To complete the section on air concentration uncertainty, let's set up an exercise. Recall when we configured the ensemble using different, five different meteorological data sets, we had the results that we transferred through in the various ensemble statistics section, and the ensemble reduction section. What I'm proposing is that, go back and rerun the meteorological ensemble, but improve the grid resolution, the concentration grid resolution, by reducing it from a quarter of a degree, or from half a degree, to a quarter degree. And also correspondingly increase the particle number from 10,000 to 20,000. And let's see how the individual models, or the individual meteorological data perform, and the overall ensemble mean.

The hint is to just go ahead and run the batch file to make this easier, and then open up the graphical user interface to do the statistics. So go ahead and pause the video and I will show you the solution in a moment.

Okay, the first thing we need to do is go back to the ensemble, the multiple meteorological data ensemble, and we can simply go to the batch file, which we know is ens_data. So I'm going to open up the tutorial batch directory and find that batch file, open up Notepad and find the two changes I need to make. And that would be reducing the grid resolution, the concentration grid resolution to half that amount, and also increasing, or doubling the particle number. One could argue that reducing the resolution by half really decreases the area by a factor of four, so I should quadruple the particle

number, make it 40,000 instead of 10,000. But we do want this calculation to finish in a reasonable amount of time. So go ahead and save and run the model. So this will take a little bit of time but not unreasonable.

And we finally completed the fifth simulation, and the batch file does go through the same statistical analysis as before, with the scatter diagram, and the statistics. But let's go ahead and actually compare that using the menus within HYSPLIT. If you go to the working directory just so you can see what was just created, we have new files for hysplit2, one through five. So we can go ahead and do what we did before, that is create a … but we can do a short cut. I was going say, we could've gone to the menu, the binary merge menu, but we do have a file here, which is cmean, which came out of the statistical program. And we could just rename this to hysplit2.006 to represent the ensemble mean of the five higher resolution simulations we just did. And I can do this because the batch file went through and did the statistical processing, which did generate the ensemble mean, the cmean file. And now we can go into the display, ensemble, statistics, and of course, we need to save that, because the menu needs to be populated. And we can select the measured data file. And let's give this a new name, instead of sumstat, sumhires, because this is a high-resolution one. And we also need to make sure that number seven will still be there, but that's okay, let’s click on execute. My guess is it’s not there.

So these are the new results with the higher resolution

simulation. And if we go to the working directory we saved the last one that we did at the course resolution. That's this one, versus the new one.

And you can see on, if you go down the individual first five files, the rank went down. The rank went down, the rank went down, slightly, went down again, went done again. So for actually, for every one of these, the overall statistic went down. The higher resolution run and the courser resolution run, the ensemble. I'm sorry, this is the one 3.32, so that went down as well. Remember this was the reduction ensemble, so we don't need, or want to look at this one. As far as correlations, actually some of the correlations went down, well this one, they all went down 0.74, 0.67, this one went up, this one went down, this one down, and this one went down.

So there's a lot of variability. Some of these square errors went up, the fractional biases. So there's quite a bit of variability in all the metrics for each of the individual members. But what's interesting is that the ensemble mean results between the two, the low resolution here and the high resolution run, are about the same. And for the individual members, generally the performance tended to be not as good. So it's interesting from the standpoint that you can reduce variability by using ensemble means. And I think as we've found before, higher resolution doesn't necessarily give you better results, especially when the model predictions are paired with measurement data in space and time. Slight differences in the timing of the arrival or slight differences in the spatial position, that

may all be within the uncertainty of the underlying data, the meteorological data for doing the calculation, but it can translate into a reduction in what appears to be the performance of the model, even though they may be substantially the same. You can also look at the scatter diagram which I think we did, but I'm not going to do that now.

So this concludes the exercise number 13.