLY).  Actual height is reset to the current mixing height
       at the release point if greater than this minimum.
       (HTMINBC)                           Default:   500.      ! HTMINBC =
500.0 !

       Search radius (km) about a receptor for sampling nearest BC puff.
       BC puffs are typically emitted with a spacing of one grid cell
       length, so the search radius should be greater than DGRIDKM.
       (RSAMPBC)                       Default:   10.       ! RSAMPBC = 10.0 !

       Near-Surface depletion adjustment to concentration profile used when
       sampling BC puffs?
       (MDEPBC)                        Default:   1        ! MDEPBC =  1  !
          0 = Concentration is NOT adjusted for depletion
          1 = Adjust Concentration for depletion

!END!
```

```
------------------------------------------------------------------------------


INPUT GROUPS: 13a, 13b, 13c, 13d -- Point source parameters
-------------------------------

--------------
Subgroup (13a)
--------------

     Number of point sources with
     parameters provided below      (NPT1)  No default  !  NPT1 =  3  !

     Units used for point source
     emissions below                (IPTU)  Default: 1  !  IPTU =   1  !
           1 =        g/s
           2 =       kg/hr
           3 =       lb/hr
           4 =     tons/yr
           5 =     Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =     Odour Unit * m**3/min
           7 =     metric tons/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (13d)        (NSPT1) Default: 0  !  NSPT1 =  0  !

     Number of point sources with
     variable emission parameters
     provided in external file      (NPT2)  No default  !  NPT2 =  0  !

     (If NPT2 > 0, these point
     source emissions are read from
     the file: PTEMARB.DAT)

!END!

--------------
Subgroup (13b)
--------------
                                    a
          POINT SOURCE: CONSTANT DATA
          ---------------------------
```

b

c

Source No.	X Coordinate (km)	Y Coordinate (km)	Stack Height (m)	Base Elevation (m)	Stack Diameter (m)	Exit Vel. (m/s)	Exit Temp. (deg. K)	Bldg. Dwash	Emission Rates
1	SRCNAM = 1								
1	X =	171.0,	4603.0,	65.0,	.0,	3.5,	12.6,	330.0,	.0, 1.0E01
1	ZPLTFM =	.0							
1	FMFAC =	1.0	!END!						
2	SRCNAM = 2								
2	X =	196.0,	4629.0,	17.0,	.0,	3.5,	12.6,	330.0,	.0, 1.0E01
2	ZPLTFM =	.0							
2	FMFAC =	1.0	!END!						
3	SRCNAM = 3								
3	X =	357.0,	4783.0,	43.0,	.0,	3.5,	12.6,	330.0,	.0, 1.0E01
3	ZPLTFM =	.0							
3	FMFAC =	1.0	!END!						

a

Data for each source are treated as a separate input subgroup
and therefore must end with an input group terminator.

SRCNAM is a 12-character name for a source
(No default)

X is an array holding the source data listed by the column headings
(No default)

SIGYZI is an array holding the initial sigma-y and sigma-z (m)
(Default: 0.,0.)

FMFAC is a vertical momentum flux factor (0. or 1.0) used to represent the effect of rain-caps or other physical configurations that reduce momentum rise associated with the actual exit velocity.
(Default: 1.0 -- full momentum used)

ZPLTFM is the platform height (m) for sources influenced by an isolated structure that has a significant open area between the surface and the bulk of the structure, such as an offshore oil platform.

The Base Elevation is that of the surface (ground or ocean), and the Stack Height is the release height above the Base (not above the platform). Building heights entered in Subgroup 13c must be those of the buildings on the platform, measured from the platform deck. ZPLTFM is used only with MBDW=1 (ISC downwash method) for sources with building downwash. (Default: 0.0)

b

0. = No building downwash modeled
1. = Downwash modeled for buildings resting on the surface
2. = Downwash modeled for buildings raised above the surface (ZPLTFM > 0.)
NOTE: must be entered as a REAL number (i.e., with decimal point)

c

An emission rate must be entered for every pollutant modeled. Enter emission rate of zero for secondary pollutants that are modeled, but not emitted. Units are specified by IPTU (e.g. 1 for g/s).

Subgroup (13c)

BUILDING DIMENSION DATA FOR SOURCES SUBJECT TO DOWNWASH

Source No.	Effective building height, width, length and X/Y offset (in meters) every 10 degrees. LENGTH, XBADJ, and YBADJ are only needed for MBDW=2 (PRIME downwash option)	a

---

a

Building height, width, length, and X/Y offset from the source are treated as a separate input subgroup for each source and therefore must end with an input group terminator. The X/Y offset is the position, relative to the stack, of the center of the upwind face of the projected building, with the x-axis pointing along the flow direction.

Subgroup (13d)

---

a

POINT SOURCE: VARIABLE EMISSIONS DATA

Use this subgroup to describe temporal variations in the emission rates given in 13b. Factors entered multiply the rates in 13b. Skip sources here that have constant emissions. For more elaborate variation in source parameters, use PTEMARB.DAT and NPT2 > 0.

IVARY determines the type of variation, and is source-specific:
(IVARY) Default: 0

- 0 = Constant
- 1 = Diurnal cycle (24 scaling factors: hours 1-24)
- 2 = Monthly cycle (12 scaling factors: months 1-12)
- 3 = Hour & Season (4 groups of 24 hourly scaling factors, where first group is DEC-JAN-FEB)
- 4 = Speed & Stab. (6 groups of 6 scaling factors, where first group is Stability Class A, and the speed classes have upper bounds (m/s) defined in Group 12
- 5 = Temperature (12 scaling factors, where temperature classes have upper bounds (C) of: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 50+)

---

a Data for each species are treated as a separate input subgroup and therefore must end with an input group terminator.

INPUT GROUPS: 14a, 14b, 14c, 14d -- Area source parameters

Subgroup (14a)

```
     Number of polygon area sources with
     parameters specified below (NAR1)       No default  !  NAR1 =  0   !

     Units used for area source
     emissions below            (IARU)       Default: 1  !  IARU =   1  !
           1 =        g/m**2/s
           2 =       kg/m**2/hr
           3 =       lb/m**2/hr
           4 =     tons/m**2/yr
           5 =     Odour Unit * m/s  (vol. flux/m**2 of odour compound)
           6 =     Odour Unit * m/min
           7 =     metric tons/m**2/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (14d)        (NSAR1) Default: 0  !  NSAR1 =  0  !

     Number of buoyant polygon area sources
     with variable location and emission
     parameters (NAR2)                      No default  !  NAR2 =  0   !
     (If NAR2 > 0, ALL parameter data for
     these sources are read from the file: BAEMARB.DAT)

!END!

---------------
Subgroup (14b)
---------------
                                    a
          AREA SOURCE: CONSTANT DATA
          --------------------------
                                                              b
Source           Effect.     Base       Initial    Emission
 No.             Height    Elevation    Sigma z     Rates
                   (m)        (m)         (m)
-------          ------     ------     --------   ---------


--------
    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.
    b
```

An emission rate must be entered for every pollutant modeled.
Enter emission rate of zero for secondary pollutants that are
modeled, but not emitted. Units are specified by IARU
(e.g. 1 for g/m**2/s).

Subgroup (14c)

COORDINATES (km) FOR EACH VERTEX(4) OF EACH POLYGON

Source No.	Ordered list of X followed by list of Y, grouped by source [a]

---

[a] Data for each source are treated as a separate input subgroup and therefore must end with an input group terminator.

Subgroup (14d)

AREA SOURCE: VARIABLE EMISSIONS DATA [a]

Use this subgroup to describe temporal variations in the emission rates given in 14b. Factors entered multiply the rates in 14b. Skip sources here that have constant emissions. For more elaborate variation in source parameters, use BAEMARB.DAT and NAR2 > 0.

IVARY determines the type of variation, and is source-specific:
(IVARY) Default: 0

- 0 = Constant
- 1 = Diurnal cycle (24 scaling factors: hours 1-24)
- 2 = Monthly cycle (12 scaling factors: months 1-12)
- 3 = Hour & Season (4 groups of 24 hourly scaling factors, where first group is DEC-JAN-FEB)
- 4 = Speed & Stab. (6 groups of 6 scaling factors, where first group is Stability Class A, and the speed classes have upper

bounds (m/s) defined in Group 12

5 = Temperature (12 scaling factors, where temperature classes have upper bounds (C) of: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 50+)

---

a

Data for each species are treated as a separate input subgroup and therefore must end with an input group terminator.

INPUT GROUPS: 15a, 15b, 15c -- Line source parameters

Subgroup (15a)

Number of buoyant line sources with variable location and emission parameters (NLN2) No default ! NLN2 = 0 !

(If NLN2 > 0, ALL parameter data for these sources are read from the file: LNEMARB.DAT)

Number of buoyant line sources (NLINES) No default ! NLINES = 0 !

Units used for line source emissions below (ILNU) Default: 1 ! ILNU = 1 !

1 = g/s
2 = kg/hr
3 = lb/hr
4 = tons/yr
5 = Odour Unit * m**3/s (vol. flux of odour compound)
6 = Odour Unit * m**3/min
7 = metric tons/yr

Number of source-species combinations with variable

emissions scaling factors
provided below in (15c) (NSLN1) Default: 0 ! NSLN1 = 0 !

Maximum number of segments used to model
each line (MXNSEG) Default: 7 ! MXNSEG = 7 !

The following variables are required only if NLINES > 0. They are
used in the buoyant line source plume rise calculations.

Number of distances at which transitional rise is computed — Default: 6 ! NLRISE = 6 !

Average building length (XL) (in meters) — No default ! XL = .0 !

Average building height (HBL) (in meters) — No default ! HBL = .0 !

Average building width (WBL) (in meters) — No default ! WBL = .0 !

Average line source width (WML) (in meters) — No default ! WML = .0 !

Average separation between buildings (DXL) (in meters) — No default ! DXL = .0 !

Average buoyancy parameter (FPRIMEL) (in m**4/s**3) — No default ! FPRIMEL = .0 !

!END!

Subgroup (15b)

BUOYANT LINE SOURCE: CONSTANT DATA

---

a

Source No.	Beg. X Coordinate	Beg. Y Coordinate	End. X Coordinate	End. Y Coordinate	Release Height	Base Elevation	Emission Rates

	(km)	(km)	(km)	(km)	(m)	(m)	
------	----------	----------	---------	----------	-------	---------	---------

----

----

a
Data for each source are treated as a separate input subgroup
and therefore must end with an input group terminator.

b
An emission rate must be entered for every pollutant modeled.
Enter emission rate of zero for secondary pollutants that are
modeled, but not emitted. Units are specified by ILNTU
(e.g. 1 for g/s).

Subgroup (15c)

---

a

BUOYANT LINE SOURCE: VARIABLE EMISSIONS DATA

Use this subgroup to describe temporal variations in the emission
rates given in 15b. Factors entered multiply the rates in 15b.
Skip sources here that have constant emissions.

IVARY determines the type of variation, and is source-specific:
(IVARY) Default: 0

0 =	Constant	
1 =	Diurnal cycle	(24 scaling factors: hours 1-24)
2 =	Monthly cycle	(12 scaling factors: months 1-12)
3 =	Hour & Season	(4 groups of 24 hourly scaling factors, where first group is DEC-JAN-FEB)
4 =	Speed & Stab.	(6 groups of 6 scaling factors, where first group is Stability Class A, and the speed classes have upper bounds (m/s) defined in Group 12
5 =	Temperature	(12 scaling factors, where temperature classes have upper bounds (C) of: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 50+)

```
-------
    a
     Data for each species are treated as a separate input subgroup
     and therefore must end with an input group terminator.


------------------------------------------------------------------------------


INPUT GROUPS: 16a, 16b, 16c -- Volume source parameters
---------------------------


---------------
Subgroup (16a)
---------------

     Number of volume sources with
     parameters provided in 16b,c (NVL1)     No default  !  NVL1 =  0   !

