

## **In-House Processing Necessary for the NESCAUM PSD Modeling Domain**

Several programs have been written to enable the necessary inputs to the Calmet and Calpuff models. Because of the grid size, incorporation of meteorological and other data is voluminous and must be automated. As we progress along with this effort revisions to the domain are also possible. The approach that has been taken allows us to easily redo the domain if necessary. Below I have described the processing necessary to this effort.

**Conversion to Lambert-Conformal grid projection** - Because of the domain size the option for Lambert-Conformal projection has been chosen. Therefore all spatially defined inputs to both Calmet and Calpuff must be represented in the x-y kilometer values of the projection. A subroutine titled "mapg2l" written by Gary Moore of Earthtech has been utilized as the core program in achieving this end. For the meteorological data locations defined in the Calmet input file, lists of station locations must be converted from latitude-longitude to the L.C. coordinates with modifications to the mapg2l subroutine.

**Geographical Inputs** - No In-house programs were necessary to this part of the domain preparation. A set of programs necessary for this effort is available from Earthtech including terrel, ctgproc, ctgcomp, and makegeo. Use of these programs is fairly simple, although it is not clear from the documentation what a few of the option settings regarding projection type and data set type are. Also some problems were experienced apparently in properly unzipping the global data sets that were utilized. Eventually these problems were resolved in our effort and now production of these fields may be easily redone for domains in North America.

**Upper Air Radiosonde Data** - Two steps in in-house processing were necessary to process radiosonde data from the NCDC CD "Radiosonde data of North America 1946-1996" to the format needed for input to Calmet. These steps occur after one uses the extraction program "getraob" associated with the CD. The first step simply converts to the Calmet input format. The second step involves data-filling and correction necessary to producing a temporally complete set of soundings in order that Calmet may be run for long time periods. The second step is more involved and the program that was produced for this need is designed to correct the existing sounding when this is acceptable to a form that allows Calmet to be run without using an entire substitute sounding for the one which Calmet does not accept. The problem with some soundings that Calmet will not accept is that no sounding level exists within one of the lowest defined vertical model levels since these levels are minimal in extent. To correct this problem the program takes wind or temperature data from the closest level above where data does exist and represents it in the lower model level where data is missing (this involves the lowest 200 meters of the atmosphere). It was concluded that this method is preferable to substituting an entire sounding from a different location. For the incidences where too much data was missing from a sounding, or the sounding was entirely missing a procedure occurred in which the surrounding stations were utilized for substitution with the closest one being the first choice if an acceptable sounding existed.

**Surface Weather Data** - No In-house programs were necessary to this part of the domain preparation. The "Hourly U.S. Weather Observations 1990-1995" CD from NCDC was utilized. First the extraction software must be used to select stations from a window of the large map.

After selected stations are downloaded run the Earthtech program “Smerge” to produce the file to be input to Calmet.

**Precipitation Data** - Data from the NCDC CD “US Hourly Precipitation Data” (TD3240 format), was utilized. Extracting data from this CD uses the serviceable “gethpd” program associated with the CD. After you have extracted the stations you need (typically in a lat/long defined window), the data must be corrected to a format recognizable by the Earthtech program “pmerge”. Pmerge, as of this writing, does not recognize the coded values of the data measurement flag (column 41 of the precip. Data). Therefore a processor was written to modify the code representations for missing data, deleted data and accumulation periods to values recognizable by pmerge. Some incidences of an isolated nonzero data measurement flag had to be omitted but the incidence of these data in the TD3240 file was meaningless as they represented beginning or ending periods of missing data carried over to a new month or from an old month (apparently the prior td3240 format had not included these lines). After the data measurement flag is corrected pmerge runs successfully.

**Buoy Data** - Data for the buoy sites was downloaded from the website [www.ndbc.noaa.gov/hist.shtml](http://www.ndbc.noaa.gov/hist.shtml). A processor was then written to convert to Calmet-recognizable format which requires data filling for every missing hour of data over the year.

*With these capabilities restructuring the domain or creating a different domain in the U.S. may be accomplished in a reasonable time.*

### **Calpuff - Work In Progress**

To date, Calpuff runs have been limited to a trial basis with the NESCAUM domain. Towards accomplishing Complete Calpuff runs the following capabilities exist:

**Emission Inventories** - Several years ago the capability to input inventory data from the SAMI inventory was accomplished. The inventory was represented in Calpuff as area sources on a county-basis and combined point sources, necessary because of the great number of point sources. For the point sources it was also necessary to extract the modeled Calmet elevation corresponding to the source location and incorporate it into the Calpuff point source inputs. In the future we intend to undertake a similar effort with modifications to the existing programming where we utilize data from the 1996 NET inventory.

**Complex Terrain Representation** - In Calpuff to better simulate deposition and other pollutant predictions complex terrain must be represented in the vicinity of a sensitive receptor in a manner similar to that used for the Ctscreen model. For the NESCAUM region the major terrain features associated with the sensitive receptors representing Class I areas has occurred using Ophill, one of the Calpuff options for this purpose.

**Boundary Mass Flux** - For the NESCAUM domain it was concluded that the component of pollutant mass input into the domain would be significant. A new option to represent atmospheric concentrations entering the domain at the boundaries is available from EarthTech (in the BCON.DAT file). We intend to construct a file suitable for our domain for this need.

