In this section we will review multiple trajectories computed within the mixed layer.

If you recall in the previous section, we determined that the mixed layer depth for the start of the CAPTEX tracer release was approximately 1700 m above mean sea level, or 1400 m above ground level. I forgot to mention in that previous section is that when you run the profile program, it also creates an output file in the hysplit working directory. You can see it created a file called profile.txt, which contains the same information that you would see through the GUI. In this case the boundary layer depth.

So now go ahead and let's do a trajectory calculation. Open the graphical user interface, trajectory tab, set up run. Now this input file, the information here may already be populated with other information, which may or may not be correct. When we did the previous calculation for a trajectory at 10 m, I asked you to save the information from the CONTROL file to a special name. At this point we could retrieve that, so click on retrieve and the name that I had asked you to save was traj_base_control.txt. This file should be in your working directory if you saved it.

Let's review the information that needs to be entered here. The starting time of the trajectory, at essentially 1700 UTC. Now we are going to do this a little differently. Instead of one trajectory starting height, we will compute three trajectories simultaneously. So enter three, and now open the starting locations menu, it now has been populated by three starting locations, all the same in this

case, they do not have to be, but we will change only the starting height. So will leave the 10 m for the original calculation that we did, this is 10 m above ground level. We will enter 750 m to be approximately mid boundary layer, and we will make the last trajectory the top of the boundary layer, and we'll just put it just above the top at 1500 m above ground level. Click on okay and it saves that information into the GUI variables. And we're going to do the calculation for 68 hours in a forward direction, we will leave the default 10 km. We're going to use the vertical velocity field from the data, and we're going to write out the information to a file called the tdump, and we're going to use the captex2_narr data file. So go ahead and save and now simply trajectory run model and the calculation completes.

Now go to display, trajectory, and I'm going to leave all the defaults, we will not change them now, and just click on execute display, and you should have something that is very close to, it if not identical to this calculation. And now you can see that, this was, the red is the original trajectory that we computed at 10 m, the blue trajectory is the mid boundary layer trajectory, and the green is the top of the boundary layer trajectory. And you can see that the coverage between the ground level and the mid boundary layer covers a much broader region now and it's more corresponding with the tracer distribution. But still we're were quite shy of all the measurements that were made in the southern regions here. So this is still not an adequate representation of the mixing, just looking at a single trajectory, starting with the tracer release at low

levels and at mid boundary layer eights. The upper level trajectory it's not going further to the south either. Generally speaking trajectories tend to veer with height, that is be a bit more clockwise because of the reduced frictional effects as we get away from the surface.

Now there is one last thing we can do here. HYSPLIT can also automatically compute the boundary layer trajectory for you. You do not have to go into the profile program and try to figure it out. So before we set that up, let's do one thing, let's save the configuration that we just did. So go back to the setup run menu and do a save as, and so we can go back and then load this again if we need to. So let’s call it traj_lev3, for three levels, we were doing three different level trajectories, traj_lev3_control.txt, and then save. Let’s close this for a minute.

And as I mentioned, that the, there's in an advanced menu, and the advanced menu changes the way the model interprets information in the input files. So if I were to go to the advanced configuration, set up trajectory, it brings up a new set of menus, and the one we're interested in, is menu number two here, defining the sub-grid and the MSL or above ground level units. So if I were to select this, the default is that HYSPLIT treats all heights in the CONTROL file as being relative to ground level. We can also over-ride that and select that heights should be relative to mean sea level, or we can select a fractional height. In this case the trajectory starting height would be some fraction of the mixed layer. So before the trajectory starts, the HYSPLIT code will look and compute

the mixed layer at that location and time and select the height that corresponds to the fraction that you entered. Now let’s select this right here.

And we'll do a save, and another save to close this menu. What happened is that we created in the HYSPLIT directory, in the working directory, we created a new file called SETUP.CFG. This file contains information, the namelist file. These variables are namelist variables that may or may not be human, easily interpreted by a human. In this case, the variable that we created, all these other settings are default, and we will discuss some of them during the course the tutorial, but the variable that was created was this K mean sea level flag, which was set to number two, and that tells HYSPLIT that it should interpret the starting heights as fractions of the mixed layer depth.

Well to make this work what you need to do is go back to the setup run menu, and let's go back to one starting height here, just to keep it simple. Now the starting height instead of being meters above ground level, is now going to be fraction of the PBL here. So let's do mid boundary layer by making it 0.5. So it'll start a mid boundary layer trajectory. So if I select okay, and save, and then run model, now up pops another message here. And the graphical user interface detected that we have a namelist file, this file called SETUP.CFG. Now this file could've been left over from a previous calculation, or you could've created it here. The graphical user interface does not know, so it's up to you to say yes, I created this file, so let's go ahead and run the model. If you don't know

what's going on, you could easily delete and then run or cancel the run. But in this case we know that we created this file and we want it and so we are going to run using setup.

When the calculation is complete, exit, and then display, and leave the defaults, and you can see here that we get the similar trajectory as we had before, the mid boundary layer trajectory, but in this case the model computed it automatically. Now this is the first time we introduced the namelist. If you're looking for information about namelist variables or other things, or input files and so on, you can go to the help menus, and help menus are context-sensitive, so that means if I were to go into trajectory, menu #2, for instance one that we were looking at, and click on help, it would open up the appropriate help menu. And you can see here that it describes what happens when you set this flag here for the fraction of the mixed layered depth. That the KMSL nameless variable is set to two. So this is a simple way of finding out what's actually going on within the model and how the different calculations may be performed, or what a particular button does, and what it does to the input files that you're trying to create.

And this concludes the discussion of the mixed layer trajectory computations.