     Units used for volume source
     emissions below in 16b       (IVLU)     Default: 1  !  IVLU =   1  !
           1 =        g/s
           2 =       kg/hr
           3 =       lb/hr
           4 =     tons/yr
           5 =     Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =     Odour Unit * m**3/min
           7 =     metric tons/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (16c)      (NSVL1)    Default: 0  !  NSVL1 =  0  !

     Number of volume sources with
     variable location and emission
     parameters                   (NVL2)     No default  !  NVL2 =   0   !

     (If NVL2 > 0, ALL parameter data for
      these sources are read from the VOLEMARB.DAT file(s) )

!END!
```

Subgroup (16b)

---

a

VOLUME SOURCE: CONSTANT DATA

---

b

X Coordinate (km)	Y Coordinate (km)	Effect. Height (m)	Base Elevation (m)	Initial Sigma y (m)	Initial Sigma z (m)	Emission Rates
---	---	---	---	---	---	---

---

a

Data for each source are treated as a separate input subgroup and therefore must end with an input group terminator.

b

An emission rate must be entered for every pollutant modeled. Enter emission rate of zero for secondary pollutants that are modeled, but not emitted. Units are specified by IVLU (e.g. 1 for g/s).

Subgroup (16c)

---

a

VOLUME SOURCE: VARIABLE EMISSIONS DATA

Use this subgroup to describe temporal variations in the emission rates given in 16b. Factors entered multiply the rates in 16b. Skip sources here that have constant emissions. For more elaborate variation in source parameters, use VOLEMARB.DAT and NVL2 > 0.

IVARY determines the type of variation, and is source-specific:
(IVARY) Default: 0

- 0 = Constant
- 1 = Diurnal cycle (24 scaling factors: hours 1-24)
- 2 = Monthly cycle (12 scaling factors: months 1-12)

3 = Hour & Season (4 groups of 24 hourly scaling factors, where first group is DEC-JAN-FEB)
4 = Speed & Stab. (6 groups of 6 scaling factors, where first group is Stability Class A, and the speed classes have upper bounds (m/s) defined in Group 12
5 = Temperature (12 scaling factors, where temperature classes have upper bounds (C) of: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 50+)

---

a
Data for each species are treated as a separate input subgroup and therefore must end with an input group terminator.

INPUT GROUPS: 17a & 17b -- Non-gridded (discrete) receptor information

---

Subgroup (17a)

Number of non-gridded receptors (NREC) No default ! NREC = 0 !

!END!

Subgroup (17b)

---

a
NON-GRIDDED (DISCRETE) RECEPTOR DATA

Receptor No.	X Coordinate (km)	Y Coordinate (km)	Ground Elevation (m)	Height b Above Ground (m)

```
------------
```

a

Data for each receptor are treated as a separate input subgroup and therefore must end with an input group terminator.

b

Receptor height above ground is optional. If no value is entered, the receptor is placed on the ground.

3.2 CALPUFF 控制流文件命令及参数说明

(1)INPUT GROUP: 0 --- 输入、输出文件路径设置：

文件类型设置：在Type下，选择input/output；在File Name下，指定输入、输出文件路径;！执行提示符，*注册提示符；在File Name选项中，CALMET.DAT为输入件;CALPUFF.LST(程序运行过程监视文件)、CONC.DAT(浓度文件)、DFLX.DAT、WFLX.DAT（干湿沉降通量文件）VISIBILITY.DAT（能见度文件）RESTARTE.DAT（执行重启动文件）为输出文件；Emission Files排放清单文件指示符：PTDAT、VOLDAT、ARDAT、LNDAT。

（2）INPUT GROUP:1 --- 执行控制参数设置：选择运行周期参数值（METRUN=0或1）；设定起始与终止时间参数（IBYR、IBMO、IBHR、IBMIN、IBSEC；IEYR、IEMO、、IEDY)、IEHR、IEMIN、IESEC)；时区参数(XBTZ)；模拟时间步长(NSECDT)；参加化学方应的物质数量（NSPEC）。

（3）INPUT GROUP：2物理机制选择：风廓线近场垂直分布方式（MGAUSS=0或1）；地形调整方法（MCTADJ=0、1、2或3）；模拟子网格尺度复杂地形选项（MCTSG=0或1)；用SLUG模拟近场烟团(MSLUG=0或1)；模拟瞬时烟与抬升(MTRANS=0或1)；建筑物下洗（MBDW=1或2）、烟囱下洗（MTIP=0或1）；模拟烟囱高度以上垂直风剪切(MSHEAR=0或1)；烟团分割（MSPLIT=0或1）；化学反应机制（MCHEM=0、1、2、3或4）；气相转化（MAQCHEM=0或1）；模拟干湿沉降（MDRY/MWET=0或1）；重力沉降（MTILT=0或1）；扩散系数计算方法（MDISP=1、2、3、4或5）；模拟边界条件（MBCON=0、1或2）；模拟冷却塔排放扩散（MBCON=0、1或2）。

（4）INPUT GROUP:3列举计算因子：CSPEC（计算因子）INPUT GROUP: 9；SPECIES、MODELED、EMITTED。

（5）INPUT GROUP:4设置图形投影与网格控制参数：投影方法（PMAP=UTM、TTM、LCC、PS、EM 、LAZA保角变化适用于中国）；气象数据网格设置（NX、NY、NZ）；网格步长(DGRIDKM)；每层到地表的高度(ZFACE)；计算网格控制参数(IBCOMP)JBCOMP、IECOMP、JECOMP）。

（6）INPUT GROUP: 5输出选项：生成下列文件（ICON、IDRY、IWET、IT2D、IRHO）IVIS（选择0或1）；运行过程屏幕显示（IMESG=0、1或2）；列举输出结果选项（SPECIES）：为CONCENTRATIONS、DRY FLUXES、WET FLUXES、MASS FLUX设置

指令PRINTED、SAVED ON DISK、PRINTED、SAVED ON DISK、PRINTED、SAVED ON DISK、SAVED ON DISK（值0或1）。

（7）INPUT GROUP: 6子网格尺度复杂地形输入：复杂地形接受点坐标设置（XRCT、YRCT、ZRCT、XHH）。

（8）INPUT GROUP: 7设定气体干沉降化学参数：DIFFUSIVITY、ALPHA STAR、REACTIVITY、MESOPHYLL RESISTANCE。

（9）INPUT GROUP:8颗粒物干沉降GEOMETRIC MASS MEAN DIAMETER、GEOMETRIC STANDARD DEVIATION。

（10）INPUT GROUP:9干沉降阻抗参数：RCUTR、RGR、REACTR、NINT、IVEG、IVEG。

（11）INPUT GROUP:10 湿沉降参数设置：去除系数（Pollutant、Liquid Precip、冻雨Frozen Precip）。

（12）INPUT GROUP:11设置化学参数：臭氧输入选项（MOZ=0或1）；臭氧月浓度序列（BCKO3）；氨月浓度序列（BCKNH3）；夜间SO2、Nox亏损率（RNITE1、RNITE2）；HNO3转化率（RNITE3）；H2O2输入选项（MH2O2）；H2O2月浓度序列（BCKH2O2）；二次生成有机气溶胶模块参数输入（BCKPMF、OFRAC、VCNX）。

（13）INPUT GROUP: 12扩散与计算参数：水平烟羽尺度（SYTDEP）;用来确定边界层以上烟羽生长率的稳定度（JSUP）；稳定条件下的垂直扩散常数（CONK1）；中性与不稳定条件的垂直扩散常数（CONK2）；用来确定Schulman-Scire与Huber-Snyder建筑物下洗公式的转换点的因子（TBD）；气象数据文件的站点特征参数（ILANDUIN、ZOIN、XLAIIN、ELEVIN、XLATIN、XONIN）；单台气象数据文件信息（ANEMHT、XMXLEN、XSAMLEN、MXNEW、MXSAM、NCOUNT、SYMIN、SZMIN）；烟团分割控制参数设置（垂直分割：NSPLIT、ZISPLIT；水平分割：NSPLITH、SYSPLITH、CNSPLITH）；积分控制变量（数值计算收敛极限EPSSLUG；轨迹步长DSRISE；烟团边界条件控制变量HTMINBC、RSAMPBC、近地面浓度衰减校正选择MDEPBC=0或1）。

（14）INPUT GROUPS:13a、13b、13c、13d设置点源参数（点源数量NPT1、POINT

SOURCE：点源参数与AERMOD同；建筑物下洗参数与AERMOD同；点源时间变化排放清单与AERMOD同）；面源参数：（AREA SOURCE:（Source No、Effect Height、Base Elevation、Initial Sigma z、Emission Rates）；

AREA SOURCE: CONSTANT DATA

Source No.	Effect. Height (m)	Base Elevation (m)	Initial Sigma z (m)	Emission Rates

浮力线源参数（与AERMOD同）：

BUOYANT LINE SOURCE: CONSTANT DATA

Source No.	Beg. X Coordinate (km)	Beg. Y Coordinate (km)	End. X Coordinate (km)	End. Y Coordinate (km)	Release Height (m)	Base Elevation (m)	Emission Rates

体积源参数：

VOLUME SOURCE: CONSTANT DATA

X Coordinate	Y Coordinate	Effect. Height	Base Elevation	Initial Sigma y	Initial Sigma z	Emission Rates

（15）INPUT GROUPS: 17a & 17b设置特定接受点：接受点数量（NREC）

NON-GRIDDED (DISCRETE) RECEPTOR DATA

Receptor	X Coordinate	Y Coordinate	Ground Elevation	Height Above Ground

4 CALMET 控制流文件格式

运行 CAIMET 诊断风场模型需要地形数据、地表特征参数、降雨量数据、常规地面站（高空站）气象数据等物理量。

4.1 CALMET 控制流文件实例

```
CALMET.INP      2.1             Hour Start and End Times with Seconds
CALMET TEST CASE
17 x 17  20 km meteorological grid -- wind & met model
Met. stations used: 12 surface, 3 upper air, 0 precip., 3 overwater
---------------- Run title (3 lines) ------------------------------------------

                    CALMET MODEL CONTROL FILE
                    -------------------------

--------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names


Subgroup (a)
------------
Default Name  Type          File Name
------------  ----          ---------
GEO.DAT       input    ! GEODAT=GEO.DAT       !
SURF.DAT      input    ! SRFDAT=SURF.DAT      !
CLOUD.DAT     input    * CLDDAT=              *
PRECIP.DAT    input    * PRCDAT=              *
WT.DAT        input    * WTDAT=               *

CALMET.LST    output   ! METLST=CALMET.LST     !
CALMET.DAT    output   ! METDAT=CALMET.DAT    !
PACOUT.DAT    output   * PACDAT=              *

All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case      ! LCFILES = T !
         F = UPPER CASE

NUMBER OF UPPER AIR & OVERWATER STATIONS:
```

```
    Number of upper air stations (NUSTA)  No default     ! NUSTA =  3  !
    Number of overwater met stations
                                (NOWSTA) No default     ! NOWSTA =  3  !

NUMBER OF PROGNOSTIC and IGF-CALMET FILEs:

    Number of MM4/MM5/3D.DAT files
                                (NM3D) No default       ! NM3D =  0  !

    Number of IGF-CALMET.DAT files
                                (NIGF)   No default     ! NIGF =  0  !

