Geophysical Research Abstracts,
Vol. 11, EGU2009-12471, 2009
EGU General Assembly 2009

Comparasion of Cloud Cover restituted by POLDER and MODIS

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PARASOL and AQUA are two sun-synchronous orbit satellites in the queue of A-Train satellites that observe our earth within a few minutes apart from each other. Aboard these two platforms, POLDER and MODIS provide coincident observations of the cloud cover with very different characteristics. These give us a good opportunity to study the clouds system and evaluate strengths and weaknesses of each dataset in order to provide an accurate representation of global cloud cover properties. This description is indeed of outermost importance to quantify and understand the effect of clouds on global radiation budget of the earth-atmosphere system and their influence on the climate changes.

We have developed a joint dataset containing both POLDER and MODIS level 2 cloud products collocated and reprojected on a common sinusoidal grid in order to make the data comparison feasible and veracious. Our foremost work focuses on the comparison of both spatial distribution and temporal variation of the global cloud cover. This simple yet critical cloud parameter need to be clearly understood to allow further comparison of the other cloud parameters.

From our study, we demonstrate that on average these two sensors both detect the clouds fairly well. They provide similar spatial distributions and temporal variations:both sensors see high values of cloud amount associated with deep convection in ITCZ, over Indonesia, and in west-central Pacific Ocean warm pool region; they also provide similar high cloud cover associated to mid-latitude storm tracks, to Indian monsoon or to the stratocumulus along the west coast of continents; on the other hand small cloud amounts that typically present over subtropical oceans and deserts in subsidence aeras are well identified by both POLDER and MODIS.

Each sensor has its advantages and inconveniences for the detection of a particular cloud types. With higher spatial resolution, MODIS can better detect the fractional clouds thus explaining as one part of a positive bias in any latitude and in any viewing angle with an order of 10% between the POLDER cloud amount and the so-called MODIS "combined" cloud amount. Nevertheless it is worthy to note that a negative bias of about 10% is obtained between the POLDER cloud amount and the MODIS "day-mean" cloud amount. Main differences between the two MODIS cloud amount values are known to be due to the filtering of remaining aerosols or cloud edges. due to both this high spatial resolution of MODIS and the fact that "combined" cloud amount filters cloud edges, we can also explain why appear the high positive bias regions over subtropical ocean in south hemisphere and over east Africa in summer.

Thanks to several channels in the thermal infrared spectral domain, MODIS detects probably much better the thin cirrus especially over land, thus causing a general negative bias for ice clouds. The multi-spectral capability of MODIS also allows for a better detection of low clouds over snow or ice, Hence the (POLDER-MODIS) cloud amount difference is often negative over Greenland, Antarctica, and over the continents at middle-high latitudes in spring and autumn associated to the snow coverage. The multi-spectral capability of MODIS also makes the discrimination possible between the biomass burning aerosols and the fractional clouds over the continents. Thus a positive bias appears in central Africa in summer and autumn associated to important biomass burning events. Over transition region between desert and non-desert, the presence of large negative bias (POLDER-MODIS) of cloud amount maybe partly due to MODIS pixel falsely labeled the desert as cloudy, where MODIS algorithm uses static desert mask. This is clearly highlighted in south of Sahara in spring and summer where we find a bias negative with an order of -0.1. What is more, thanks to its multi-angular capability, POLDER can discriminate the sun-glint region thus minimizing the dependence of cloud amount on view angle. It makes the detection of high clouds easier over a black surface thanks to its polarization character.