

In this last section on deposition we will review how to configure HYSPLIT for the wet deposition of particles. The computational approach is the same as in the other deposition methods, in that we compute a time constant, or an inverse time constant, based on a scavenging coefficient, modified by a precipitation rate to the .79 power. In HYSPLIT the deposition is divided into below-cloud and within-cloud, but after version 657 we simplified some of the equations to use the same approach for below- and within-cloud removal. This computational approach is consistent with what other modelers are using and there is quite an extensive discussion in the literature about what coefficients might be used, or might be appropriate for different pollutants, and under different precipitation scenarios. Once we've developed, or computed this coefficient, it is then applied in the same removal equation as an additional exponent in the exponential term to compute the mass removal from the particle

To configure HYSPLIT, you can continue on from the previous section, or if you are starting this from the beginning, you can retrieve the previously saved CONTROL and name list files for deposition. We assume here that we are continuing on from the previous calculation, so open up the set up run menu, go to the deposition menu, and then press the reset button to give us a clean slate, in terms of defining the particle wet removal coefficients. Simply select particle and wet deposition, and the menu is populated with the default values. In this case we've defined a particle through the

nonzero values here, and we've also defined the scavenging coefficient for in-cloud and below-cloud. At this point we have no information to indicate that these values should be different. So we are using the same below-cloud and within-cloud coefficients. The only thing that we need to do, is we want to turn off the dry deposition calculation, even though, well once we've defined this as a particle, then it automatically does gravitational settling, and it would automatically do dry removal of those particles, once they reach the surface layer. So to turn this off we can put in an override for the deposition, the dry deposition velocity, by putting in here a very small number, to make it essentially negligible. And just to ensure that there is no confusion, there is a special feature within HYSPLIT that should only be used for diagnostic purposes, that if this value is negative, then whatever particles do reach the surface deposition layer, will not lose mass, so we have a negligible gravitational settling, but we've essentially turned off the dry deposition.

At this point these are the only changes required and you may now close these menus and run the model. And then display. Let's give it a unique name for output plot\_wetp for particle, and everything else should be fine. We do have the multipliers from picograms, and if we scroll to the end, we see again these two wet deposition regions, but notice that the yellow contour instead of being one or two picograms per square meter, this inner contour, is now 100,000 picograms per square meter. So the particle wet deposition default value here if you will, is much larger than the gaseous deposition, for particles. And we can,

although it's many hundreds of thousands, 10,000 times greater than the gaseous wet deposition, if you were to look at the MESSAGE file for this run, you can see at the end of the simulation, we're only down by 5 kg, so a difference of 5 kg in mass lost results in 10,000 times greater deposition amount. So this is not inconsistent, you can try doing a little arithmetic and then figuring out the area and multiplying by the deposition amount to see if you can account for the mass that was lost in the calculation and I think you will find that it is consistent.

So the take away from the deposition computations is that the wet deposition generally is much larger per event, let's say, per unit time, than the dry deposition, but dry deposition tends to be going on all the time. So for short duration simulations, wet deposition maybe important, but for very long range simulations, the continued accumulation of dry deposition, even though it may be much smaller, can account for a lot more mass removal.

This concludes now the deposition discussions about configuring the model and the next section will be an exercise.