                        !END!
-------------------------------------------------------------------------------
-
Subgroup (b)
---------------------------------
Upper air files (one per station)
---------------------------------
Default Name  Type       File Name
------------  ----       ---------
UP1.DAT       input     1  ! UPDAT=UP1.DAT!    !END!
UP2.DAT       input     2  ! UPDAT=UP2.DAT!    !END!
UP3.DAT       input     3  ! UPDAT=UP3.DAT!    !END!
-------------------------------------------------------------------------------
-
Subgroup (c)
----------------------------------------
Overwater station files (one per station)
----------------------------------------
Default Name  Type       File Name
------------  ----       ---------
SEA1.DAT       input     1  ! SEADAT=SEA1.DAT!    !END!
SEA2.DAT       input     2  ! SEADAT=SEA2.DAT!    !END!
SEA3.DAT       input     3  ! SEADAT=SEA3.DAT!    !END!
-------------------------------------------------------------------------------
-
Subgroup (d)
--------------------------------------------
MM4/MM5/3D.DAT files (consecutive or overlapping)
--------------------------------------------
Default Name  Type       File Name
------------  ----       ---------
```

```
MM51.DAT       input     1  * M3DDAT=LSP2003.DAT *    *END*
------------------------------------------------------------------------------
-
Subgroup (e)
---------------------------------------------
IGF-CALMET.DAT files (consecutive or overlapping)
---------------------------------------------
Default Name  Type       File Name
------------  ----       ---------
IGFn.DAT       input     1  * IGFDAT=CALMET0.DAT *    *END*
------------------------------------------------------------------------------
-
Subgroup (f)
----------------
Other file names
----------------

Default Name  Type       File Name
------------  ----       ---------
DIAG.DAT      input      * DIADAT=                  *
PROG.DAT      input      * PRGDAT=                  *

TEST.PRT      output     * TSTPRT=                  *
TEST.OUT      output     * TSTOUT=                  *
TEST.KIN      output     * TSTKIN=                  *
TEST.FRD      output     * TSTFRD=                  *
TEST.SLP      output     * TSTSLP=                  *
DCST.GRD      output     * DCSTGD=                  *

------------------------------------------------------------------------------
-
NOTES: (1) File/path names can be up to 70 characters in length
       (2) Subgroups (a) and (f) must have ONE 'END' (surrounded by
           delimiters) at the end of the group
       (3) Subgroups (b) through (e) are included ONLY if the corresponding
           number of files (NUSTA, NOWSTA, NM3D, NIGF) is not 0, and each must have
           an 'END' (surround by delimiters) at the end of EACH LINE

                        !END!


------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
```

```
-------------

     Starting date:    Year   (IBYR)  --    No default   ! IBYR  =  1988  !
                       Month  (IBMO)  --    No default   ! IBMO  =  7  !
                       Day    (IBDY)  --    No default   ! IBDY  =  7  !
     Starting time:    Hour   (IBHR)  --    No default   ! IBHR  =  0  !
                       Second (IBSEC) --    No default   ! IBSEC =  0  !

     Ending date:      Year   (IEYR)  --    No default   ! IEYR  =  1988  !
                       Month  (IEMO)  --    No default   ! IEMO  =  7  !
                       Day    (IEDY)  --    No default   ! IEDY  =  8  !
     Ending time:      Hour   (IEHR)  --    No default   ! IEHR  =  0  !
                       Second (IESEC) --    No default   ! IESEC =  0  !

      UTC time zone          (ABTZ) -- No default       ! ABTZ= UTC-0500 !
         (character*8)
         PST = UTC-0800, MST = UTC-0700 , GMT = UTC-0000
         CST = UTC-0600, EST = UTC-0500

     Length of modeling time-step (seconds)
     Must divide evenly into 3600 (1 hour)
     (NSECDT)                         Default:3600     ! NSECDT =  3600  !
                                      Units: seconds

     Run type             (IRTYPE) -- Default: 1       ! IRTYPE=  1  !

        0 = Computes wind fields only
        1 = Computes wind fields and micrometeorological variables
            (u*, w*, L, zi, etc.)
        (IRTYPE must be 1 to run CALPUFF or CALGRID)

     Compute special data fields required
     by CALGRID (i.e., 3-D fields of W wind
     components and temperature)
     in additional to regular            Default: T    ! LCALGRD = T !
     fields ? (LCALGRD)
     (LCALGRD must be T to run CALGRID)

      Flag to stop run after
      SETUP phase (ITEST)              Default: 2       ! ITEST=  2   !
      (Used to allow checking
      of the model inputs, files, etc.)
      ITEST = 1 - STOPS program after SETUP phase
      ITEST = 2 - Continues with execution of
```

```
                    COMPUTATIONAL phase after SETUP

!END!

--------------------------------------------------------------------------------

INPUT GROUP: 2 -- Map Projection and Grid control parameters
--------------

     Projection for all (X,Y):
     -------------------------

     Map projection
     (PMAP)                      Default: UTM    ! PMAP = UTM  !

         UTM :  Universal Transverse Mercator
         TTM :  Tangential Transverse Mercator
         LCC :  Lambert Conformal Conic
          PS :  Polar Stereographic
          EM :  Equatorial Mercator
        LAZA :  Lambert Azimuthal Equal Area

     False Easting and Northing (km) at the projection origin
     (Used only if PMAP= TTM, LCC, or LAZA)
     (FEAST)                     Default=0.0     ! FEAST  = 0.000  !
     (FNORTH)                    Default=0.0     ! FNORTH = 0.000  !

     UTM zone (1 to 60)
     (Used only if PMAP=UTM)
     (IUTMZN)                    No Default      ! IUTMZN =  19   !

     Hemisphere for UTM projection?
     (Used only if PMAP=UTM)
     (UTMHEM)                    Default: N      ! UTMHEM = N  !
         N   :  Northern hemisphere projection
         S   :  Southern hemisphere projection

     Latitude and Longitude (decimal degrees) of projection origin
     (Used only if PMAP= TTM, LCC, PS, EM, or LAZA)
     (RLAT0)                     No Default      ! RLAT0 = 40N  !
     (RLON0)                     No Default      ! RLON0 = 74W  !

         TTM :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
```

LCC : RLON0 identifies central (true N/S) meridian of projection
RLAT0 selected for convenience
PS : RLON0 identifies central (grid N/S) meridian of projection
RLAT0 selected for convenience
EM : RLON0 identifies central meridian of projection
RLAT0 is REPLACED by 0.0N (Equator)
LAZA: RLON0 identifies longitude of tangent-point of mapping plane
RLAT0 identifies latitude of tangent-point of mapping plane

Matching parallel(s) of latitude (decimal degrees) for projection
(Used only if PMAP= LCC or PS)
(XLAT1) No Default ! XLAT1 = 35N !
(XLAT2) No Default ! XLAT2 = 45N !

LCC : Projection cone slices through Earth's surface at XLAT1 and XLAT2
PS : Projection plane slices through Earth at XLAT1
(XLAT2 is not used)

Note: Latitudes and longitudes should be positive, and include a letter N,S,E, or W indicating north or south latitude, and east or west longitude. For example,
35.9 N Latitude = 35.9N
118.7 E Longitude = 118.7E

Datum-region

The Datum-Region for the coordinates is identified by a character string. Many mapping products currently available use the model of the Earth known as the World Geodetic System 1984 (WGS-84). Other local models may be in use, and their selection in CALMET will make its output consistent with local mapping products. The list of Datum-Regions with official transformation parameters is provided by the National Imagery and Mapping Agency (NIMA).

NIMA Datum - Regions(Examples)

WGS-84	WGS-84 Reference Ellipsoid and Geoid, Global coverage (WGS84)
NAS-C	NORTH AMERICAN 1927 Clarke 1866 Spheroid, MEAN FOR CONUS (NAD27)
NAR-C	NORTH AMERICAN 1983 GRS 80 Spheroid, MEAN FOR CONUS (NAD83)
NWS-84	NWS 6370KM Radius, Sphere

```
     ESR-S     ESRI REFERENCE 6371KM Radius, Sphere

     Datum-region for output coordinates
     (DATUM)                    Default: WGS-84    ! DATUM = NAS-C  !


     Horizontal grid definition:
     ---------------------------

     Rectangular grid defined for projection PMAP,
     with X the Easting and Y the Northing coordinate

           No. X grid cells (NX)      No default     ! NX =   17  !
           No. Y grid cells (NY)      No default     ! NY =   17  !

     Grid spacing (DGRIDKM)           No default     ! DGRIDKM = 20. !
                                      Units: km

     Reference grid coordinate of
     SOUTHWEST corner of grid cell (1,1)

        X coordinate (XORIGKM)        No default     ! XORIGKM = 120.000 !
        Y coordinate (YORIGKM)        No default     ! YORIGKM = 4570.000 !
                                      Units: km


     Vertical grid definition:
     -------------------------

        No. of vertical layers (NZ)   No default     ! NZ =  6  !

        Cell face heights in arbitrary
        vertical grid (ZFACE(NZ+1))   No defaults
                                      Units: m
        ! ZFACE = 0.,20.,50.,100.,500.,2000.,3300. !

!END!


------------------------------------------------------------------------------

INPUT GROUP: 3 -- Output Options
--------------
```

```
DISK OUTPUT OPTION

   Save met. fields in an unformatted
   output file ?              (LSAVE)  Default: T     ! LSAVE = T !
   (F = Do not save, T = Save)

   Type of unformatted output file:
   (IFORMO)                            Default: 1    ! IFORMO =  1  !

        1 = CALPUFF/CALGRID type file (CALMET.DAT)
        2 = MESOPUFF-II type file     (PACOUT.DAT)


LINE PRINTER OUTPUT OPTIONS:

   Print met. fields ?  (LPRINT)       Default: F     ! LPRINT = T !
   (F = Do not print, T = Print)
   (NOTE: parameters below control which
          met. variables are printed)

   Print interval
   (IPRINF) in hours                   Default: 1     ! IPRINF =  6  !
   (Meteorological fields are printed
    every  6  hours)


   Specify which layers of U, V wind component
   to print (IUVOUT(NZ)) -- NOTE: NZ values must be entered
   (0=Do not print, 1=Print)
   (used only if LPRINT=T)        Defaults: NZ*0
   ! IUVOUT =  1 ,  0 ,  0 ,  0 ,  0 ,  0  !
   ----------------------


   Specify which levels of the W wind component to print
   (NOTE: W defined at TOP cell face --  6  values)
   (IWOUT(NZ)) -- NOTE: NZ values must be entered
   (0=Do not print, 1=Print)
   (used only if LPRINT=T & LCALGRD=T)
   ---------------------------------
                                       Defaults: NZ*0
    ! IWOUT =  0 ,  0 ,  0 ,  0 ,  0 ,  0  !
```

```
Specify which levels of the 3-D temperature field to print
(ITOUT(NZ)) -- NOTE: NZ values must be entered
(0=Do not print, 1=Print)
(used only if LPRINT=T & LCALGRD=T)
----------------------------------
                                    Defaults: NZ*0
 ! ITOUT =  1 ,  0 ,  0 ,  0 ,  0 ,  0  !

Specify which meteorological fields
to print
(used only if LPRINT=T)             Defaults: 0 (all variables)
----------------------

  Variable            Print ?
                    (0 = do not print,
                     1 = print)
  --------          ------------------

!  STABILITY  =          1           ! - PGT stability class
!  USTAR      =          1           ! - Friction velocity
!  MONIN      =          1           ! - Monin-Obukhov length
!  MIXHT      =          1           ! - Mixing height
!  WSTAR      =          1           ! - Convective velocity scale
!  PRECIP     =          1           ! - Precipitation rate
!  SENSHEAT   =          0           ! - Sensible heat flux
!  CONVZI     =          0           ! - Convective mixing ht.


Testing and debug print options for micrometeorological module

   Print input meteorological data and
   internal variables (LDB)         Default: F       ! LDB = F !
   (F = Do not print, T = print)
   (NOTE: this option produces large amounts of output)

   First time step for which debug data
   are printed (NN1)                Default: 1       ! NN1 =  1  !

