The figures below correspond to one year of IPSL (LMDZ) outputs from a run that was performed with COSPv2 inline having a first debugged version of the CloudSat simulator precip diagnostics.

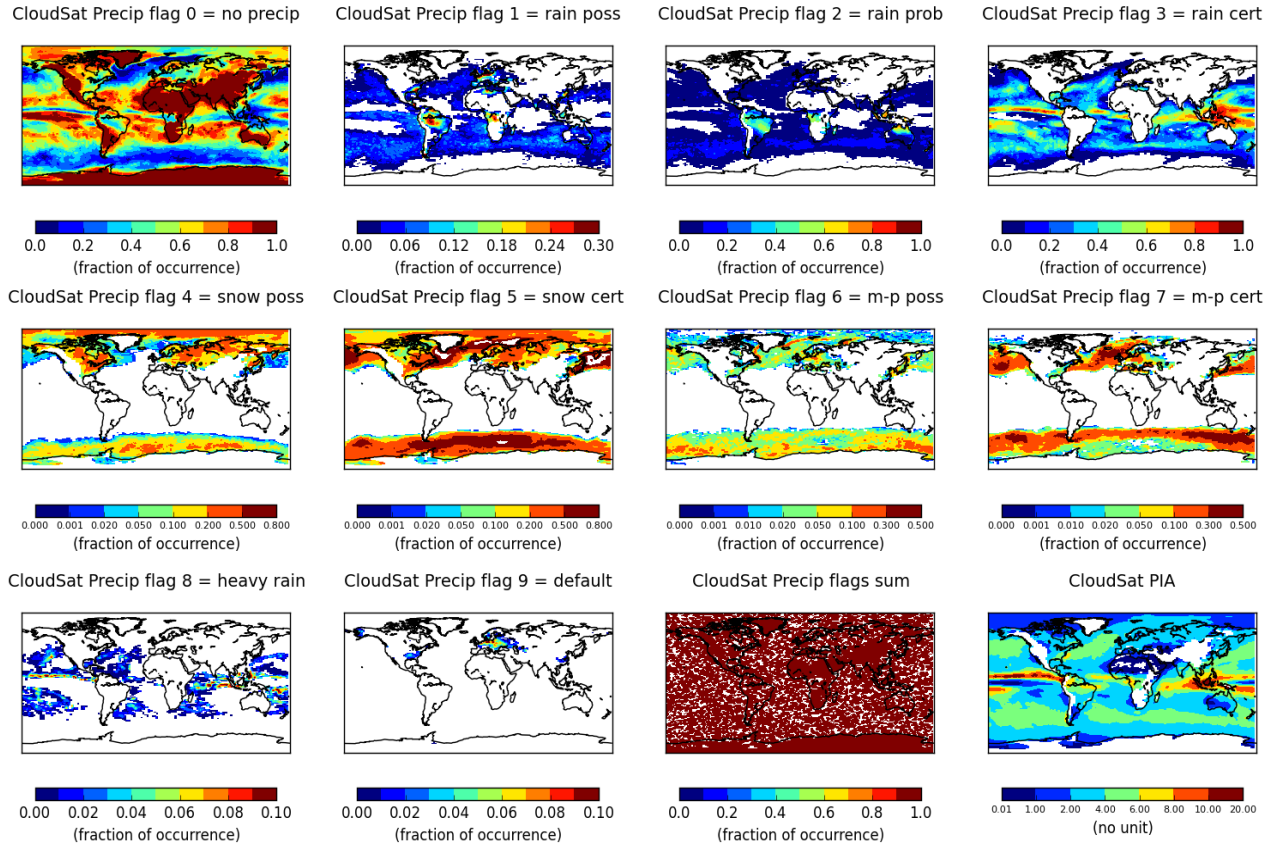

Figure 1 : CloudSat simulator COSPv2 precip diagnostics flags.

