Geophysical Research Abstracts
Vol. 13, EGU2011-14154, 2011
EGU General Assembly 2011

Polarized radiative transfer simulations in the cloudy atmosphere

Claudia Emde

Fakultät für Physik, Meteorologisches Institut, Ludwig-Maximilians-Universität, Theresienstrasse 37, 80333 Munich, Germany (claudia.emde@lmu.de)

The 3D Monte Carlo code MYSTIC has been extended to allow the computation of polarized radiances. MYSTIC which is run in the framework of the libRadtran radiative transfer package includes all relevant atmospheric components: Molecular scattering and absorption, aerosol, three-dimensional clouds, and inhomogeneous surfaces including topography. The model is used for the simulation of ground based or satellite observations. Of particular interest are the polarization features that can be observed for clouds and different aerosol types.

Radiation which is scattered in liquid water clouds becomes strongly polarized in the region of the cloud-bow. This feature is used to retrieve the cloud effective radius and the effective variance of the droplet size distribution from polarized reflectance measurements as performed for instance by the Research Scanning Polarimeter (RSP). RSP is the airborne simulator of ASP (Aerosol Polarimetry Sensor) on board the GLORY satellite. RSP measurements have been simulated using the MYSTIC model with artificial clouds from an LES model as input. These simulations provide synthetic data which may be used to validate the cloud retrieval algorithm for the RSP instrument, in particular with respect to 3D effects.

Cirrus clouds consist of ice crystals of various shapes. The polarization state of the radiation contains information about the shape of the interacting particles and can hence be used to reduce uncertainties in the retrieval of ice cloud optical properties. The impact of ice crystal shape on the polarization pattern has been investigated using the MYSTIC model.