   Last time step for which debug data
   are printed (NN2)                Default: 1       ! NN2 =  1  !

   Print distance to land
```

```
   internal variables (LDBCST)      Default: F       ! LDBCST = F !
   (F = Do not print, T = print)
   (Output in .GRD file DCST.GRD, defined in input group 0)

Testing and debug print options for wind field module
(all of the following print options control output to
 wind field module's output files: TEST.PRT, TEST.OUT,
 TEST.KIN, TEST.FRD, and TEST.SLP)

   Control variable for writing the test/debug
   wind fields to disk files (IOUTD)
   (0=Do not write, 1=write)        Default: 0       ! IOUTD =  0  !

   Number of levels, starting at the surface,
   to print (NZPRN2)                Default: 1       ! NZPRN2 =  0  !

   Print the INTERPOLATED wind components ?
   (IPR0) (0=no, 1=yes)             Default: 0       !  IPR0 =  0  !

   Print the TERRAIN ADJUSTED surface wind
   components ?
   (IPR1) (0=no, 1=yes)             Default: 0       !  IPR1 =  0  !

   Print the SMOOTHED wind components and
   the INITIAL DIVERGENCE fields ?
   (IPR2) (0=no, 1=yes)             Default: 0       !  IPR2 =  0  !

   Print the FINAL wind speed and direction
   fields ?
   (IPR3) (0=no, 1=yes)             Default: 0       !  IPR3 =  0  !

   Print the FINAL DIVERGENCE fields ?
   (IPR4) (0=no, 1=yes)             Default: 0       !  IPR4 =  0  !

   Print the winds after KINEMATIC effects
   are added ?
   (IPR5) (0=no, 1=yes)             Default: 0       !  IPR5 =  0  !

   Print the winds after the FROUDE NUMBER
   adjustment is made ?
   (IPR6) (0=no, 1=yes)             Default: 0       !  IPR6 =  0  !

   Print the winds after SLOPE FLOWS
   are added ?
```

```
          (IPR7) (0=no, 1=yes)              Default: 0       !  IPR7 =  0  !

          Print the FINAL wind field components ?
          (IPR8) (0=no, 1=yes)              Default: 0       !  IPR8 =  0  !

!END!


------------------------------------------------------------------------------

INPUT GROUP: 4 -- Meteorological data options
--------------

    NO OBSERVATION MODE              (NOOBS)  Default: 0     ! NOOBS =  0   !
          0 = Use surface, overwater, and upper air stations
          1 = Use surface and overwater stations (no upper air observations)
              Use MM4/MM5/3D for upper air data
          2 = No surface, overwater, or upper air observations
              Use MM4/MM5/3D for surface, overwater, and upper air data

    NUMBER OF SURFACE & PRECIP. METEOROLOGICAL STATIONS

       Number of surface stations    (NSSTA)  No default     ! NSSTA =  12  !

       Number of precipitation stations
       (NPSTA=-1: flag for use of MM5/3D precip data)
                                     (NPSTA)  No default     ! NPSTA =  0  !

    CLOUD DATA OPTIONS
       Gridded cloud fields:
                                   (ICLOUD)  Default: 0     ! ICLOUD =  0  !
       ICLOUD = 0 - Gridded clouds not used
       ICLOUD = 1 - Gridded CLOUD.DAT generated as OUTPUT
       ICLOUD = 2 - Gridded CLOUD.DAT read as INPUT
       ICLOUD = 3 - Gridded cloud cover computed from prognostic fields

    FILE FORMATS

       Surface meteorological data file format
                                   (IFORMS)  Default: 2     ! IFORMS =  2  !
       (1 = unformatted (e.g., SMERGE output))
       (2 = formatted   (free-formatted user input))

       Precipitation data file format
```

```
                                (IFORMP)  Default: 2     ! IFORMP =  2  !
       (1 = unformatted (e.g., PMERGE output))
       (2 = formatted   (free-formatted user input))

       Cloud data file format
                                (IFORMC)  Default: 2     ! IFORMC =  1  !
       (1 = unformatted - CALMET unformatted output)
       (2 = formatted   - free-formatted CALMET output or user input)

!END!


--------------------------------------------------------------------------------

INPUT GROUP: 5 -- Wind Field Options and Parameters
--------------


    WIND FIELD MODEL OPTIONS
       Model selection variable (IWFCOD)     Default: 1      ! IWFCOD =  1  !
          0 = Objective analysis only
          1 = Diagnostic wind module

       Compute Froude number adjustment
       effects ? (IFRADJ)                    Default: 1      ! IFRADJ =  1  !
       (0 = NO, 1 = YES)

       Compute kinematic effects ? (IKINE)   Default: 0      ! IKINE  =  0  !
       (0 = NO, 1 = YES)

       Use O'Brien procedure for adjustment
       of the vertical velocity ? (IOBR)     Default: 0      ! IOBR =  0  !
       (0 = NO, 1 = YES)

       Compute slope flow effects ? (ISLOPE) Default: 1      ! ISLOPE  =  1  !
       (0 = NO, 1 = YES)

       Extrapolate surface wind observations
       to upper layers ? (IEXTRP)            Default: -4     ! IEXTRP =  4  !
       (1 = no extrapolation is done,
        2 = power law extrapolation used,
        3 = user input multiplicative factors
            for layers 2 - NZ used (see FEXTRP array)
        4 = similarity theory used
```

```
 -1, -2, -3, -4 = same as above except layer 1 data
     at upper air stations are ignored

Extrapolate surface winds even
if calm? (ICALM)                    Default: 0      ! ICALM  =  0  !
(0 = NO, 1 = YES)

Layer-dependent biases modifying the weights of
surface and upper air stations (BIAS(NZ))
  -1<=BIAS<=1
Negative BIAS reduces the weight of upper air stations
  (e.g. BIAS=-0.1 reduces the weight of upper air stations
by 10%; BIAS= -1, reduces their weight by 100 %)
Positive BIAS reduces the weight of surface stations
  (e.g. BIAS= 0.2 reduces the weight of surface stations
by 20%; BIAS=1 reduces their weight by 100%)
Zero BIAS leaves weights unchanged (1/R**2 interpolation)
Default: NZ*0
                        ! BIAS =  0 ,  0 ,  0 ,  0 ,  0 ,  0  !

Minimum distance from nearest upper air station
to surface station for which extrapolation
of surface winds at surface station will be allowed
(RMIN2: Set to -1 for IEXTRP = 4 or other situations
 where all surface stations should be extrapolated)
                                    Default: 4.     ! RMIN2 = -1.0 !

Use gridded prognostic wind field model
output fields as input to the diagnostic
wind field model (IPROG)            Default: 0      ! IPROG =  0  !
(0 = No, [IWFCOD = 0 or 1]
 1 = Yes, use CSUMM prog. winds as Step 1 field, [IWFCOD = 0]
 2 = Yes, use CSUMM prog. winds as initial guess field [IWFCOD = 1]
 3 = Yes, use winds from MM4.DAT file as Step 1 field [IWFCOD = 0]
 4 = Yes, use winds from MM4.DAT file as initial guess field [IWFCOD = 1]
 5 = Yes, use winds from MM4.DAT file as observations [IWFCOD = 1]
 13 = Yes, use winds from MM5/3D.DAT file as Step 1 field [IWFCOD = 0]
 14 = Yes, use winds from MM5/3D.DAT file as initial guess field [IWFCOD =
1]
 15 = Yes, use winds from MM5/3D.DAT file as observations [IWFCOD = 1]

Timestep (hours) of the prognostic
model input data   (ISTEPPG)        Default: 1      ! ISTEPPG =  1   !
```

```
   Use coarse CALMET fields as initial guess fields (IGFMET)
   (overwrites IGF based on prognostic wind fields if any)
                                        Default: 0      ! IGFMET =  0  !

RADIUS OF INFLUENCE PARAMETERS

   Use varying radius of influence      Default: F      ! LVARY =  T!
   (if no stations are found within RMAX1,RMAX2,
    or RMAX3, then the closest station will be used)

   Maximum radius of influence over land
   in the surface layer (RMAX1)         No default      ! RMAX1 = 100. !
                                        Units: km
   Maximum radius of influence over land
   aloft (RMAX2)                        No default      ! RMAX2 = 500. !
                                        Units: km
   Maximum radius of influence over water
   (RMAX3)                              No default      ! RMAX3 = 500. !
                                        Units: km


OTHER WIND FIELD INPUT PARAMETERS

   Minimum radius of influence used in
   the wind field interpolation (RMIN)  Default: 0.1    ! RMIN = 2. !
                                        Units: km
   Radius of influence of terrain
   features (TERRAD)                    No default      ! TERRAD = 10. !

                                        Units: km
   Relative weighting of the first
   guess field and observations in the
   SURFACE layer (R1)                   No default      ! R1 = 100. !
   (R1 is the distance from an          Units: km
   observational station at which the
   observation and first guess field are
   equally weighted)

   Relative weighting of the first
   guess field and observations in the
   layers ALOFT (R2)                    No default      ! R2 = 500. !
   (R2 is applied in the upper layers   Units: km
   in the same manner as R1 is used in
   the surface layer).
```

```
      Relative weighting parameter of the
      prognostic wind field data (RPROG)    No default      ! RPROG = 54. !
      (Used only if IPROG = 1)              Units: km
      ----------------------

      Maximum acceptable divergence in the
      divergence minimization procedure
      (DIVLIM)                              Default: 5.E-6  ! DIVLIM= 5.0E-06 !

      Maximum number of iterations in the
      divergence min. procedure (NITER)     Default: 50     ! NITER =  50  !

      Number of passes in the smoothing
      procedure (NSMTH(NZ))
      NOTE: NZ values must be entered
           Default: 2,(mxnz-1)*4 ! NSMTH =
2 ,  8 ,  8 ,  12 ,  12 ,  12  !

      Maximum number of stations used in
      each layer for the interpolation of
      data to a grid point (NINTR2(NZ))
      NOTE: NZ values must be entered       Default: 99.    ! NINTR2 =
99 ,  99 ,  99 ,  99 ,  99 ,  99  !

      Critical Froude number (CRITFN)       Default: 1.0    ! CRITFN = 1. !

      Empirical factor controlling the
      influence of kinematic effects
      (ALPHA)                               Default: 0.1    ! ALPHA = 0.1 !

      Multiplicative scaling factor for
      extrapolation of surface observations
      to upper layers (FEXTR2(NZ))          Default: NZ*0.0
      ! FEXTR2 = 0., 0., 0., 0., 0., 0. !
      (Used only if IEXTRP = 3 or -3)


   BARRIER INFORMATION

      Number of barriers to interpolation
      of the wind fields (NBAR)             Default: 0      ! NBAR =  0  !

      Level (1 to NZ) up to which barriers
```

```
   apply (KBAR)                          Default: NZ     ! KBAR =  6  !

   THE FOLLOWING 4 VARIABLES ARE INCLUDED
   ONLY IF NBAR > 0
   NOTE: NBAR values must be entered     No defaults
         for each variable               Units: km

      X coordinate of BEGINNING
      of each barrier (XBBAR(NBAR))      ! XBBAR = 0. !
      Y coordinate of BEGINNING
      of each barrier (YBBAR(NBAR))      ! YBBAR = 0. !

      X coordinate of ENDING
      of each barrier (XEBAR(NBAR))      ! XEBAR = 0. !
      Y coordinate of ENDING
      of each barrier (YEBAR(NBAR))      ! YEBAR = 0. !