Figure 1 shows 1 year averaged maps of « my » debugged precip diagnostics. Compared to what we had before introducing the bug fix, these maps look much more realistic than the old ones. We performed a quick comparison with the rain and snow fall fields from the LMDZ model (Fig.2) to see if it looked reasonable enough to make our first runs.

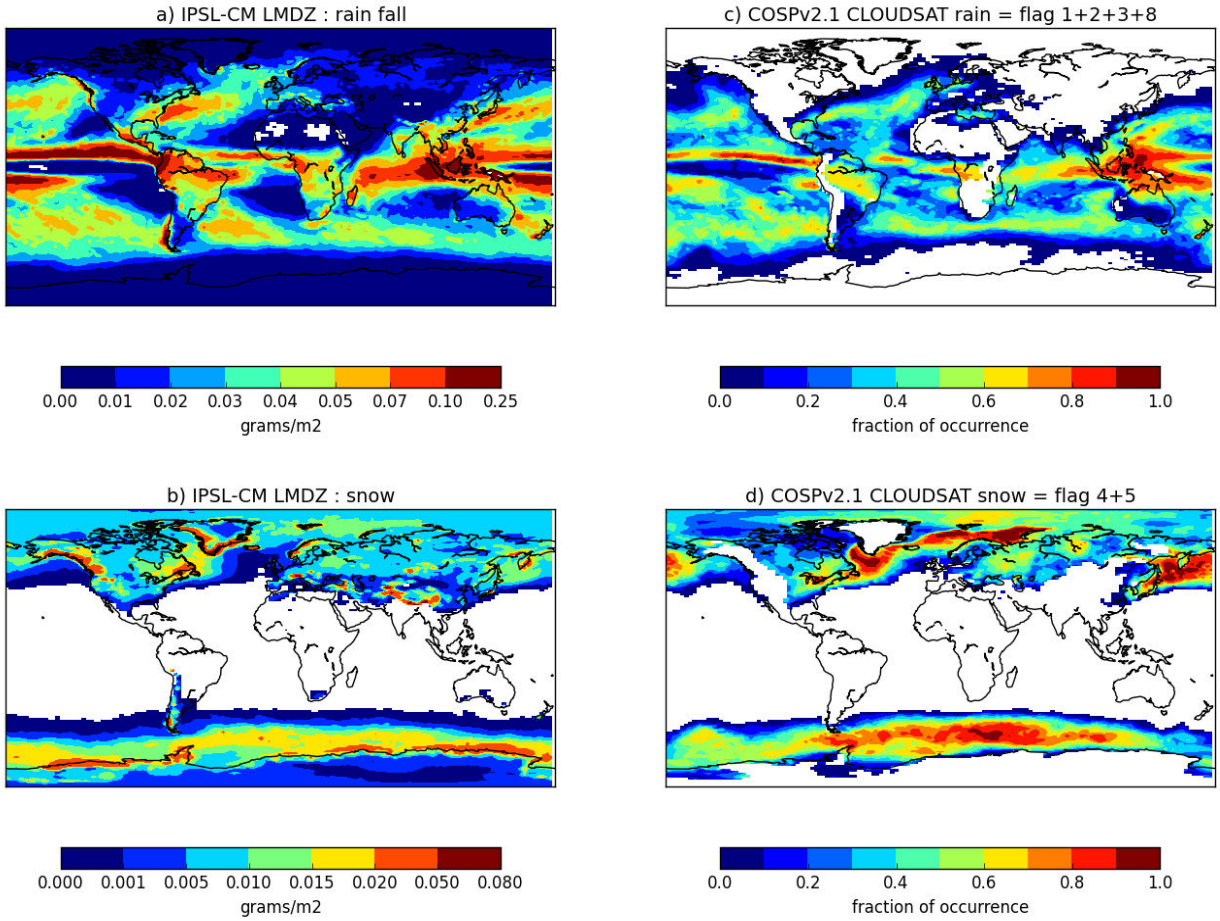

Figure 2 : Comparison of (right) COSPv2 precip diagnostics with (left) LMDZ native fields of (top) rain and (bottom) snow surface precipitations.

