

Cindy-Dynamo

Model activity for the French group

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Here is a summary of the various model approaches currently done or scheduled to exploit and interpret the Cindy-dynamo measurements. Various outputs of these simulations will be available from the CDFrand EOL web sites (on the site or links toward the relevant web sites).

Arpege and Aladin Analyses and forecasts

Meteorological analyses and forecasts are available from 2011-10-01 to 2012-03-31 with two models Arpege and Aladin Reunion. Arpege is a global operational model, T798C2.4L70 (~35 km in the Indian Ocean) with 4D-Var assimilation. Aladin-Reunion is a limited area operational model over the South-West Indian Ocean, 8kmL70, with 3D-Var assimilation and lateral boundary conditions coming from from Arpege.

Mesoscale Models

Mesoscale simulations will be exploited in particular to test the representation of the cloud microphysics, the simulation of the microwaves radiances and of the electrical activity. They will be also exploited to better understand the process in the CD array, in particular in the process of testing the convective parameterization with the Single Column Model (SCM).

A MesoNH simulation was done by LACy for the period 2011-11-20 to 2011-12-11 and for a domain (4.6°N– 9.7°S; 68.2°E – 89.7°E) of the Indian Ocean with 8kmL70 resolution. Initial and boundary conditions are given by ECMWF analyses. The aim is to study in detail the active MJO event of the end of November over the CD region. Based on this simulation, several shorter nudged simulations at higher resolution (2km) will be done for selected periods and regions.

A model-to-satellite approach, based on the RTTOV radiative transfer model, is being developed for microwave satellite radiances using the Aladin-Reunion and Meso-NH models during the Dynamo period. Simulated radiances will be compared to the ones observed by satellite, including Megha-Tropiques Madras when available, and sensitivity experiments will be conducted. The relationship between model and variables and the simulated radiances will be analyzed using the Jacobian matrix of RTTOV. The main purpose of this work is to develop the assimilation of microwave radiances in tropical cloud/rainy areas in meso-scale numerical models.

Ocean and Atmosphere General Circulation Models

A regional simulation of the entire Indian Ocean was done using 1/4° Ocean-GCM forced with ERA-I. The simulation covers the 1990 to June 2012 period, and most outputs are available as 5-day averages. A detailed analysis of the CINDY-DYNAMO experiment period will be undertaken before the Cindy-Dynamo workshop. If the atmospheric forcing proves insufficient to reproduce accurately the

MJO and tropical cyclones response during the experiment (we have in particular doubts about the quality of the shortwave forcing), another experiment with improved surface forcing may later be run.

Multiple runs of the WRF model are done for the DYNAMO season with different initial conditions to measure relative contribution of internal vs boundary forced variability.

Hindcasts simulations with different configurations of the LMD-Z AGCM will be done for the three intraseasonal events of 2011. The aim is in particular to test the representation of these events with different physical parameterizations (boundary layer and convective) and with different horizontal and vertical resolutions. Some tests will be done with different water isotope tracers.

Single Column Model (SCM)

Tests of various versions of the physical parameterizations are currently done with the 1D version of the LMD-Z AGCM for TOGA-COARE and TWP cases. These tests will be extended with different cases of the CD campaign.

Idealized Models

A simple primitive equation global model is forced with empirically defined forcing that allows realistic annual cycle. The aim is to nudge the tropics to various filtered forms of NCEP2 data and to look at effect on simulated extratropical interannual variability.