DIAGNOSTIC MODULE DATA INPUT OPTIONS

   Surface temperature (IDIOPT1)         Default: 0      ! IDIOPT1 =  0  !
      0 = Compute internally from
          hourly surface observations
      1 = Read preprocessed values from
          a data file (DIAG.DAT)

      Surface met. station to use for
      the surface temperature (ISURFT)   No default     ! ISURFT =  5  !
      (Must be a value from 1 to NSSTA)
      (Used only if IDIOPT1 = 0)
      -------------------------

   Domain-averaged temperature lapse
   rate (IDIOPT2)                        Default: 0     ! IDIOPT2 =  0  !
      0 = Compute internally from
          twice-daily upper air observations
      1 = Read hourly preprocessed values
          from a data file (DIAG.DAT)

      Upper air station to use for
      the domain-scale lapse rate (IUPT) No default     ! IUPT   =  1  !
      (Must be a value from 1 to NUSTA)
      (Used only if IDIOPT2 = 0)
      -------------------------
```

```
   Depth through which the domain-scale
   lapse rate is computed (ZUPT)      Default: 200.  ! ZUPT = 200. !
   (Used only if IDIOPT2 = 0)         Units: meters
   -------------------------

Domain-averaged wind components
(IDIOPT3)                             Default: 0     ! IDIOPT3 =  0  !
   0 = Compute internally from
       twice-daily upper air observations
   1 = Read hourly preprocessed values
       a data file (DIAG.DAT)

   Upper air station to use for
   the domain-scale winds (IUPWND)    Default: -1    ! IUPWND = -1  !
   (Must be a value from -1 to NUSTA)
   (Used only if IDIOPT3 = 0)
   -------------------------

   Bottom and top of layer through
   which the domain-scale winds
   are computed
   (ZUPWND(1), ZUPWND(2))        Defaults: 1., 1000. ! ZUPWND= 1., 2000. !
   (Used only if IDIOPT3 = 0)    Units: meters
   -------------------------

Observed surface wind components
for wind field module (IDIOPT4)  Default: 0     ! IDIOPT4 =  0  !
   0 = Read WS, WD from a surface
       data file (SURF.DAT)
   1 = Read hourly preprocessed U, V from
       a data file (DIAG.DAT)

Observed upper air wind components
for wind field module (IDIOPT5)  Default: 0     ! IDIOPT5 =  0  !
   0 = Read WS, WD from an upper
       air data file (UP1.DAT, UP2.DAT, etc.)
   1 = Read hourly preprocessed U, V from
       a data file (DIAG.DAT)

LAKE BREEZE INFORMATION

   Use Lake Breeze Module  (LLBREZE)
                                    Default: F      ! LLBREZE = F !
```

```
          Number of lake breeze regions (NBOX)           ! NBOX =  0  !

        X Grid line 1 defining the region of interest
                                                         ! XG1 = 0. !
        X Grid line 2 defining the region of interest
                                                         ! XG2 = 0. !
        Y Grid line 1 defining the region of interest
                                                         ! YG1 = 0. !
        Y Grid line 2 defining the region of interest
                                                         ! YG2 = 0. !

         X Point defining the coastline (Straight line)
                   (XBCST)  (KM)   Default: none    ! XBCST = 0. !

         Y Point defining the coastline (Straight line)
                   (YBCST)  (KM)   Default: none    ! YBCST = 0. !

         X Point defining the coastline (Straight line)
                   (XECST)  (KM)   Default: none    ! XECST = 0. !

         Y Point defining the coastline (Straight line)
                   (YECST)  (KM)   Default: none    ! YECST = 0. !


       Number of stations in the region     Default: none ! NLB =  0 !
       (Surface stations + upper air stations)

       Station ID's  in the region   (METBXID(NLB))
       (Surface stations first, then upper air stations)
         ! METBXID =  0 !

!END!


-----------------------------------------------------------------------

INPUT GROUP: 6 -- Mixing Height, Temperature and Precipitation Parameters
-------------

    EMPIRICAL MIXING HEIGHT CONSTANTS

       Neutral, mechanical equation
       (CONSTB)                              Default: 1.41   ! CONSTB = 1.41 !
```

```
   Convective mixing ht. equation
   (CONSTE)                              Default: 0.15   ! CONSTE = 0.15 !
   Stable mixing ht. equation
   (CONSTN)                              Default: 2400.  ! CONSTN = 2400.!
   Overwater mixing ht. equation
   (CONSTW)                              Default: 0.16   ! CONSTW = 0.16 !
   Absolute value of Coriolis
   parameter (FCORIOL)                   Default: 1.E-4  ! FCORIOL = 1.0E-04!
                                         Units: (1/s)

SPATIAL AVERAGING OF MIXING HEIGHTS

   Conduct spatial averaging
   (IAVEZI)  (0=no, 1=yes)               Default: 1      ! IAVEZI =  1  !

   Max. search radius in averaging
   process (MNMDAV)                      Default: 1      ! MNMDAV =  3  !
                                         Units: Grid
                                                cells
   Half-angle of upwind looking cone
   for averaging (HAFANG)                Default: 30.    ! HAFANG = 30. !
                                         Units: deg.
   Layer of winds used in upwind
   averaging (ILEVZI)                    Default: 1      ! ILEVZI =  1  !
   (must be between 1 and NZ)


CONVECTIVE MIXING HEIGHT OPTIONS:
   Method to compute the convective
   mixing height(IMIHXH)                 Default: 1      ! IMIXH =  1  !
       1: Maul-Carson for land and water cells
      -1: Maul-Carson for land cells only -
          OCD mixing height overwater
       2: Batchvarova and Gryning for land and water cells
      -2: Batchvarova and Gryning for land cells only
          OCD mixing height overwater

   Threshold buoyancy flux required to
   sustain convective mixing height growth
   overland (THRESHL)                    Default: 0.05   ! THRESHL = 0.05 !
   (expressed as a heat flux             units: W/m3
    per meter of boundary layer)
```

```
   Threshold buoyancy flux required to
   sustain convective mixing height growth
   overwater (THRESHW)                  Default: 0.05   ! THRESHW = 0.05 !
   (expressed as a heat flux            units: W/m3
    per meter of boundary layer)


   Option for overwater lapse rates used
   in convective mixing height growth
   (ITWPROG)                            Default: 0      ! ITWPROG =  0  !
   0 : use SEA.DAT lapse rates and deltaT (or assume neutral
       conditions if missing)
   1 : use prognostic lapse rates (only if IPROG>2)
       and SEA.DAT deltaT (or neutral if missing)
   2 : use prognostic lapse rates and prognostic delta T
       (only if iprog>12 and 3D.DAT version# 2.0 or higher)

   Land Use category ocean in 3D.DAT datasets
   (ILUOC3D)                            Default: 16     ! ILUOC3D =  16  !
   Note: if 3D.DAT from MM5 version 3.0, iluoc3d = 16
         if MM4.DAT,           typically iluoc3d = 7


OTHER MIXING HEIGHT VARIABLES

   Minimum potential temperature lapse
   rate in the stable layer above the
   current convective mixing ht.        Default: 0.001  ! DPTMIN = 0.001 !
   (DPTMIN)                             Units: deg. K/m
   Depth of layer above current conv.
   mixing height through which lapse    Default: 200.   ! DZZI = 200. !
   rate is computed (DZZI)              Units: meters

   Minimum overland mixing height       Default:  50.   ! ZIMIN = 100. !
   (ZIMIN)                              Units: meters
   Maximum overland mixing height       Default: 3000.  ! ZIMAX = 3200. !
   (ZIMAX)                              Units: meters
   Minimum overwater mixing height      Default:   50.  ! ZIMINW = 100. !
   (ZIMINW) -- (Not used if observed    Units: meters
   overwater mixing hts. are used)
   Maximum overwater mixing height      Default: 3000.  ! ZIMAXW = 3200. !
   (ZIMAXW) -- (Not used if observed    Units: meters
   overwater mixing hts. are used)
```

```
OVERWATER SURFACE FLUXES METHOD and PARAMETERS
      (ICOARE)                          Default: 10      ! ICOARE =  10   !
       0: original deltaT method (OCD)
      10: COARE with no wave parameterization (jwave=0, Charnock)
      11: COARE with wave option jwave=1 (Oost et al.)
          and default wave properties
     -11: COARE with wave option jwave=1 (Oost et al.)
          and observed wave properties (must be in SEA.DAT files)
      12: COARE with wave option 2 (Taylor and Yelland)
           and default wave properties
     -12: COARE with wave option 2 (Taylor and Yelland)
          and observed wave properties (must be in SEA.DAT files)

      Coastal/Shallow water length scale (DSHELF)
      (for modified z0 in shallow water)
      ( COARE fluxes only)
                                    Default : 0.        ! DSHELF = 0. !
                                    units: km

       COARE warm layer computation (IWARM)             ! IWARM =  0   !
       1: on - 0: off (must be off if SST measured with
       IR radiometer)               Default: 0

       COARE cool skin layer computation (ICOOL)        ! ICOOL =  0   !
       1: on - 0: off (must be off if SST measured with
       IR radiometer)               Default: 0

RELATIVE HUMIDITY PARAMETERS

   3D relative humidity from observations or
   from prognostic data? (IRHPROG)       Default:0       ! IRHPROG =  0   !

      0 = Use RH from SURF.DAT file
          (only if NOOBS = 0,1)
      1 = Use prognostic RH
          (only if NOOBS = 0,1,2)

TEMPERATURE PARAMETERS

   3D temperature from observations or
   from prognostic data? (ITPROG)        Default:0       ! ITPROG =  0   !

      0 = Use Surface and upper air stations
```

```
            (only if NOOBS = 0)
         1 = Use Surface stations (no upper air observations)
            Use MM5/3D for upper air data
            (only if NOOBS = 0,1)
         2 = No surface or upper air observations
            Use MM5/3D for surface and upper air data
            (only if NOOBS = 0,1,2)

      Interpolation type
      (1 = 1/R ; 2 = 1/R**2)              Default:1         ! IRAD =  1  !

      Radius of influence for temperature
      interpolation (TRADKM)              Default: 500.     ! TRADKM = 500. !
                                          Units: km

      Maximum Number of stations to include
      in temperature interpolation (NUMTS)  Default: 5       ! NUMTS = 5  !

      Conduct spatial averaging of temp-
      eratures (IAVET)  (0=no, 1=yes)     Default: 1        ! IAVET =  1  !
      (will use mixing ht MNMDAV,HAFANG
       so make sure they are correct)

      Default temperature gradient            Default: -.0098    ! TGDEFB =
-0.0098 !
      below the mixing height over        Units: K/m
      water (TGDEFB)

      Default temperature gradient            Default: -.0045    ! TGDEFA =
-0.0035 !
      above the mixing height over        Units: K/m
      water (TGDEFA)

      Beginning (JWAT1) and ending (JWAT2)
      land use categories for temperature                  ! JWAT1 =  55  !
      interpolation over water -- Make                     ! JWAT2 =  55  !
      bigger than largest land use to disable

   PRECIP INTERPOLATION PARAMETERS

      Method of interpolation (NFLAGP)    Default: 2       ! NFLAGP =  3  !
       (1=1/R,2=1/R**2,3=EXP/R**2)
      Radius of Influence  (SIGMAP)       Default: 100.0   ! SIGMAP = 1. !
       (0.0 => use half dist. btwn        Units: km
```

```
          nearest stns w & w/out
          precip when NFLAGP = 3)
        Minimum Precip. Rate Cutoff (CUTP)     Default: 0.01     ! CUTP = 1. !
         (values < CUTP = 0.0 mm/hr)           Units: mm/hr
!END!