Considering that the units are not the same for the LMDZ fields and for COSPv2 precip diagnostics, Helene and I thought that the global patterns looked reasonable enough to give it a try and perform the fisrt runs with this bug fix on the CloudSat simulator precip diagnostics.

On the other hand, I was making sure the OPAQ diagnostics from the CALIPSO simulator were ok for the run too, and they all looked fine except for a few grid points on the « opaque cloud temperature » (Fig.3b) and the « z_opaque temperture » (Fig.3d) diagnostics. But because we don't use these diagnostics as much as the altitude ones (Fig.4) which looked perfectly fine, and because after reading my code again I did not see any problem in my algorithm, I did not dig any further in what appeared to me as a small bug that would be fixed in the future after having some feedback from users of these COSPv2 diagnostics.

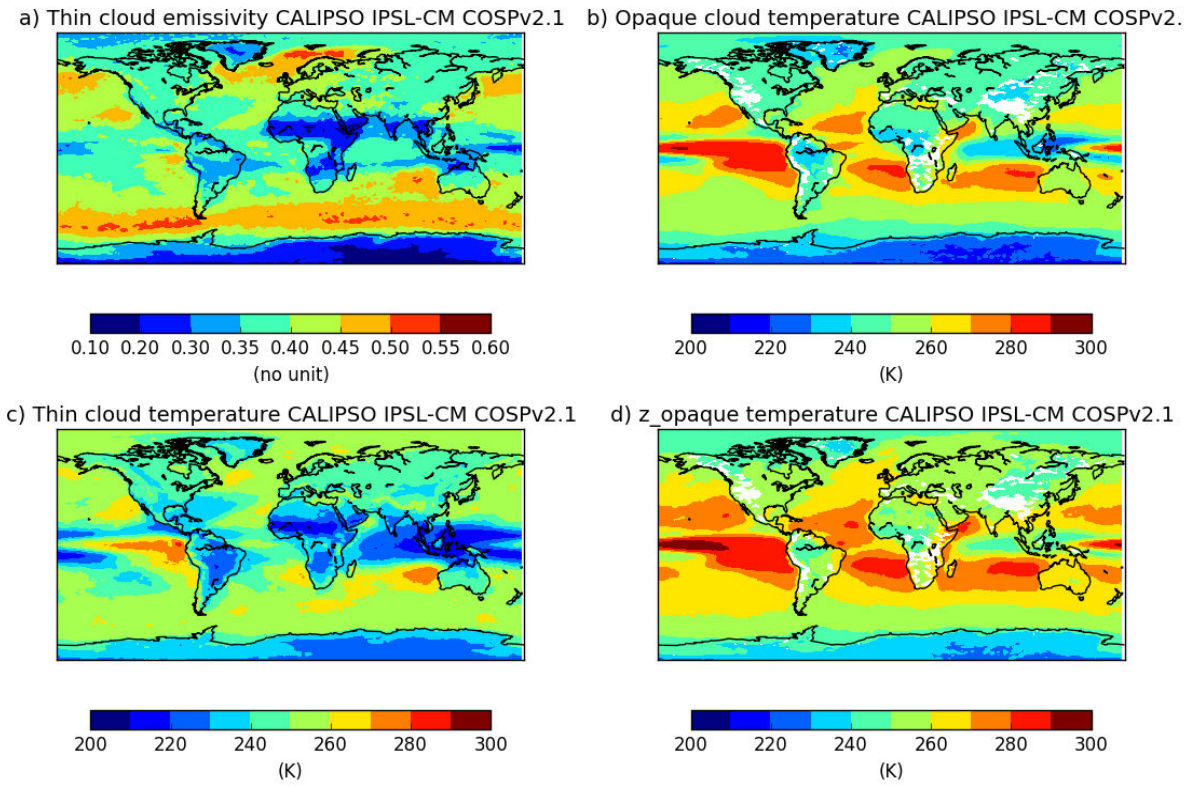

Figure 3 : (a) Thin cloud emissivity and (b) opaque cloud, (c) thin cloud and (d) z_opaque temperature COSPv2 OPAQ diagnostics.

