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Evaluation of cloud heterogeneities effects on total and polarized visible radiances as measured by POLDER/PARASOL and consequences on the retrieved clouds properties.

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Clouds play a crucial role in the climate system. Several sensors are thus dedicated to their observations. Among them, POLDER/PARASOL measures total and polarized visible radiances up to 16 directions. As for other sensors, the POLDER cloud retrieval algorithm is based on the assumption that clouds are plan-parallel, homogeneous and infinite. However, POLDER presents the advantages of measuring total and polarized radiances at different viewing angles. To assess the cloud heterogeneities impact on POLDER radiances and thus on the different retrieved cloud parameters, we developed a tri-dimensional radiative transfer model, which allows to compute total and polarized radiances of 3D cloud. In this study, we investigate the 3D effects on the total and polarized radiances fields for different types of usual clouds (stratocumulus, cirrus cloud…). The input cloud properties are simulated with a model called 3Dcloud, which is based on a simplified dynamic/thermodynamic scheme to get cloud characteristic shape coupled with a Fourier stochastic approach to enforce cloud scale invariance.
Analyzes of total and polarized angular signature show that, depending on the viewing observations and types of clouds, cloud heterogeneities should not be neglected even from polarized radiances. From these radiances simulations, the POLDER algorithm is next applied to assess the errors on the cloud parameters.