------------------------------------------------------------------------------

INPUT GROUP: 7 -- Surface meteorological station parameters
--------------

     SURFACE STATION VARIABLES
     (One record per station --  12  records in all)


              1     2
          Name    ID            X coord.    Y coord.    Time    Anem.
                                  (km)        (km)       zone    Ht.(m)
       ------------------------------------------------------------
! SS1  ='ORH '     94746        263.540     4683.190     5     10  !
! SS2  ='HYA '     94720        393.190     4613.390     5     10  !
! SS3  ='PVD '     14765        297.650     4622.780     5     10  !
! SS4  ='BOS '     14739        332.600     4692.310     5     10  !
! SS5  ='CON '     14745        296.880     4785.840     5     10  !
! SS6  ='LEB '     94765        232.410     4836.240     5     10  !
! SS7  ='GFL '     14750        125.790     4809.830     5     10  !
! SS8  ='ALB '     14735        107.130     4744.020     5     10  !
! SS9  ='BDL '     14740        194.630     4648.690     5     10  !
! SS10 ='BDR '     94702        153.240     4565.320     5     10  !
! SS11 ='BTV '     14742        169.880     4931.910     5     10  !
! SS12 ='PWM '     14764        393.550     4833.630     5     10  !
------------------

      1
        Four character string for station name
        (MUST START IN COLUMN 9)

      2
        Six digit integer for station ID

!END!

------------------------------------------------------------------------------
```

```
INPUT GROUP: 8 -- Upper air meteorological station parameters
-------------

     UPPER AIR STATION VARIABLES
     (One record per station --  3  records in all)

            1     2
         Name    ID      X coord.    Y coord.   Time zone
                           (km)        (km)
        ------------------------------------------------
! US1  ='ALB '    14735    108.638    4741.709    5  !
! US2  ='PWM '    14764    395.124    4831.385    5  !
! US3  ='CHH '    14684    420.891    4611.141    5  !
-------------------
      1
        Four character string for station name
        (MUST START IN COLUMN 9)

      2
        Five digit integer for station ID

!END!


--------------------------------------------------------------------------------

INPUT GROUP: 9 -- Precipitation station parameters
-------------

     PRECIPITATION STATION VARIABLES
     (One record per station --  0  records in all)
     (NOT INCLUDED IF NPSTA = 0)

           1          2
         Name   Station    X coord.   Y coord.
                  Code       (km)       (km)
        ----------------------------------


------------------
      1
        Four character string for station name
        (MUST START IN COLUMN 9)
```

```
      2
        Six digit station code composed of state
        code (first 2 digits) and station ID (last
        4 digits)

!END!
```

4.2 CALMET 控制流文件命令及参数说明

（1） NPUT GROUP: 0 －输入、输出文件路径设置

文件类型设置：在Type下，选择input/output；在File Name下，指定输入、输出文件路径;！执行提示符，*注册提示符；在File Name选项中，GEO.DAT为输入 的地形文件；CALMET.LST（程序运行过程监视文件）、CALMET.DAT（生成的边界层参数文件）、CLOUD.DAT（云量文件）、PRECIP.DAT（降水文件）、MM5.DAT（MM5预测风场物理量数据文件）、WT.DAT（水域气象台站数据）、NUSTA（高空台站数量）、NOWSTA（水域气象台站数量）；输入高空数据文件路径（UPDAT）；输入水域气象数据文件路径（SEADAT）；结束提示符!END!。

（2）INPUT GROUP:1 ---执行控制参数设置：设定起始时间参数（IBYR、IBMO、IBHR）、IEHR、IEMIN、IESEC）；时区参数（IBTZ）；模拟时间（IRLG）；选择运行类型（IRTYPE=0或1）。

（3）INPUT GROUP:2设置图形投影与网格控制参数：投影方法（PMAP=UTM、TTM、LCC、PS、EM 、LAZA保角变化适用于中国）；气象数据网格设置（NX、NY、NZ）；网格步长（DGRIDKM）；每层到地表的高度（ZFACE）；网格西南角坐标（XORIGKM、YORIGKM）。

（4）INPUT GROUP: 3 ---输出选项：以自由格式保存数据文件（LSAVE=T或F）；输出类型(IFORMO=1或2);传口打印输出(LPRINT=T或F);输出时间步长(IPRINF);水平风向量输出层位（IUVOUT）；垂直风向量输出层位（IWOUT）；三位温度场输出层位（ITOUT）；设置输出气象要素（0或1）。

（5）INPUT GROUP: 4 － 气象数据选项：初始场数据格式选择（NOOBS=0、1或2）；常规地面站数量（NSSTA）；降雨台站数量（NPSTA）；云选项（ICLOUD=0、1、2、或3）；地面站气象数据格式（IFORMS=1或2）；降雨数据格式（IFORMP=1或2）；云数据格式（IFORMC=1或2）。

（6）INPUT GROUP: 5 ---风场选项及参数：客观分析或诊断风场模型选项（IWFCOD=0或1）；计算地形阻挡调整（IFRADJ=0或1）；计算地行动力学调整（IKINE=0或1）；垂直速度O'Brien算法调整（IOBR=0或1）；计算倾斜流影响（ISLOPE=0或1）；地面测风外插高空层（IEXTRP=0、1、2、3或4）；静风条件下地面测风外插（ICALM=0或1）；设置地面与高空站权重因子（-1<=BIAS<=1）；最近的高空站距离需要对风场进行外插的地面站的最小距离（RMIN2）；用网格化的预测风场输出物理量作为诊断风场的输入文件（IPROG=0、1、2、3、4、5、13、14或15）；预测模型输入文件的时间步长（ISTEPPG）；是否使用变化的

影响半径（LVARY=T或F）；影响半径参数（RMAX、RMAX2、RMAX3）；风场内插最小影响半径（RMIN）；地形影响半径（TERRAD）；初猜场与地面观测场的相对权重因子（R1）；初猜场与抬升层观测场的相对权重因子（R2）；预测风场相对权重参数（RPROG）；发散最小化可接受的最大迭代误差（DIVLIM）；发散最小化最大迭代次数（NITER）；平滑处理（NSMTH）；将数据插值到网格点上需要的最大台站数量（NINTR2）；临界Froud数（CRITFN）；控制动力学影响的经验因子（ALPHA）；障碍物参数设置（NBAR、XBBAR、YBBAR、XEBAR、YEBAR）；诊断模块数据输入选项:地面温度(IDIOPT1=0或1)、控制地面温度得台站数量(ISURFT)；区域平均温度梯度计算方式(IDIOPT2)；用作区域尺度lapse率的高空站(IUPT)；lapse率计算高度（ZUPT）；区域风场选项（IDIOPT3=0或1）；用左区域尺度风场的高空站（IUPWND=0）；计算区域风场的顶、底层（ZUPWND(1), ZUPWND(2)；风场模块需要地面站或高空站风向量（IDIOPT4, IDIOPT5=0或1）；湖泊气流模块（LLBREZE）；湖泊计算区域参数设置（XG1、XG2、YG1、YG2）；海岸线设置参数（XBCST、YBCST、XECST、YECST）。

（7）INPUT GROUP: 6 ---混和层高度、温度、降雨参数设置：混合层高度常数（CONSTB、CONSTE、CONSTN、CONSTW）；Coriolis绝对值（FCORIOL）；使用预测或监测温度（ITPROG=0、1或2）；插值类型（IRAD=1）；温度插值影响半径（TRADKM）；需要对温度插值的最大抬站数（NUMTS）；温度空间分配（IAVET=0或1）；水面上混和层高度以下的温度梯度（TGDEFB）；水面上混和层高度以上的温度梯度（TGDEFA）；土地使用类型范围（JWAT1、JWAT2）；降雨插值参数（NFLAGP）；影响半径（SIGMAP）；最小降雨量（CUTP）。

（8）INPUT GROUP: 7---地面站参数设置：台站名、ID、地理坐标、测风高度(Name、ID、Xcoord、Ycoord、Time zone、AnemHt）。

（9）INPUT GROUP: 8 ---高空站参数设置：台站名、ID、地理坐标、测风高度（Name、ID、X coord、Ycoord、Time zone）。

（10）INPUT GROUP: 9—降雨站参数设置：台站名、ID、地理坐标（Name、ID、Xcoord、Ycoord）。令命输入以!END!结束。

5 CALPOST 控制流文件格式

5.1 CALPOST 控制流文件实例

```
CALPUFF Application with met data from CALMET
Produce table and map-file for peak 1-hr average concentrations

--------------- Run title (3 lines) ------------------------------------------

                    CALPOST MODEL CONTROL FILE
                    --------------------------

------------------------------------------------------------------------------
```

```
INPUT GROUP: 0 -- Input and Output File Names
--------------

Input Files
-----------

File                      Default File Name
----                      -----------------
Conc/Dep Flux File        MODEL.DAT          ! MODDAT =CALPUFF.CON   !
Relative Humidity File    VISB.DAT           * VISDAT =   *
Background Data File      BACK.DAT           * BACKDAT =   *
Transmissometer or        VSRN.DAT           * VSRDAT =   *
Nephelometer Data File     or
DATSAV Weather Data File   or
Prognostic Weather  File

Output Files
------------

File                      Default File Name
----                      -----------------
List File                 CALPOST.LST        ! PSTLST =CALPOST.LST   !

Pathname for Timeseries Files   (blank)      * TSPATH =   *
(activate with exclamation points only if
providing NON-BLANK character string)

Pathname for Plot Files   (blank)            * PLPATH =   *
(activate with exclamation points only if
 providing NON-BLANK character string)

User Character String (U) to augment default filenames
(activate with exclamation points only if
 providing NON-BLANK character string)

Timeseries          TSERIES_ASPEC_ttHR_CONC_TSUNAM.DAT
Peak Value          PEAKVAL_ASPEC_ttHR_CONC_TSUNAM.DAT

                                           * TSUNAM =   *

Top Nth Rank Plot   RANK(ALL)_ASPEC_ttHR_CONC_TUNAM.DAT
                or  RANK(ii)_ASPEC_ttHR_CONC_TUNAM.GRD

                                           ! TUNAM =TEST   !
```

```
Exceedance Plot      EXCEED_ASPEC_ttHR_CONC_XUNAM.DAT
                 or  EXCEED_ASPEC_ttHR_CONC_XUNAM.GRD

                                              * XUNAM =   *

Echo Plot
(Specific Days)
           yyyy_Mmm_Ddd_hhmm(UTCszzzz)_LOO_ASPEC_ttHR_CONC.DAT
     or    yyyy_Mmm_Ddd_hhmm(UTCszzzz)_LOO_ASPEC_ttHR_CONC.GRD


Visibility Plot      DAILY_VISIB_VUNAM.DAT   * VUNAM =   *
(Daily Peak Summary)


Auxiliary Output Files
----------------------

File                     Default File Name
----                     -----------------
Visibility Change        DELVIS.DAT          * DVISDAT =   *

-------------------------------------------------------------------------------
-
All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case               ! LCFILES = T !
         F = UPPER CASE
NOTE: (1) file/path names can be up to 132 characters in length
NOTE: (2) Filenames for ALL PLOT and TIMESERIES FILES are constructed
          using a template that includes a pathname, user-supplied
          character(s), and context-specific strings, where
             ASPEC = Species Name
              CONC = CONC Or WFLX Or DFLX Or TFLX
                tt = Averaging Period (e.g. 03)
                ii = Rank (e.g. 02)
                hh = Hour(ending) in LST
             szzzz = LST time zone shift (EST is -0500)
              yyyy = Year(LST)
                mm = Month(LST)
                dd = day of month (LST)
          are determined internally based on selections made below.
          If a path or user-supplied character(s) are supplied, each
```

```
          must contain at least 1 non-blank character.

!END!
------------------------------------------------------------------------------
-

INPUT GROUP: 1 -- General run control parameters
--------------

     Option to run all periods found
     in the met. file(s)  (METRUN)        Default: 0   ! METRUN =   0  !

         METRUN = 0 - Run period explicitly defined below
         METRUN = 1 - Run all periods in CALPUFF data file(s)

     Starting date:    Year   (ISYR)  --    No default   ! ISYR  =  1988  !
                       Month  (ISMO)  --    No default   ! ISMO  =  7  !
                       Day    (ISDY)  --    No default   ! ISDY  =  7  !
     Starting time:    Hour   (ISHR)  --    No default   ! ISHR  =  0  !
                       Minute (ISMIN) --    No default   ! ISMIN =  0  !
                       Second (ISSEC) --    No default   ! ISSEC =  0  !

