How to add an aerosol to the GCM:
By: Laura Kerber

Do you already have optical properties for your aerosol (Qext, omega, g)?

If not, read this section. If so, skip to *Adding the Aerosol*.

Getting Optical Properties for your Aerosol

1. Find the necessary indices for your aerosol of choice. The HiTRAN database is an excellent place to start. http://www.cfa.harvard.edu/hitran/ You will end up with a table with the real and imaginary parts of the optical constants according to wavelength. If they are not there, you will have to look in the literature. There are also several "Handbooks of Optical Constants".

2. Once you have the optical indices for your aerosol, divide the values into two separate files, one for the visible wavelengths and one for the infrared wavelengths. Run them through the Mie code.

If you have never used the Mie code before, read this advice from J.B. Madeleine:

"In the Mie code, nsize is the number of bins used to integrate Qext, omega, and g over the particle radius. Usually 1E4 is a good number. You can try to increase this number to see if it changes the results, and if it does, keep increasing it until you reach constant and consistent results. Rmin and rmax are the minimum and maximum particle radius used for the integration. In this case, 1.E-10 and 1E-4 usually work because the reference radius is often around 1.E-6 (this may change depending on your aerosol). Nsun is the number of wavelengths in the input file optind_*.dat. So you will run the Mie code twice, once to create the properties for the visible spectrum, once to make the properties for the infrared part of the spectrum."

Save these as different files with names like "optprop_aerosolnamevis_n20.dat", where n## indicates how many radii you used in the Mie code (only to help you remember). Put these files in datagcm.

Adding the Aerosol

Add the aerosol in aeropacity.F90. This is where the amount of aerosol in the atmosphere is calculated. You will see the other aerosols there, so you can model the new aerosol after the existing ones.

Add the aerosol to aerosol_mod.F90. This is the common file which creates all of the iaero tags and initializes them to zero.

Add the aerosol to iniaerosol.F

Add the aerosol to radii_mod.F90, if you want the radius to be available through reffrad.

Add aerosol to suaer_corrk.F90. This is where you point to the files which contain the optical properties for your aerosol in datagcm.

Adding flags

If you want the flag for the aerosol to appear in callphys.def, add the aerosol flag to callkeys.h (e.g., the flag for iaero_co2 is called 'aeroco2'). You also have to add the aerosol flag to inifis.F. Finally, put the flag in callphys.def.