In this next section we will take a closer look at the PARTICLE size distributions. In the original calculation that was done, the original volcanic ash calculation in the first section, we assumed four different particle sizes. So we're going to re-compute that but this time looking at more particle sizes. So the first thing we should do is actually retrieve that calculation. We will start it up again and we'll do it by doing a reset and then retrieving the original configuration, that is the CONTROL file from the volcano directory in the tutorial, and also the name list file from the tutorial directory. Now, because we've been continuing on from previous sections, you do have a PARINIT file, you should delete that so we don't accidentally use it in a calculation.

The next step will be to add deposition. Now this first calculation that we did only showed air concentration. The particle size, if we play with particle sizes and adjust those, it'll be more evident in the deposition output. So let's open up that deposition menu and add a second layer, the deposition layer at level 0, so we can see that output as well. And that is the base calculation, so we should rerun that just to get the results, to get the deposition results that is.

And let's go to the display menu and let's select all pollutants again and we're going to leave this, because we just want to look at the deposition, and let's fix the contours, so we can get some good-looking numbers or at least see the gradients a little more clearly. Units will be micrograms and these numbers are rather large, so I think

we're starting with 50,000, I'm sorry 500,000; 200,000; +50, +10, +5, +2, +1000, so it gives us plenty of contours and let's see what this looks like. This is the first hour, the first 6, after 6 hours, and now after 12 hours and I think I entered the contours incorrectly, let's double check that, that's 500,000; 200,000, missing a zero, okay, much better. And so this is the base calculation of deposition in micrograms per square meter.

So now we're going to change the particle distribution from 4 sizes to something a little bit more complex. So let's close this and what we're going to do is, there is an option within HYSPLIT to increase, or interpolate a particle number distribution based upon the LOG of the particle diameter. We're going to use this approach, where the number distribution, the particle number distribution, is linear according to the log of the particle diameter. And that can be invoked automatically within HYSPLIT, but unfortunately it is not part of the graphical user interface. If you were to look in here, in the help file, for the graphical user interface, you can see there's a list of different name list variables, and there's also a summary of all the name list variables, and the one that we're particularly interested in is NBPTYP, so this is the number of redistributed particle size bins per pollutant type. So the default is one, so that we have for each particle size bin, and that is really what the four particle sizes that we used in the default configuration for HYSPLIT represent, they're the bins where the particle size that was given is really the median particle size. So you can read about this particular parameter and these are variables that are not set in the

GUI and that will discuss this in more detail.

So I'm going to quit this and what that means is if, let's say we were just to set this to 5, that we would then define 5 particle sizes within each of the existing bins and if you recall in the existing bins and I could do that in several different ways, I can look at the CONTROL file, these were the bins that we defined, the different particle size bins: 0.6, 2.0, 6.0, and 20 microns. So those just represent median values. So if we want to fill that in and when filling with 5 values per bin, then what we need to do is edit the name list file SETUP.CFG, because this is not in the graphical user interface. What's interesting about this, this one doesn't have the variables, so you would have to add it. Or we could go to CONC.CFG, which is written by the model and you can see that is one of the variables that is defined, because remember that SETUP.CFG was written by the graphical user interface, that variable is not defined in the graphical user interface. But when the model runs it writes out CONC.CFG which contains all the name list variables. And the values that were set by SETUP, so you could just change this to 5, save, and then delete this one, and rename this one, to … so now we've added a variable that is not in the graphical user interface. So now if we run the model, it will use that edited set up file. And notice the message here, particle size redistribution.

And if I were to look at the MESSAGE file, for that run, right away it shows us what the particle size redistribution was. So for the four existing bins, bin one, the .6, and bin

two and so on, we have five new categories, and the emissions amounts were of course adjusted according, so that the total emissions are still the same, within each pollutant category and these are the sizes that, remember the .6 was the one in the middle here. So these are the new sizes that were generated. Now clearly this effect will be greatest on the largest particle sizes that have the most gravitational settling, for the smaller particle sizes and it's not going to make that much difference.

So we know that worked and we can now go to display and we will do new deposition and let's just call this concplotnew or just concplot5 for the five bins and you look at the results here and compare it with the old result, so that would be concplot, there it is, this is the old one, then we have the new one. So new on the left, old on the right, and you can see that, yes there are some differences. So we have a little region here that's not evident here, but all in all they look very similar. The peak is 1.2 on the new one, the peak on the old one was 1.4. So that is why, you know we can get away with looking at a complex emission scenario of different particle sizes with only a few bins that represent the deposition due to large particles and the long range downwind transport of the finer particles. It doesn't take very many to give us a good approximation.

And this concludes the particle size discussion.