     Ending date:      Year   (IEYR)  --    No default   ! IEYR  =  1988  !
                       Month  (IEMO)  --    No default   ! IEMO  =  7  !
                       Day    (IEDY)  --    No default   ! IEDY  =  8  !
     Ending time:      Hour   (IEHR)  --    No default   ! IEHR  =  0  !
                       Minute (IEMIN) --    No default   ! IEMIN =  0  !
                       Second (IESEC) --    No default   ! IESEC =  0  !

     (These are only used if METRUN = 0)

     All times are in the base time zone of the CALPUFF simulation.
     CALPUFF Dataset Version 2.1 contains the zone, but earlier versions
     do not, and the zone must be specified here.  The zone is the
     number of hours that must be ADDED to the time to obtain UTC (or GMT).
     Identify the Base Time Zone for the CALPUFF simulation
                             (BTZONE) -- No default   ! BTZONE = 5.0 !

     Process every period of data?
                               (NREP) -- Default: 1   ! NREP  =  1  !
      (1 = every period processed,
       2 = every 2nd period processed,
       5 = every 5th period processed, etc.)
```

```
Species & Concentration/Deposition Information
------------------------------------------

      Species to process (ASPEC)       -- No default   ! ASPEC = SO2  !
      (ASPEC = VISIB for visibility processing)

      Layer/deposition code (ILAYER)   -- Default: 1   ! ILAYER =  1  !
        '1'  for CALPUFF concentrations,
        '-1' for dry deposition fluxes,
        '-2' for wet deposition fluxes,
        '-3' for wet+dry deposition fluxes.

      Scaling factors of the form:     -- Defaults:    ! A =  0.0    !
            X(new) = X(old) * A + B          A = 0.0    ! B =  0.0    !
        (NOT applied if A = B = 0.0)         B = 0.0

      Add Hourly Background Concentrations/Fluxes?
                              (LBACK)  -- Default: F   ! LBACK =  F !

Source information
------------------

  Option to process source contributions:
         0 =  Process only total reported contributions
         1 =  Sum all individual source contributions and process
         2 =  Run in TRACEBACK mode to identify source
              contributions at a SINGLE receptor
                            (MSOURCE) -- Default: 0   ! MSOURCE =  0  !

Receptor information
--------------------

  Gridded receptors processed?    (LG) -- Default: F   ! LG  = T  !
  Discrete receptors processed?   (LD) -- Default: F   ! LD  = F  !
  CTSG Complex terrain receptors processed?
                                 (LCT) -- Default: F   ! LCT = F  !

--Report results by DISCRETE receptor RING?
  (only used when LD = T)      (LDRING) -- Default: F   ! LDRING = F  !

--Select range of DISCRETE receptors (only used when LD = T):

  Select ALL DISCRETE receptors by setting NDRECP flag to -1;
                                OR
```

```
  Select SPECIFIC DISCRETE receptors by entering a flag (0,1) for each
     0 = discrete receptor not processed
     1 = discrete receptor processed
  using repeated value notation to select blocks of receptors:
     23*1, 15*0, 12*1
  Flag for all receptors after the last one assigned is set to 0
  (NDRECP) -- Default: -1
                                              ! NDRECP =  -1  !


--Select range of GRIDDED receptors (only used when LG = T):

       X index of LL corner (IBGRID) -- Default: -1     ! IBGRID = -1  !
           (-1 OR 1 <= IBGRID <= NX)

       Y index of LL corner (JBGRID) -- Default: -1     ! JBGRID = -1  !
           (-1 OR 1 <= JBGRID <= NY)

       X index of UR corner (IEGRID) -- Default: -1     ! IEGRID = -1  !
           (-1 OR 1 <= IEGRID <= NX)

       Y index of UR corner (JEGRID) -- Default: -1     ! JEGRID = -1  !
           (-1 OR 1 <= JEGRID <= NY)

  Note: Entire grid is processed if IBGRID=JBGRID=IEGRID=JEGRID=-1


--Specific gridded receptors can also be excluded from CALPOST
  processing by filling a processing grid array with 0s and 1s.  If the
  processing flag for receptor index (i,j) is 1 (ON), that receptor
  will be processed if it lies within the range delineated by IBGRID,
  JBGRID,IEGRID,JEGRID and if LG=T. If it is 0 (OFF), it will not be
  processed in the run.  By default, all array values are set to 1 (ON).

  Number of gridded receptor rows provided in Subgroup (1a) to
  identify specific gridded receptors to process
                           (NGONOFF) -- Default: 0      ! NGONOFF =  0  !

!END!


--------------
Subgroup (1a) -- Specific gridded receptors included/excluded
--------------
```

```
    Specific gridded receptors are excluded from CALPOST processing
    by filling a processing grid array with 0s and 1s.  A total of
    NGONOFF lines are read here.  Each line corresponds to one 'row'
    in the sampling grid, starting with the NORTHERNMOST row that
    contains receptors that you wish to exclude, and finishing with
    row 1 to the SOUTH (no intervening rows may be skipped).  Within
    a row, each receptor position is assigned either a 0 or 1,
    starting with the westernmost receptor.
       0 = gridded receptor not processed
       1 = gridded receptor processed

    Repeated value notation may be used to select blocks of receptors:
       23*1, 15*0, 12*1

    Because all values are initially set to 1, any receptors north of
    the first row entered, or east of the last value provided in a row,
    remain ON.

    (NGXRECP) -- Default: 1


------------------------------------------------------------------------------

INPUT GROUP: 2 -- Visibility Parameters (ASPEC = VISIB)
--------------

    Particle growth curve f(RH) for hygroscopic species
                               (MFRH) -- Default: 2   ! MFRH   =  2  !

         1 =  IWAQM (1998) f(RH) curve (originally used with MVISBK=1)
         2 =  FLAG (2000) f(RH) tabulation
         3 =  EPA (2003) f(RH) tabulation

    Maximum relative humidity (%) used in particle growth curve
                               (RHMAX) -- Default: 98  ! RHMAX  = 0.0 !

    Modeled species to be included in computing the light extinction
     Include SULFATE?          (LVSO4) -- Default: T   ! LVSO4  = T  !
     Include NITRATE?          (LVNO3) -- Default: T   ! LVNO3  = T  !
     Include ORGANIC CARBON?   (LVOC)  -- Default: T   ! LVOC   = T  !
     Include COARSE PARTICLES? (LVPMC) -- Default: T   ! LVPMC  = T  !
     Include FINE PARTICLES?   (LVPMF) -- Default: T   ! LVPMF  = T  !
     Include ELEMENTAL CARBON? (LVEC)  -- Default: T   ! LVEC   = T  !
```

```
    And, when ranking for TOP-N, TOP-50, and Exceedance tables,
     Include BACKGROUND?       (LVBK)  -- Default: T   ! LVBK   = T  !

    Species name used for particulates in MODEL.DAT file
                  COARSE    (SPECPMC) -- Default: PMC ! SPECPMC = PMC !
                  FINE      (SPECPMF) -- Default: PMF ! SPECPMF = PMF !

Extinction Efficiency (1/Mm per ug/m**3)
----------------------------------------
    MODELED particulate species:
              PM  COARSE      (EEPMC) -- Default: 0.6 ! EEPMC  = 0.6 !
              PM  FINE        (EEPMF) -- Default: 1.0 ! EEPMF  = 1.0 !
    BACKGROUND particulate species:
              PM  COARSE    (EEPMCBK) -- Default: 0.6 ! EEPMCBK = 0.6 !
    Other species:
             AMMONIUM SULFATE (EESO4) -- Default: 3.0 ! EESO4  = 3.0 !
             AMMONIUM NITRATE (EENO3) -- Default: 3.0 ! EENO3  = 3.0 !
             ORGANIC CARBON   (EEOC)  -- Default: 4.0 ! EEOC   = 4.0 !
             SOIL             (EESOIL)-- Default: 1.0 ! EESOIL = 1.0 !
             ELEMENTAL CARBON (EEEC)  -- Default: 10. ! EEEC   = 10.0 !

Background Extinction Computation
---------------------------------

    Method used for the 24h-average of percent change of light extinction:
    Hourly ratio of source light extinction / background light extinction
    is averaged?              (LAVER) -- Default: F   ! LAVER = F  !


    Method used for background light extinction
                             (MVISBK) -- Default: 2   ! MVISBK =  2  !

         1 =  Supply single light extinction and hygroscopic fraction
              - Hourly F(RH) adjustment applied to hygroscopic background
                and modeled sulfate and nitrate
         2 =  Compute extinction from speciated PM measurements (A)
              - Hourly F(RH) adjustment applied to observed and modeled sulfate
                and nitrate
              - F(RH) factor is capped at F(RHMAX)
         3 =  Compute extinction from speciated PM measurements (B)
              - Hourly F(RH) adjustment applied to observed and modeled sulfate
                and nitrate
              - Receptor-hour excluded if RH>RHMAX
```

```
            - Receptor-day excluded if fewer than 6 valid receptor-hours
       4 =  Read hourly transmissometer background extinction measurements
            - Hourly F(RH) adjustment applied to modeled sulfate and nitrate
            - Hour excluded if measurement invalid (missing, interference,
              or large RH)
            - Receptor-hour excluded if RH>RHMAX
            - Receptor-day excluded if fewer than 6 valid receptor-hours
       5 =  Read hourly nephelometer background extinction measurements
            - Rayleigh extinction value (BEXTRAY) added to measurement
            - Hourly F(RH) adjustment applied to modeled sulfate and nitrate
            - Hour excluded if measurement invalid (missing, interference,
              or large RH)
            - Receptor-hour excluded if RH>RHMAX
            - Receptor-day excluded if fewer than 6 valid receptor-hours
       6 =  Compute extinction from speciated PM measurements
            - FLAG monthly RH adjustment factor applied to observed and
              modeled sulfate and nitrate
       7 =  Use observed weather or prognostic weather information for
            background extinction during weather events; otherwise, use Method
2
            - Hourly F(RH) adjustment applied to modeled sulfate and nitrate
            - F(RH) factor is capped at F(RHMAX)
            - During observed weather events, compute Bext from visual range
              if using an observed weather data file, or
            - During prognostic weather events, use Bext from the prognostic
              weather file
            - Use Method 2 for hours without a weather event

    Additional inputs used for MVISBK = 1:
    --------------------------------------
     Background light extinction (1/Mm)
                              (BEXTBK) -- No default   ! BEXTBK = 0.0 !
     Percentage of particles affected by relative humidity
                              (RHFRAC) -- No default   ! RHFRAC = 0.0 !

    Additional inputs used for MVISBK = 6:
    --------------------------------------
     Extinction coefficients for hygroscopic species (modeled and
     background) are computed using a monthly RH adjustment factor
     in place of an hourly RH factor (VISB.DAT file is NOT needed).
     Enter the 12 monthly factors here (RHFAC).  Month 1 is January.

     (RHFAC)  -- No default     ! RHFAC = 0.0, 0.0, 0.0, 0.0,
                                          0.0, 0.0, 0.0, 0.0,
```

```
                                        0.0, 0.0, 0.0, 0.0 !

Additional inputs used for MVISBK = 7:
-------------------------------------
 The weather data file (DATSAV abbreviated space-delimited) that
 is identified as VSRN.DAT may contain data for more than one
 station.  Identify the stations that are needed in the order in
 which they will be used to obtain valid weather and visual range.
 The first station that contains valid data for an hour will be
 used.  Enter up to MXWSTA (set in PARAMS file) integer station IDs
 of up to 6 digits each as variable IDWSTA, and enter the corresponding
 time zone for each, as variable TZONE (= UTC-LST).

