AMMA

Forecasts of Small Pressurized Balloon trajectories
Computed at LMD

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Forecasts of Small Pressurized Balloon (SPB) trajectories are computed by means of the ten-day deterministic forecasts (240h) produced twice a day (at 0h UT and 12h UT) by the ECMWF. So, SPB trajectories are numerically computed twice a day and are available on the web site around 8h30 and 20h30 UT.

For each available ECMWF forecast, 15 sets of balloons are numerically launched, every 6 hours, at launching times from D+12h to D+96h (D+4 days). With these deterministic forecasts, each set consists in 50 aerostats distributed on a 50 km radius circle around Cotonou in Benin (longitude 2.3850 E ; latitude 6.3539 N).

Three density levels have been selected on which 15x50 balloons are advected. These densities are :

- density d= 1.00 Kg/m^3, around 840 hPa, 1700 m

- density d= 1.03 Kg/m^3, around 870 hPa, 1400 m

- density d= 1.06 Kg/m^3, around 900 hPa, 1000 m

On maps, SPBs positions are shown each 24 hours by means of different colors (positions at 0h UT and 12h UT functions of the hour of meteorological forecast).

Description of numerical model.

ECMWF data (operational forecasting model ; spectral, troncation T511, 91 levels).

- Zonal wind et méridian wind obtained on 26 hybrid levels N° 64 à 89 of ECMWF model.

- Temperature on 26 hybrid levels N° 64 à 89 of ECMWF model.

- Surface Pressure (allows to obtain the pressure in model level).

- For a surface pressure equal to 1013.25 hPa, model levels are pressures equal to : 497,9584 ; 526,4620 ; 555,3989 ; 584,4855 ; 613,4989 ; 642,2899 ; 670,7310 ; 698,7032 ; 726,0656 ; 752,6718 ; 778,4036 ; 803,1575 ; 826,8141 ; 849,2512 ; 870,3798 ; 890,1340 ; 908,4403 ; 925,2226 ; 940,4416 ; 954,0914; 966,1707; 976,6735; 985,6311; 993,3027; 999,8373; 1005,1222 hPa

- Horizontal regular grid 0.5°x0.5°.

- Computational domain 30°O – 30°E, 10°S – 30°N (121x81 points).

- Temporal sampling of 3 hours from 0h to 72h and each 6 hours until 240h.

Model for advection

- Time interpolations with a knot-a-knot cubic spline interpolation on three values on each side of the time of interest.

- Horizontal interpolations with a knot-a-knot cubic spline interpolation on four points on each side of the point of interest in each direction.

- Vertical interpolation to the desired density level is done by means of a knot-aknot cubic spline interpolation in the density logarithm on all 26 hybrid levels.

- Temporal advection using a second order Runge-Kutta scheme with a 30mn time step.

- As the lowest hybrid level follows the topography, a crash of a SPB can be detected.