In this section we will take a closer look at the emissions file, the EMITIMES emissions file that can be used to create complex emissions scenarios. We're going to repeat the original volcanic ash calculation, but instead of doing it manually, we will do it in one sweep using the EMITIMES file.

We had used the EMITIMES file in an earlier example, the smoke simulation and the EMITIMES file format is relatively simple, it consists of two identification records. This first identification record defines this first header record and then the second identification record defines the subsequent data records. And this first record, the identification record defines the time period that these data records are valid, the emission records. So in this particular case, these 8 emission records, these 8 records are valid starting at April 14 hour zero for duration of 12 hours. And then each subsequent data record consists of the starting time of the emission, and a duration of the emission in hours and minutes, the latitude and longitude of the emission point, the height of the emission point, and the emission rate in units per hour. For the smoke calculations, we also had included an area and a heat release rate for doing the plume rise. We will not be doing that in the volcanic ash, so those fields will remain zero.

In the case of the volcanic ash simulation, there is an interesting complication that, or complexity that you need to account for, is that the CONTROL file shows to release heights, a height of 100 m and a height of 6000 m.

However, the corresponding EMITIMES file for this CONTROL file scenario of the two of emission heights, requires 8 records, because it requires one record for each emission height, but it also requires one record for each pollutant that is submitted from that height. Therefore 8 records are required. And the number of records, the number of data records in the CONTROL file or in the EMITIMES file, needs to match the number of emission records in the CONTROL file. But there are 2 emission records, but there are 4 pollutants, so therefore 8 records are required. So that is the complication that you need to keep in mind.

So to do the earlier example, say to redo the earlier example with a single calculation, let's start by just eliminating any PARDUMP files or PARINIT files so that we don't have, we don't have any complications. And then we can go back and do a reset, and let’s go ahead and load the original configuration, that was the volcano CONTROL file and for the name list, the set up.

Now to use a name list file, certain changes are required. Let's go back and go through it step-by-step. Now instead of doing a 12 hour simulation we want to do a thirty 6 hour simulation. Remember the first 12 hours, the emissions are from 100 to 6000, then the next 12 hours, 6, 100 to 12,000 and then the last 12 hours would be 100 to 6000 again. So make this 36 and of course this can stay the same, we have, for now.

And let's go to the pollutant menu, for these 4 pollutants,

what we’re going to do is, because we're going to use an EMITIMES file instead, what I would prefer is that these numbers all become zero. Because what happens is if, well what happens is that normally the EMITIMES file would replace the values that are here, so it overrides anything you enter here. However, if it does not overwrite it and perhaps you made a mistake, then it will use the emissions that you set here. So we need to do this for all four species, so this way if you do make a mistake in configuring the EMITIMES file and it is a complex file, so it is easy to make mistakes, then at least you won't get answers, if you have no emissions. So this way the only emissions that you will get will be from the EMITIMES file.

So now to configure the EMITIMES file, let's close this and go into the configuration first, and just make sure that in menu number six here, that it's looking for an emissions file, so I want a click on default name. Now an EMITIMES file can be called anything you like, that's just the default name that we use. So this actually sets the parameter in the name list to look for, to open this file by this name.

And now to create the EMITIMES file for the first time, there is a menu in the graphical user interface and it's under file edit, emission file, and this will create the file for you the first time. So let’s, we are configuring two release locations, so let’s start with location one, and it takes the information from the graphical user interface variables that have been set in the menu. And we know that we want the first emissions group to be a 12 hour duration group

and we're going to be releasing from 100 meters, and for now let's leave this, these values as one, and as far as emission rate, we will adjust this in a moment. So I'm going to save that, and the second group, this comes from the CONTROL file, this is the 6000 m height, will also be for 12 hours, and save.

Now and then save to file. So the editor, the CONTROL file creator in the graphical user interface is very simple, it can only do one time group. So to actually represent the example that we want to do, we need to open this up a Notepad, and we need to make a few changes, not very many. So this, for instance, is the first time group that is going to be valid for a duration of 12 hours starting at 00. And what we want the emission rates to be are fractions, because we will, you could enter the actual emission rate here like we did in the emissions file, that is ten to the sixteenth or ten to the eighteenth, for instance. But we're just going to keep it as fractions to make it a little bit easier to work with, and so this first emission rate will be, will represent how much in that smallest particle size, that is the 1%, and in the second particle size, the second smallest particle size, will contain 7%, if you will, and then the next one will contain 25%, and then the last one will contain 67%. So the sum of these is one, so this is, this represents the total emission. We can do the same thing for the 6000 m height.

So this now represents the first 12 hour period. Now we want three of these 12 hour periods to give us a total 36 hour duration calculation. So all we need to do is copy

the header record and change these numbers, this becomes now valid at 1412. I can do it this way. And we can change the, remember the second 12 hour period, the emissions went to 12 km and then the third time group, we went back to the 6 km emissions, and this would've started at 15 00. So 14 00 gets replaced by 15 00. And that actually should be it.

So now we've got three emission groups, one starting at 14 00, the next at 14 12, and last 15 00, where we changed the top of the emissions from 6 to 12 in the middle group, with this particle mass release rate distribution. Now it's a unit right now, so we can correct it in the last, actually replace it with actual emission rates here, but we want to keep this file simple, so we're not going do it here. So it's all done and you can now go ahead and run the model.

So it should be clear that we did if you will, a unit source calculation in this using this emissions file and with that unit source calculation then the multiplier would need to be one times ten to the sixteenth to give us the micrograms per cubic meter. So if we go ahead and display, we're going to display all the particle sizes, and one E+16 and of course we didn't do the deposition, if you did, you would have to put the same in here, and micrograms, and we should probably fix the contours, 100+50+20+10, and execute. And this would be identical to what you got before for the simulation had we taken it out to 36 hours, we did not look at the 36 hour concentration plots, but we did look at the particle plot. And you can see the particle

number going up with the low height, the 6 km height emissions, the 12 km height emissions, and then back to 6 km. So this is identical to the previous calculation that was done manually in three sections. So this concludes the configuration of an EMITIMES file.

This is a very practical file to be able to use. It can create very complex emission scenarios. You could define moving sources within this file, where the Lat/Lon position, the emission position, changes as a function of time. The complexity of course, of the emissions that can be simulated, does mean the file itself can be difficult to configure at times. But I think if you go about this in a step-by-step manner, adding complexity one step at a time, and making sure that things work, you should be able to configure the kind simulation that you want.

So this concludes the volcanic ash section and we will do an exercise to conclude this.