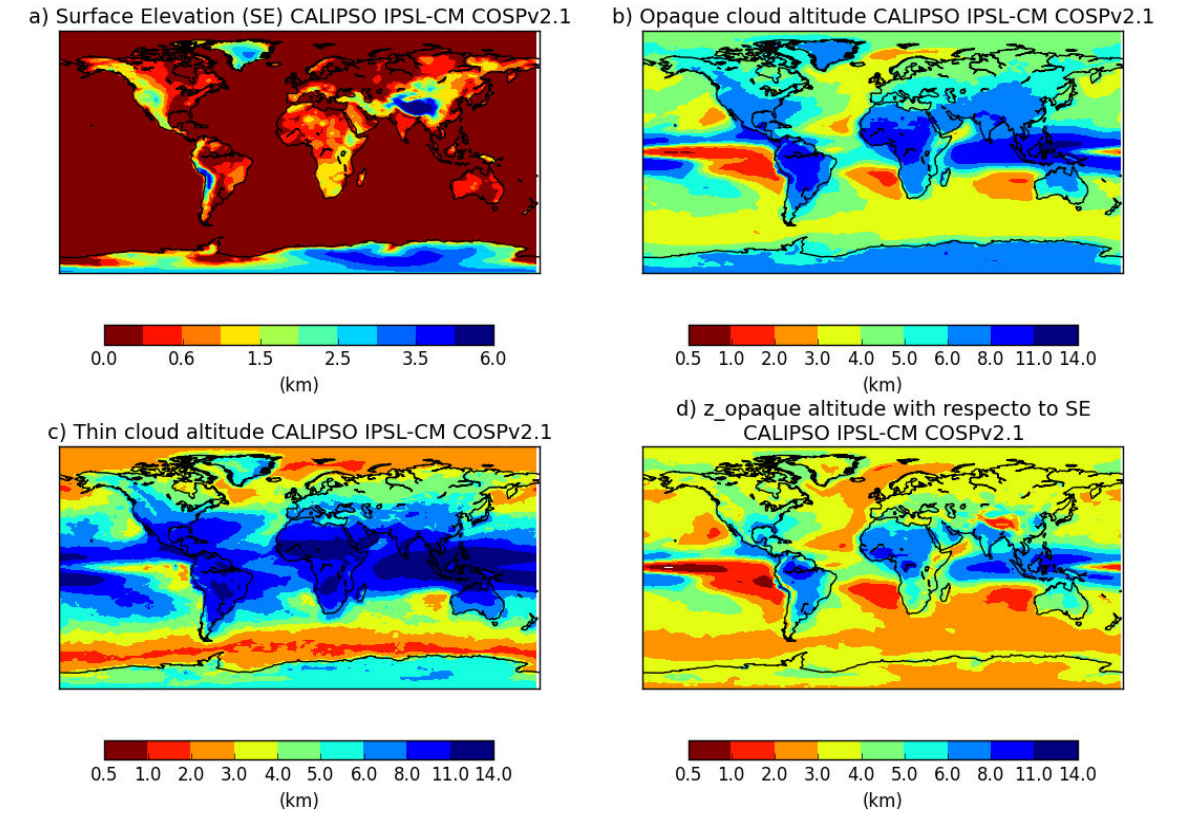

Figure 4 : (a) Surface Elevation from LMDZ, (b) opaque cloud and (c) thin cloud altitudes, and (d) z_opaque altitude with respect to Surface Elevation COSPv2 OPAQ diagnostics.

