Modelling within AMMA-SCOUT

Emiliano Orlandi, Federico Fierli

with input from:

C. Mari, V.Marecal, E.Riviere, M. Russo

Modelling within AMMA/SCOUT

- July August 2006 part of the SOP-B was dedicated to UT-LS studies
- 7 High altitude aircraft flights from Ouagadougou, Burkina Faso
- Large number of stratospheric balloon from Niamey, Niger
- Synergy with F-F20 and DLR F20 measurements
- 4 models are currently exploited in the data analysis

Models involved

- BOLAM-MOLOCH, ISAC-CNR (Buzzi et al., Fierli et al.) Tracers and chemistry (under implementation)
- B-RAMS, LPCE-Orleans,U. Reims, (Marecal et al.) (Tracers can be implmented)
- MESO-NH, LA-CNRS, (Mari et al.) (tracers and chemistry)
- UK Met Office Ported Unified Model (PUM), U.Cambridge (Russo et al.) (Tracers)

Models involved

- BOLAM-MOLOCH, ISAC-CNR (Buzzi et al., Fierli et al.)
- B-RAMS, LPCE-Orleans,U. Reims, (Marecal et al.)
- MESO-NH, LA-CNRS, (Mari et al.)
- UK Met Office Ported Unified Model (PUM), U.Cambridge (Russo et al.)

Mesoscale modelling

- Simulate single MCS in Africa is a difficult task
  - Lesson learnt from 2005 Dry run experiment and 2006 campaign
  - Uncertainty can derive from dynamics (AEJ and AEW), fluxes at the ground, water vapour horizontal fluxes, local convective triggering
  - MCSs can be poorly related to large scale circulation
  - We can state that large role is played by uncertainty of ECMWF analysis

