In this last tutorial section, we will review some unrelated simulations. And we will start with the dynamic or Lagrangian and sampling option. If you recall that in most, well in all of the previous air concentration calculations we had a fixed sampling grid over which we sampled the particles or sum their mass as they pass through the domain. In this dynamic or Lagrangian approach, what we do is we define a sampler, a single point rather than the grid, that will move through the computational domain, either passively with the wind, or using a forced vector, that is, speed and direction, as what might be defined by an aircraft. This should remind you of the aircraft sampling configuration that we did earlier for doing model testing, where we compared the model results with data collected during multiple aircraft passes. So what we will do is, we're going to try to reconfigure this example case, but this time using the dynamic sampling option. And if you recall, we saved that configuration. Now we are, this was some time ago and you may or may not still have those files in your working directory, but they will be available in the tutorial/files directory. So start by doing a reset, and then in the set up run menu, we will retrieve from the tutorial files the conc_case_control.txt file as well as the same name list file setup, conc_case_setup.txt.

Now if you recall the flight configuration, what we're going to do is, we're going to just look at this last flight, which started here. Remember this flight was in the tutorial/captex directory, the flight for 914 m above mean sea level. And there were several passes and we will look at this last pass. So we will look at this as the starting point of that flight and this is the ending point here, the last line. And you can see it ends at hour 03 54 minutes, that is 48+6, and therefore from the time of the release, that would be an 11 hour calculation. So if we go to the setup run menu, we should be doing an 11 hour calculation that will take us through this last record, at 03 54.

And the other thing we need to do is define the concentration grid correctly. And there is one difference, in the dynamic or Lagrangian sampling mode, we need to do a snapshot calculation, that is we need to save the particle positions, the summed masses into the grid every time step. So this is just a mechanism that permits us to look at information, the concentration information every time step and compare the aircraft sampler position with that every time step. And we can start at the beginning here at the 26th, so I'm not sure that actually matters, but hour three is too late. So we'll start up at midnight on the 26th as far this snapshot grid is turned on, and we can do is save here. And the next step is really to configure the dynamic sampling.

And to do that you go to the advanced, file edit, dynamic sampling menu, and you can configure up to nine samplers and it will create an output file called LAGSET.CFG and when the model sees that file it will do the dynamic sampling calculation. So let's configure this one aircraft pass, that is sampler one. And we will populate this menu with the information from the start of the sample, so the 40.86, -81, at 914 m comes from this position here at the start of this pass. And we are setting, even though it says above ground level, we are setting the MSL flag, if you recall from the previous examples in the name list menu. Therefore, we will put in this height as mean sea level. Now in this vector field here, zero, that means that the dynamic sampler acts passively like a balloon, but if we put in a direction and speed, then it acts as a aircraft sampler, moving at that velocity through the domain. And you can determine these numbers by just looking at the change in the latitude/longitude along this pass as a function of time, and I think you will find that the direction is approximately a little bit north of west, the aircraft direction, at 50 meters per second. So that is really just determined from the series of samples that were collected.

And the first sample will be collected on the 26th, hour 02 48, hour 02, 48 minutes, so that is this number and the sample start time, in other words, this is the time that the aircraft starts and this is the time that we turn on the sampler in this virtual aircraft. So in this case it's going to be the same time. And we know that the output here is every 6 minutes, so we will set that sampler averaging time to 6 minutes, and we also want to see those numbers every 6 minutes. And the output will be written to a file called LAGOUT.TXT. And that is all that is needed to configure the dynamic sampler. And once you've done this last save to file, in your working directory you should have this LAGSET.CFG, which contains the information that we just entered in the menu. And the next step, well just as a reminder before you run the model, if you look at the name list file, we did set the flag relative to mean sea level, that was part of that configuration.

So at this point you can run model, and because that LAGSET.CFG file was found in the working directory, the model does run with the dynamic sampling option, and it creates an output file called LAGOUT.TXT, which if I open up and compare to the measurement data, you can see that, for instance the peak concentration that the model predicts, is approximately in the same location as was measured.

Now the dynamic sampling provides no unit conversion options, so the output in the LAGOUT.TXT file is in grams per cubic meter and to convert to picograms we multiply by 10^{12}, so therefore this number is about 14,000 pico grams per cubic meter, which is about half of the 29,000 that was measured by the aircraft. So position wise and the location of the peak gives a nice matchup. So this is a way you can configure the model to simulate the dynamic sampling of aircraft or balloon based measurements. And as I said in the introduction up to nine samplers can be tracked at any one time.

And this concludes the dynamic sampling discussion.