To summarize, now that I have some feedback from another model running COSPv2 with these diagnostics, these are my conclusions :

1) In Figure 1 and Figure 2 we can clearly see that there is a problem over Greenland because the figures shows that there is never any kind of precipitation over that land (precip_flag_0 = 1) with COSPv2 diagnostics, whereas it snows in the model. I did not notice this since my main concern was to have realistic patterns of rain at the low latitudes, mixed-precipitation in the mid-latitudes and snow at high latitudes and to have some precipitations over land. We can also see that problem over Antarctica and other high-altitude land points. So my bug fix did solve a first problem of not having at all precipitation over land but did not fix another bug which, apparently, has to do with high-altitude land points.

2) The small bug I have for the opaque (Fig.3b) and z_opaque (Fig.3d) temperature diagnostics might be related to that high-altitude land points issue. If we look at these two figures, the missing points (in white, corresponding to non-physical values) that appear are mainly found where high-altitude land points are. But, that condition is not enough in these diagnostics because we also need to be in a place where clouds are thick enough to be flagged as opaque clouds and, also, the attenuation of the lidar (z_opaque) has to be close to the Surface Elevation. That is why we don't have any wrong values in Antarctica (no opaque clouds), and only some in Greenland (few opaque clouds). Nevertheless, there are land regions in these two figures with wrong values which don't have particularly high-altitude surface elevations (some points in Europe for example). Lastly, Figure 5 shows two raw plots of these diagnostics for one month (February) plotted with Ferret where we can see the grid points having problems.

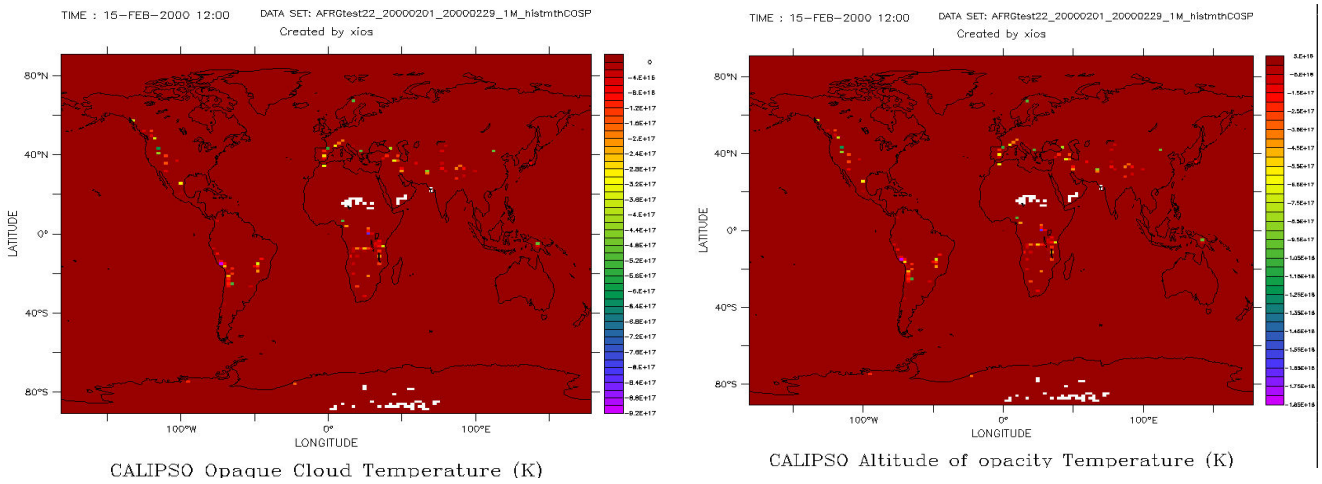

Figure 5 : Raw plots (no interpolation or masking) of (left) the opaque cloud and (right) the z_opaque temperatures COSPv2 OPAQ diagnostics.