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Evaluation of cloud feedback sensitivity in LMDZ climate model using GLAS spatial lidar observations

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Clouds are a key parameter in the earth radiative budget because they strongly contribute to non-anthropogenic greenhouse and albedo effects. Their radiative impact is governed by their microphysical and macrophysical properties, hence it is essential to be able to estimate them using climate model. These models have progressed to simulate radiative fluxes at the Top Of the Atmosphere (TOA). But the response of these fluxes to climate change is still different for one model to each other, and is still the most important uncertainty for the estimation of climate change due to anthropogenic activities. We think that this uncertainty mainly comes from those two reasons: (i) only evaluate the TOA fluxes is not sufficient to correctly characterize the clouds properties as good reproduction of fluxes could be due to errors compensation; (ii) one should estimate how and why those fluxes are modified in case of climate changing, and how this changing could be evaluated using observations. Those two points will be focused using LMDZ climate model and observations from GLAS (Geoscience Laser Altimeter System) spatial lidar that allows the description of the complete atmospheric column at global scale. Simulations and measurements are compared for one given large-scale situation, in order to separate the comparison of this large-scale situation from the comparison of the cloud radiative properties. Comparison and simulations are compared on a statistical way. The first step of the comparison is the simulation of lidar signals from the model output, in order to do the first evaluation: simulated cloud occurrence, cloud altitude and thermodynamical phase… This study allows the characterization of the vertical distribution of clouds in the model.