Université de Lille

FACULTÉ DES SCIENCES ET TECHNOLOGIES

Labex CaPPA

International Master 2 Atmospheric Sciences: Research Training 2020-2021

Laboratory:LOA

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Eventually,

CaPPA Work Package:

3D simulations of RADAR/LIDAR signals in an atmospheric model. Sensitivity to microphysical parameterizations.

Recently, the Monte-Carlo radiative transfer code 3DMCPOL (Cornet et al., 2010) has been adapted to simulate the signals of active instruments: RADAR and LIDAR.
These two instruments are complementary and have been used for several years in different inversion codes in order to reproduce the microphysical/macrophysical properties of the observed clouds.
The inversion algorithm that will be considered during this internship is the DARDAR code (Delanoë and Hogan, 2010) which is used operationally on satellite measurements made by the CPR cloud radar (95GHz) on board the CloudSat satellite and the CALIOP Lidar (532nm) on board the CALIPSO satellite; both are part of the A-Train satellite constellation.
The course of this internship will be in 2 parts. First, more or less complex cloud simulations from a high spatial resolution atmospheric model (spatial resolution <200m) will be used in order to simulate, with the Monte-Carlo code MCRALI (Alkasem et al., 2017), what these 2 active instruments would measure (i.e. synthetic observations : Radar Reflectivity and Lidar backscatter coefficient). In a second step, sensitivity tests will be performed to determine the impact of different key microphysical parameters on the simulated observables (such as the hydrometeor size distribution or the mass-diameter law coefficients) as well as on the inverse cloud properties retrieved from DARDAR.

Key words: Numerical simulation, cloud microphysics, retrievals, RADAR, LIDAR