In this section, we will review the meteorological data that will be used in most of the tutorial sections. Most of the CAPTEX example calculations in the following sections use one or more of the five meteorological data files provided in the tutorial captex directory. Additional meteorological files are provided for the customized simulations. These would include Japan, Smoke simulations, Dust simulations, and the Sage experiment. These are all contained in their own directories.

All meteorological files contain the data: U and V component of the wind, temperature, and several other variables on a regular grid at multiple levels and at regular time periods. These files are already in a format that can be read by HYSPLIT directly. Converting data in other formats to be used by HYSPLIT will be discussed in the next section.

There are several programs available through the GUI that can be used to examine the contents of the meteorological data files. To start, let’s take a look at the first program to look at the grid domain, what spatial coverage does each meteorological file represent. If we open up the graphical user interface, the meteorology tab, and go to display data, we can look at the grid domain. This brings up a default menu. We need to select the name of the ARL or HYSPLIT formatted file. If we go to the tutorial directory, under captex, you'll find the five meteorological data files that were referenced earlier. These all end in .bin. The one that will be use most frequently will be the North American Regional Reanalysis or NARR, so select this

file, and you can see that the grid point plotting interval defaults to every other grid point rather than every grid point. If the file has too fine a resolution, you may find that the coverage is not very good, too black, too many grid points. For now we are going to select every grid point and we are going to draw latitude and longitude lines at five degree intervals, and we don't need to change the map background file. And if we select create map, you can see the coverage of the North American Regional Reanalysis for the CAPTEX Experiment. So it covers the release location near Ohio and all the sampling locations in the northeastern US and southern Canada.

You can do this for some of the other meteorological data files as well. We'll be discussing these in the calculations as they come along but we have the Weather Research Forecast model at 27 km resolution, and nine, and three kilometer resolution, as well as a Global Reanalysis, but it's only an extract that covers North America, the United States. It's a global file that was would be too big. And we also have another extract of the same re-analysis. This is a two and a half degree spatial resolution that covers the entire month. We will be doing some calculations for the month and we also have the ECMWF reanalysis. Now you can get more information about these files, they are summarized here to some extent. But you can also get more information through the GUI.

Now if we go back to the meteorology tab and display data, for instance, we can do check file, as an example, and we can again pick the same North American Regional

Reanalysis file under tutorial/captex/captex2_narr.bin and we open this and you can see that this provides a little more information about the file and its structure, showing the starting and stopping times of the file, the grid size, in X, Y, and Z. There are 20 levels here. It is at three hour intervals, 180 minutes between time periods. It gives the projection information and a summary of the variables that are contained in the first time period. The wind components, the heights, temperatures, specific humidity, followed by a listing of each data record contained in the file. So the first group of records is for the first time period: the 25th at 15 UTC and then the next time group starts at 18 UTC and so on.

All meteorological files are the same, the ones that are HYSPLIT compatible. They are composed of one or more time periods, each time period begins with one or more ASCII index records that summarize the valid time, the grid definition, the variables, and level information. Each subsequent record contains one horizontal data field, consisting of 50 ASCII bytes of time, variable, and level information for the record, followed by X times Y bytes of data, the horizontal and vertical dimensions of that grid, in the west to east and south to north directions. The floating point or integer data are then packed as one byte per variable. Precision is maintained by packing the difference between adjacent grade points rather than packing the absolute values.

So we will be using these data as well as other data in various examples that follow.