 A prognostic weather data file with Bext for weather events may be used
 in place of the observed weather file.  Identify this as the VSRN.DAT
 file and use a station ID of IDWSTA = 999999, and TZONE = 0.

 NOTE:  TZONE identifies the time zone used in the dataset.  The
        DATSAV abbreviated space-delimited data usually are prepared
        with UTC time rather than local time, so TZONE is typically
        set to zero.

 (IDWSTA)   -- No default   * IDWSTA = 000000 *
 (TZONE)    -- No default   * TZONE =      0. *

Additional inputs used for MVISBK = 2,3,6,7:
-------------------------------------------
 Background extinction coefficients are computed from monthly
 CONCENTRATIONS of ammonium sulfate (BKSO4), ammonium nitrate (BKNO3),
 coarse particulates (BKPMC), organic carbon (BKOC), soil (BKSOIL), and
 elemental carbon (BKEC).  Month 1 is January.
 (ug/m**3)

 (BKSO4)  -- No default     ! BKSO4 = 0.0, 0.0, 0.0, 0.0,
                                      0.0, 0.0, 0.0, 0.0,
                                      0.0, 0.0, 0.0, 0.0 !
 (BKNO3)  -- No default     ! BKNO3 = 0.0, 0.0, 0.0, 0.0,
                                      0.0, 0.0, 0.0, 0.0,
                                      0.0, 0.0, 0.0, 0.0 !
 (BKPMC)  -- No default     ! BKPMC = 0.0, 0.0, 0.0, 0.0,
                                      0.0, 0.0, 0.0, 0.0,
                                      0.0, 0.0, 0.0, 0.0 !
 (BKOC)   -- No default     ! BKOC  = 0.0, 0.0, 0.0, 0.0,
                                      0.0, 0.0, 0.0, 0.0,
```

```
                                        0.0,  0.0,  0.0,  0.0 !
     (BKSOIL) -- No default     ! BKSOIL= 0.0,  0.0,  0.0,  0.0,
                                        0.0,  0.0,  0.0,  0.0,
                                        0.0,  0.0,  0.0,  0.0 !
     (BKEC)   -- No default     ! BKEC  = 0.0,  0.0,  0.0,  0.0,
                                        0.0,  0.0,  0.0,  0.0,
                                        0.0,  0.0,  0.0,  0.0 !

    Additional inputs used for MVISBK = 2,3,5,6,7:
    ----------------------------------------------

     Extinction due to Rayleigh scattering is added (1/Mm)
                           (BEXTRAY) -- Default: 10.0 ! BEXTRAY = 0.0 !

!END!
-------------------------------------------------------------------------------

INPUT GROUP: 3 -- Output options
--------------

Documentation
-------------

    Documentation records contained in the header of the
    CALPUFF output file may be written to the list file.
    Print documentation image?
                                (LDOC) -- Default: F   !  LDOC = T !

Output Units
------------
    Units for All Output       (IPRTU) -- Default: 1   ! IPRTU =  3   !
                    for            for
                Concentration    Deposition
       1 =          g/m**3          g/m**2/s
       2 =         mg/m**3         mg/m**2/s
       3 =         ug/m**3         ug/m**2/s
       4 =         ng/m**3         ng/m**2/s
       5 =       Odour Units

    Visibility: extinction expressed in 1/Mega-meters (IPRTU is ignored)


Averaging time(s) reported
--------------------------
```

```
    1-pd averages           (L1PD) -- Default: T   !   L1PD = F  !
    (pd = averaging period of model output)

    1-hr averages           (L1HR) -- Default: T   !   L1HR = T  !

    3-hr averages           (L3HR) -- Default: T   !   L3HR = F  !

    24-hr averages         (L24HR) -- Default: T   !  L24HR = F  !

    Run-length averages    (LRUNL) -- Default: T   !  LRUNL = F  !

    User-specified averaging time in hours, minutes, seconds
    - results for this averaging time are reported if it is not zero

                           (NAVGH) -- Default: 0   !   NAVGH =  0  !
                           (NAVGM) -- Default: 0   !   NAVGM =  0  !
                           (NAVGS) -- Default: 0   !   NAVGS =  0  !


Types of tabulations reported
-----------------------------

   1) Visibility: daily visibility tabulations are always reported
                  for the selected receptors when ASPEC = VISIB.
                  In addition, any of the other tabulations listed
                  below may be chosen to characterize the light
                  extinction coefficients.
                  [List file or Plot/Analysis File]


   2) Top 50 table for each averaging time selected
      [List file only]
                           (LT50) -- Default: T   !   LT50 = T  !

   3) Top 'N' table for each averaging time selected
      [List file or Plot file]
                          (LTOPN) -- Default: F   !  LTOPN = T  !

        -- Number of 'Top-N' values at each receptor
           selected (NTOP must be <= 4)
                           (NTOP) -- Default: 4   ! NTOP =  2   !

        -- Specific ranks of 'Top-N' values reported
           (NTOP values must be entered)
```

```
                (ITOP(4) array) -- Default:     ! ITOP =  1 , 2   !
                                   1,2,3,4
```

4) Threshold exceedance counts for each receptor and each averaging time selected

[List file or Plot file]

```
                        (LEXCD) -- Default: F   !  LEXCD = F  !
```

-- Identify the threshold for each averaging time by assigning a non-negative value (output units).

```
                                -- Default: -1.0
Threshold for  1-hr averages   (THRESH1) !  THRESH1 = -1.0  !
Threshold for  3-hr averages   (THRESH3) !  THRESH3 = -1.0  !
Threshold for 24-hr averages  (THRESH24) ! THRESH24 = -1.0  !
Threshold for NAVG-hr averages (THRESHN) !  THRESHN = -1.0  !
```

-- Counts for the shortest averaging period selected can be tallied daily, and receptors that experience more than NCOUNT counts over any NDAY period will be reported. This type of exceedance violation output is triggered only if NDAY > 0.

```
Accumulation period(Days)
                     (NDAY) -- Default: 0   !    NDAY =  0  !
Number of exceedances allowed
                   (NCOUNT) -- Default: 1   !  NCOUNT =  1  !
```

5) Selected day table(s)

Echo Option -- Many records are written each averaging period selected and output is grouped by day

[List file or Plot file]

```
                        (LECHO) -- Default: F   !  LECHO = T  !
```

Timeseries Option -- Averages at all selected receptors for each selected averaging period are written to timeseries files. Each file contains one averaging period, and all receptors are written to a single record each averaging time.

[TSERIES_ASPEC_ttHR_CONC_TSUNAM.DAT files]

```
                        (LTIME) -- Default: F   !  LTIME = F  !
```

```
      Peak Value Option -- Averages at all selected receptors for
      each selected averaging period are screened and the peak value
      each period is written to timeseries files.
      Each file contains one averaging period.
      [PEAKVAL_ASPEC_ttHR_CONC_TSUNAM.DAT files]
                          (LPEAK) -- Default: F   !  LPEAK = F  !

        -- Days selected for output
                     (IECHO(366)) -- Default: 366*0
           ! IECHO  = 188*0,1*1,177*0  !
           (366 values must be entered)

Plot output options
-------------------

     Plot files can be created for the Top-N, Exceedance, and Echo
     tables selected above.  Two formats for these files are available,
     DATA and GRID.  In the DATA format, results at all receptors are
     listed along with the receptor location [x,y,val1,val2,...].
     In the GRID format, results at only gridded receptors are written,
     using a compact representation.  The gridded values are written in
     rows (x varies), starting with the most southern row of the grid.
     The GRID format is given the .GRD extension, and includes headers
     compatible with the SURFER(R) plotting software.

     A plotting and analysis file can also be created for the daily
     peak visibility summary output, in DATA format only.

     Generate Plot file output in addition to writing tables
     to List file?
                                (LPLT) -- Default: F   ! LPLT  = T !

     Use GRID format rather than DATA format,
     when available?
                                (LGRD) -- Default: F   ! LGRD  = T !


Auxiliary Output Files (for subsequent analyses)
------------------------------------------------

      Visibility

      A separate output file may be requested that contains the change
      in visibility at each selected receptor when ASPEC = VISIB.  This
```

```
      file can be processed to construct visibility measures that are
      not available in CALPOST.

      Output file with the visibility change at each receptor?
                              (MDVIS) -- Default: 0   ! MDVIS  =  0  !

           0 =  Do Not create file
           1 =  Create file of DAILY (24 hour) Delta-Deciview
           2 =  Create file of DAILY (24 hour) Extinction Change (%)
           3 =  Create file of HOURLY Delta-Deciview
           4 =  Create file of HOURLY Extinction Change (%)


Additional Debug Output
-----------------------

   Output selected information to List file
    for debugging?
                               (LDEBUG) -- Default: F  ! LDEBUG  = F !

   Output hourly extinction information to REPORT.HRV?
    (Visibility Method 7)
                              (LVEXTHR) -- Default: F  ! LVEXTHR = F !

!END!
```

5.2 CALPOST 控制流文件命令及参数说明

（1）INPUT GROUP: 0---输入、输出文件设置：浓度/沉降通量（MODEL.DAT）、相对湿度（VISB.DAT）、背景浓度（BACK.DAT）、VSRDAT；输出文件（CALPOST.LST；
（2）INPUT GROUP: 1---运行控制参数：运行周期选项（METRUN=0或1）；起始时间（ISYR、ISMO、ISDY、ISHR）；运行时间（NHRS）、步长（NHRS）；污染因子/浓度/沉降选项参数（ASPEC、ILAYER）；接受点（LG、LD）；复杂地形处理模块设置（LCT）；设置网格接受点（IBGRID、JBGRID、IEGRID、JEGRID）。
（3）INPUT GROUP: 2 －能见度参数设置（VISIB）；设置参与计算的污染物因子（T或F）。
（4）INPUT GROUP: 3 － 输出选项：1、3、24小时平均浓度参数设定（L1HR、L3HR、L24HR）、在整个运行时间上对结果进行平均（LRUNL）；用户指定的平均时间（NAVG）；输出格式选项（LPLT、LGRD为T或F）；将选择的信息输出到List调试文件中（LDEBUG=T或F）。

6 数据格式

GEO.dat

输入各网格的土地使用类型、地面高程、地表粗糙度、反照率、波文率、土壤热通量常数、人为热通量、叶表面积指数。

表 6-1 常用地类型及缺省参数列表

土地类型	特征描述	表面粗糙度	反照率	波文比率	土壤热流动	人为热流动	叶表面积指数
10	城市用地	1.0	0.18	1.5	0.25	0.0	0.2
20	农业用地(非灌溉)	0.25	0.15	1.0	0.15	0.0	1.0
-20	农业用地(灌溉)	0.25	0.15	0.5	0.15	0.0	3.0
40	林 地	1.0	0.10	1.0	0.15	0.0	7.0
50	水 体	0.001	0.10	0.0	1.0	0.0	0.0

可用 MAKEGEO 工具生成。

SURF.dat

Surface Met Data File

CALMET is designed to require only routinely available surface meteorological observations, although special data inputs can be accommodated. The surface meteorological data consists of Hourly observations of:

wind speed
wind direction
temperature
cloud cover
ceiling height
surface pressure
relative humidity
precipitation type code

The precipitation type codes are optional, (used only if wet removal is to be modeled). These parameters are available from National Weather Service surface stations. The preprocessors are designed to use data in the National Climatic Data Center's (NCDC) standard data formats (e.g., CD-144 format for the surface data).

NOTE: The data can also be input into the model by way of free formatted, user prepared files. This option is provided to eliminate the need for running the preprocessors to prepare the data files for short CALMET runs for which the input data can easily be input manually.

可用 SMERGE 工具生成。