Case studies from 2006

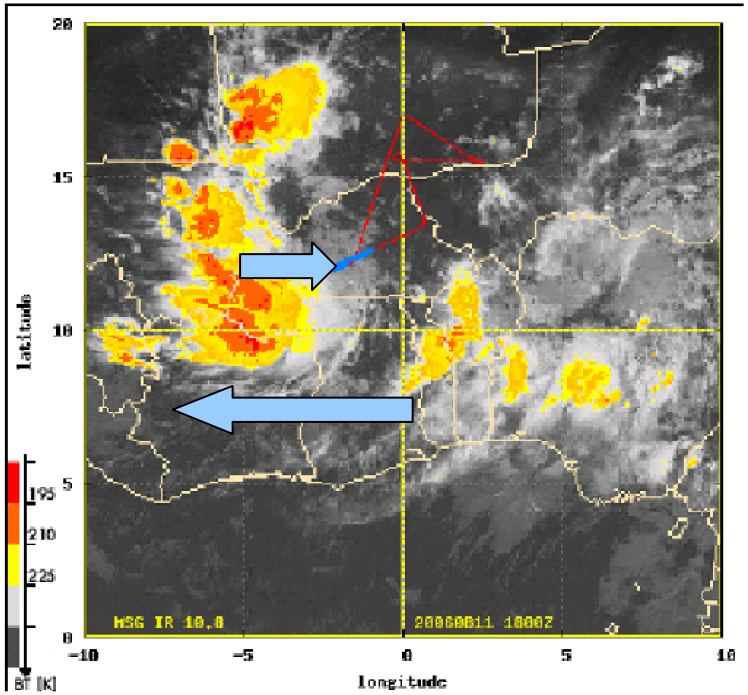
4 case studies identified

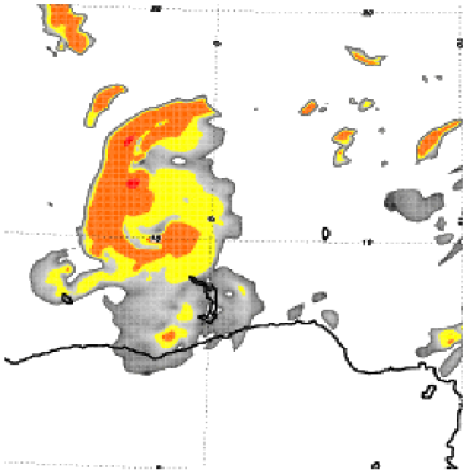
- 7 Aug: Deep convection over Niger and Northern Mali, use of data from M55, Ballons, D-F20 (BOLAM, BRAMS)
- 11 Aug: Convective outflow in Burkina and West Nigeria with potential overshooting data from M55, D-F20, F-F20 (BOLAM)
- 15 Aug.: Deep convection over Niger (MESO-NH), F-F20
- 23 August: Deep convection and potential overshooting ,Balloon data over Niger (BRAMS) Ballons

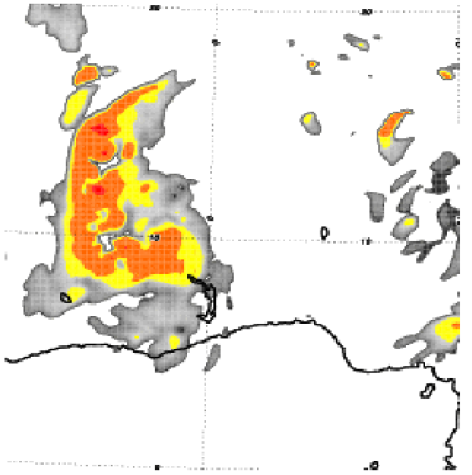
BOLAM & MOLOCH model

- BOLAM Hydrostatic meteo model
  - Convection is both explicit and parametrized (Kain Fritsch, 2002)
- Simulation starts on Aug. 9, 0 UTC, DX=12 km
- Initialized with ECMWF analysis
- Brightness temperature retrieved with RT-TOV algorithm (Saunders, 1998)
- Tracer is kept constant at 10 units at z=0 above land

