Séminaire 27 Mai 2011 11h / Seminar May 27th 2011 11h

Conférencier/Lecturer:	Heike Kalesse
Sujet/Subject:	Spatial heterogeneity and ice crystal shape - Effects on the remote sensing of ice cloud properties: Case study results
Présentation/Presentation:	Anglais / English
Lieu/Room:	Salle des vents (Dorval)

iweb: http://web-mrb.cmc.ec.gc.ca/mrb/rpn/SEM/
web: http://collaboration.cmc.ec.gc.ca/science/rpn/SEM/index.php

Abstract

One of the most challenging problems of current climate research programs is in understanding the impact of clouds on the global radiation energy budget. In that context, so-called cloud retrievals have been developed to infer macro- and microphysical cloud properties from satellite data. Cirrus are still the big unknown in cloud retrievals because they consist of non-spherical ice crystals. The various crystal habits that occur in cirrus add a degree of freedom to the retrievals. A-priori assumptions about the single-scattering properties of ensembles of ice crystals have to be made in operational cirrus retrievals. The influence of ice crystal habit and spatial inhomogeneities on the retrieval of ice cloud optical thickness and effective ice particle radius is investigated. For this purpose, airborne spectral solar radiation measurements as well as solar and thermal infrared radiative transfer simulations were conducted. Airborne spectral upwelling radiance data were obtained with the Spectral Modular Airborne Radiation measurement sysTem (SMART-Albedometer) within the frame of the CIRrus CLoud Experiment-2 (CIRCLE-2) in May 2007. Based on these radiance data a cloud retrieval algorithm was employed to derive cirrus optical thickness and particle effective radius from one-dimensional (1D) radiative transfer calculations. The influence of ice particle habit on retrieved properties was evaluated by variation of the ice particle single-scattering properties in the retrieval. The question of relative impact of ice cloud spatial heterogeneity and ice particle shape was addressed via three-dimensional (3D) and independent pixel approximation (IPA) radiative transfer calculations. This analysis is based on a model cloud generated from data collected during the National Aeronautics and Space Administration (NASA) Tropical Composition, Cloud, and Climate Coupling (TC4) experiment in summer 2007 in Costa Rica. For the presented case study, locally both - shape effects and 3D effects - were found to be of the same magnitude though on domain average, ice particle shape effects bias the retrievals more strongly than 3D effects.