Geophysical Research Abstracts, Vol. 8, 08011, 2006
SRef-ID: 1607-7962/gra/EGU06-A-08011

Influence of the dimensionality on three-dimensional solar radiative transfer effect

Sebastián Gimeno García (1), Victor Venema (2) and Thomas Trautmann (3)

(1) Institut fuer Meteorologie, Universitaet Leipzig, Germany, (2) Meteorologisches Institut, Universitaet Bonn, Germany, (3) Institut fuer Methodik der Fernerkundung, Deutsches Zentrum fuer Luft- und Raumfahrt (DLR), Germany. (gimeno@rz.uni-leipzig.de/Fax: +49(0)341 9732899)

Because of their optical and geometrical properties, clouds are the main modulator of the radiative fluxes in the Earth's atmosphere. As clouds have variability in all the spatial dimensions, three dimensional (3D) calculations would be needed for dealing with the exact radiative transfer (RT) in the atmosphere. However, due to its expensive computational cost, this is prohibitive for weather forecasting and climate models. One dimensional (1D) parameterizations of the RT are used instead. The independent colunm approximation (ICA) deals with the spatial variability of the cloud fields by performing 1D-calculations in every atmospheric colunms. So, ICA treats the 3D-variability of clouds but does not allow the horizontal photon transfer between the grid colunms. The three-dimensional radiative transfer effect (3D-effect) is defined as the difference between the full 3D-calculations and the ICA. In order to be able to estimate the 3D-effect, realistic clouds are needed. However, it is not possible to capture the full 3D cloud structure by means of remote sensing or in-situ measurements. One way to overcome this problem is to use some statistical properties from limited cloud measurements and use them as input of stochastical cloud generators to produce 3D-clouds (see submitted abstract V. Venema et al.). In this work we will study the 3D solar radiative effect in 2D- and 3D-generated clouds which share the power spectrum and the probability density function (PDF) with clouds obtained by ground-based measurements. In previous studies 3D-model clouds were compared to 2D-cross-cuts of these clouds. In this case the 2D-cross-cut will have a smaller variability. In our study the 2D- and the 3D-clouds have exactly the same distribution. We will focus our study on the influence of the dimensionality on the 3D-effect.