Introducing libmpdata++ and libcloudph++ - Reusable Software for Atmospheric Modelling

Sylwester Arabas
University of Warsaw
Poland

Two newly developed reusable software components applicable to atmospheric modelling will be introduced during the talk. The two projects named libmpdata++ and libcloudph++ are implemented as C++ libraries and are released as free and open-source software. Both are designed with maintainability, researchers productivity and result reproducibility as priorities.

The libmpdata++ is an implementation of a family of advective transport solvers based on the Multidimensional Positive Definite Advection Transport Algorithm (MPDATA). It covers the basic second-order-accurate formulation of MPDATA, its third-order variant, the infinite-gauge option for variable-sign fields, and a flux-corrected transport extension to guarantee non-oscillatory solutions. In the current release, the solvers offer integration in up to three spatial dimensions and parallelisation through domain decomposition using shared memory.

The second library - libcloudph++ - is a collection of algorithms for representing cloud microphysics in numerical models. It is intended for models of different dimensionality and complexity, ranging from simple zero-dimensional parcel frameworks to complex cloud-resolving (e.g. large-eddy) simulations. In the current release, the library covers three warm-rain schemes: a single-moment bulk scheme, a double-moment scheme and a particle-based scheme featuring the "Super Droplet" Monte-Carlo coalescence algorithm. The particle-based scheme is implemented for execution on both CPU[s] and GPU.

Simulations of aerosol-cloud interactions performed using a model based on libmpdata++ and libcloudph++ will be presented.

This seminar will be recorded and available via webcast at:
http://www.fin.ucar.edu/it/mms/fl-live.htm

Thursday, 4 September 2014, 3:30 PM
Refreshments 3:15 PM
NCAR-Foothills Laboratory
3450 Mitchell Lane
Bldg 2 Main Auditorium, Room 1022