In the last section we configured and ran the model for the CAPTEX tracer release. Now we will go on and look at the various display options that are available for the model output files that were generated.

But before we start, we should go ahead and save the CONTROL file and the name list file from the simulation. And the suggestion would be to name the CONTROL file, save as, captex_control.txt and the namelist file as captex_setup.txt. So now we will have this for future use.

Going onto the display options, we have two different output files that were generated. We generated a binary file of the concentration grid and also a binary file of particle positions. There are multiple programs available that can be used to display the information contained in these files.

Let's go to concentration, display concentration, contours. Now in this case, it opened up directly, but there are situations when you will do what I just did and you will get an error message. So for instance, when opening up the graphical user interface for the first time, and I want to display the simulation that was done previously, you will see this message that the grid is undefined. We need to execute a set up first. And the reason for this is that the variables within the graphic graphical user interface have not yet been defined. Therefore you need to do set up run which we already know contains the configuration for CAPTEX, save, and now we can do display, contours.

To continue on with this, the graphical user interface automatically populates the menu with information that is obtained from the CONTROL file, so that the output is the hysplit4 bin file. But you can override this by typing in something else here. So if this name in the input field does not match the preselected, it will use the name that you typed in. And by default the output will be named concplot appended with .ps. This is the map background file, which is the default, we will go into different mapping options later on. You can also use Shapefiles, for instance, for your map background. You can force the projection, because the concentration gridded data are remapped in this display program and you can force different map projections. In this case you normally would let the graphical program determine the optimal projection. The contours that are created within this program can be converted to ESRI Generate Format or a KML/KMZ format, the first being needed for display in various GIS programs, or KML/KMZ for display in a browser. The source position can be labeled or not. We can automatically draw the rings at various distances and we can center the map at a different location rather than over the source location, which is the default. If we had defined multiple pollutants for the simulation, you may select which pollutant. We can average, if we have multiple levels, we can average the output. In this case we only have one. And we can apply conversion factors from the units that the model was run with to the display units. In this case we only have concentration, air concentration, as an output and we know that units are grams and the output would then be grams per cubic

meter. And these numbers are going to be quite small, so we want to convert the output units to something more integer like. So if I were to multiply by, and this is a computer kind of definition for multiplication, we want to multiply by, this is E format, by 10^{12}, so it would be E+12, exponent plus twelve, and that would turn the units of grams per cubic meter to picograms per cubic meter. So there are 10^{12} picograms for every gram. And we will default to color, and we will let the program select the exponents automatically, and we can go ahead and just run the display.

And you can see that the peak concentration after the first three hours, near the source, the red square, this is a 25 km resolution grid, is 20,000 picograms per cubic meter. We can scroll through the frames for each three hour period. And we can see that by the end of the simulation the concentration has been reduced, at least the peak area here has been reduced to 700 pg/m³ and I should add, the initial concentration was not 20,000, the initial peak concentration was 200,000 pg.

Now this can be animated as we had done with a trajectory, by going to the utilities, and PostScript to image, and selecting the animate button, and also you probably should select the crop button, which means that the whitespace about the image will be removed. The frames option is not useful for animation, because what this will do is, instead of generating one output file with multiple frames, it will generate one output file for each frame. A frame is a time period, an output time period.

We will increase the resolution a little bit and execute the conversion. Similar to the trajectory animation, the output will be written in the hysplit4/working directory. There is no message when it completes and we can just open this up in a browser, and perhaps that was not a good choice here. And there we have the animation.

The next display, since we generated a particle output file, are particle positions. And again the menu was populated by the files from the default names, and in this case the output would be partplot.ps and we will leave the cross-section as the display default. And let's save a little time and maybe in this case plot every 10th particle and let's execute. So after three hours, you can see there's very little growth, 6 hours, 9,12, and so on as we go further downstream and as we've seen earlier, that the faster particles are higher, are little further aloft, and they also tend to be further south. You can see that the bulk of the material, the bulk of the particles, stay below 3 km or 4 km in that region. Now there's an interesting feature developing here, which is this, what appears to be a straight horizontal line, well not quite horizontal, but the particles do not seem to cross. Now this is not some unique meteorological feature, but it is an artifact of the meteorological grid, because this is the edge of the meteorological domain, just as there is an edge out here, so that particles that reach this point will just get dropped. That’s the end of the frame.

Another display option is arrival time. The output file is called TOA, Time Of Arrival, and we can let the options

automate. You can read about the options, in all these menus, the help is context sensitive, so if you just press help. Let's go ahead and execute the display and what the graphic shows you is how many hours from the start of the release did it take for non-zero concentration to be measured at this point. So for instance, if you looked at the central New York region here, this is well in the middle of the green, and it took approximately 32 hours after the release, for non-zero tracer measurements to be predicted in this region. And again you can see here the limits of the, in this case the domain, the computational domain.

And the last display program are grid values. The contouring program remaps the data to a different grid, whereas the grid values program just fills in the color at each grid cell according to the concentration, so there is no remapping involved. The remapping and the contouring does result in areas of concentration that may not exist, especially at the edges of the plume when you go from a value to a zero value. So there is some uncertainty as to where that transition to zero actually occurs. Clearly the smaller the grid cell, the finer the resolution, the less uncertainty about that kind of contour.

So let’s make a few changes here, not very many. Let's also have a multiplier to get units of picograms, so will multiply by E+12, exponent +12, and we will call units picograms (pg) and we want the contouring interval, not so much contouring, but the difference between color intervals, to be factors of two, and then execute.

And in this case you can see the size of these 25 km grid cells, so there is no interpolation involved here, so these are the actual concentration grid cells that are impacted by the particles for each sampling duration. We can just take this right to the end, with the colors getting colder as the concentrations get lower and lower. And as I mentioned these files all get written into the hysplit4/working directory, the grid plot that we just did, the time of arrival, the particle position plots and the concentration contouring plots.

All these files, the default output format is Postscript, and as I mentioned, there are other options that we can look at for creating GIS output, such as ESRI Shapefiles, or the Google Earth KML Keyhole Markup Language output, and we will do that in some later sections.

And this concludes the discussion about display.