In this next section, 9.2, we will continue to optimize the HYSPLIT configuration for the aircraft sampling. If you are not continuing on from the previous section, you need to go back and do 9.1. The first thing that you would have noticed in the previous simulation was that the results were quite course. Since it is still saved in the graphical user interface, I can just go and display those results again.   Clearly the first step here would be to reduce the concentration grid. To do that, and I think everyone should already know how to do that, is that we open up the set up run menu, go to the grids menu bar, and we will just reduce the resolution here from 25 km, to let’s say 5 km, and everything else stays the same, and we run the model. This will run a little bit slower than before but not that much slower because we're only going to 13 hours.

As you can see it's finished. And back to display.   And there are a couple things evident in this graphic.   One, the plume is a little bit narrower and this is because the concentration grid cell is less.   Some of the plume width that we saw was really just an artifact of the contouring, contouring from positive values to zero values. The concentration, the peak concentration is a little bit higher, 26,000, and the outside edges are a little bit noisy, but that's not really a critical issue here.

So I think the next step would be to try, instead of a particle simulation, let's do one of the puff simulations. So we would have to open up the advanced menu for concentration, and we are configuring the release of particles or puffs, that is menu number three.   And let's start with a top hat horizontal, particle vertical. Now the advantage of puffs is that we can release fewer of them, so let's change the limits from, this menu four, from 50,000 to 5000, and then run model again. Clearly this ran much faster and if we look at the results, we have a much smoother plume. It is still a little bit too narrow compared with the measurements. It is also giving us a peak concentration that is very close to the peak 29,000, measured peak, 30,000 predicted, but the peak is trailing, is not yet at the peak location. We will fix this soon.

The next combination to try is a Gaussian puff and see how that changes the calculation. That is menu three again. We will select Gaussian horizontal, particle vertical, and run model again, and display. And in this particular case, the calculation looks very much like the top hat. So it is interesting that whether we select top hat or Gaussian, we're really getting the same horizontal structure, the same plume structure, with the highest contours being in the middle. And the reason for this is that the horizontal distribution of the final product is not so much the result of the distribution assumed for an individual puff, but the distribution of the 5000 puffs that were released.

Now let's fix up the rest of this and there are two issues that we have not addressed. One is the averaging time is three hours, the aircraft samples were collected only for six minutes, and they were collected at 914 m above mean sea level, not at the ground. We are, at this point, only predicting the average concentration between zero and 100 m. From the previous trajectory calculations, you may have some clue as to how to fix this, so the first step would be, let's go into the concentration set up, and we need to define the MSL-AGL units which is menu number two. So we will set the flag of, to tell the model to interpret the heights in the CONTROL file as relative to mean sea level rather than to above ground level. That's the first step and we can save. And now let's go to the set up run menu and open up the grids, and we need to define a layer now, where the aircraft is. So we know that the aircraft flew at 914 m, so let's define a layer between 800 and 1000, so it encompasses the aircraft flight level. And of course this number needs to be set to two and the concentration output file will actually have two levels, a 0 to 800 m level which we don't care about, and an 800 m to 1000 m average concentration level, which we do care about. And the last step, we could do snapshot, but I'm going to set this to just a one hour averaging period. So it gives us a little bit more smooth result. You can experiment with a snapshot as well if you like on your own. So I'm going to save and another save. But before we run, it's clear that we don't need to run to 13 hours anymore, because the previous calculation at the sample time of 600 so we can run actually a few hours less, save and then run, and display.

See we didn't select the proper level in this case, we're getting 0 to 800 m, so let's fix that, and just show the 1000 meter level, the 800 to 1000. If we were to select bottom 800 to top 1000, we would get both levels. So we need to just select the 1000 and then execute. You can see the result now is between 800 and 1000 m, it's a one hour average between 0300 and 0400. And you can see that the peak concentration now is 31,000 pg, at the little red square, which is very close to the actual measured peak of 30,000, 29,900 at the plus symbol. The plume still looks a little bit too narrow compared with the measurements.

And so now we're in the position where we can do some sensitivity tests. This example was selected partly because the results were very good. It's hard to do parameter sensitivity tests, trying out different assumptions about this dispersion and mixing, and stability, if the results are bad. Because a little bit bad, a little bit less bad, is hard to distinguish. But if we're doing well and then we make some adjustments, we can see what effect would be a little bit more clearly.

So in any event, now that we know this works, and it works the way we wanted to, go ahead and save the name list and the CONTROL file with special names, so that we can call it up when we need to use it. So set up menu, save as, and let me suggest conc_case_control.txt and also in the name list menu conc_case_setup.txt.

And this concludes the configuration and optimization of the example case for aircraft sampling.