AMMA: 11 Aug. 2006
Meteosat & BOLAM outlook

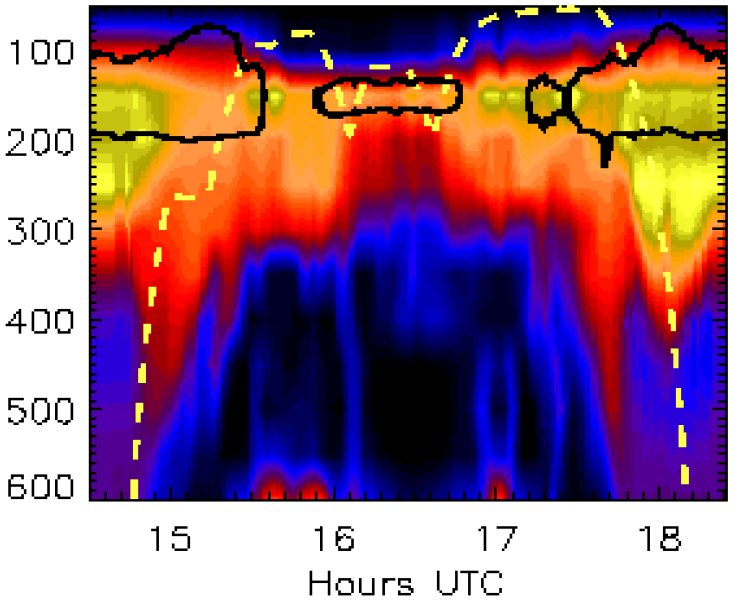


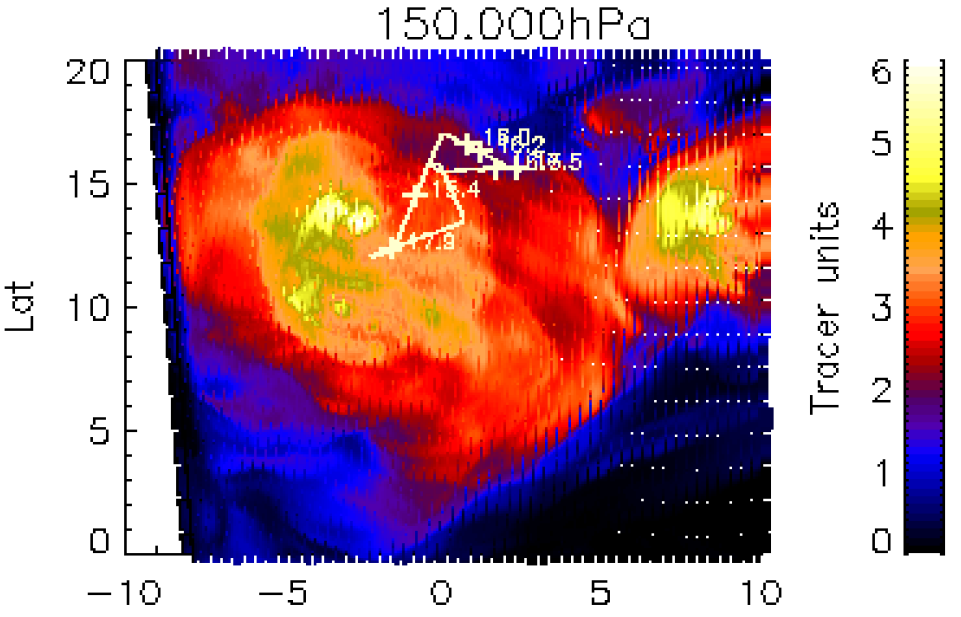


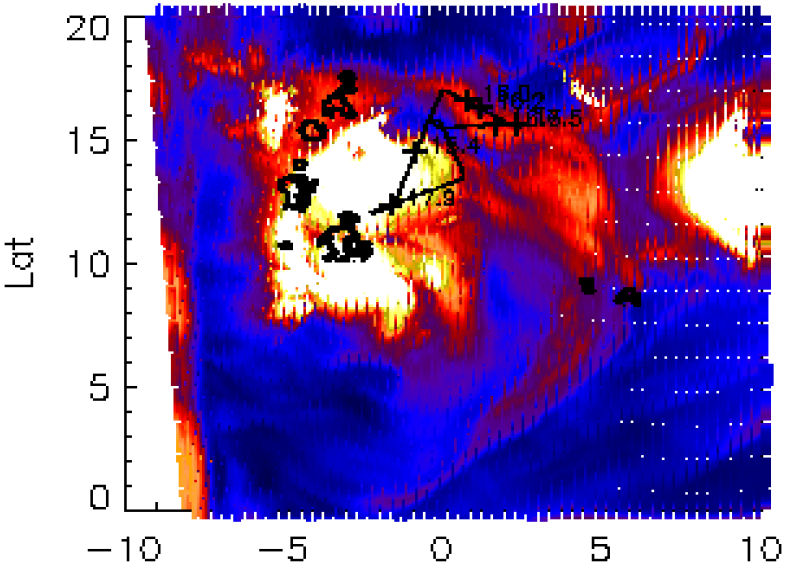


- Meteosat and BOLAM model
- 10.8 um brightness temperatures 11 Aug. 18 UTC

BOLAM model: Tracer







What is the impact of MCS on the 3D redistributions of chemical species ?

Meso-NH Squall line 15 August 2004

Three models run, nesting

Horizontal mesh size 40x40 km2 -> 10x10 km2 -> 2.5x2.5 km2

Vertical grid: 66 levels / Model top 27 km

Vertical mesh size: First level 60 m /sol / Near model top 600 m

MesoNH versions: Masdev 4.7

Initialization and coupling: ECMWF

Tracers:

LiNOx: simplified approach based on the relative position of ice reservoirs + 10 fl/min

VOC tracers [VEG x LAI] with different lifetimes (permanent, τ=1h, τ=1day, τ=1week)

Solubles species

Harmattan tracer (900-500hPa)

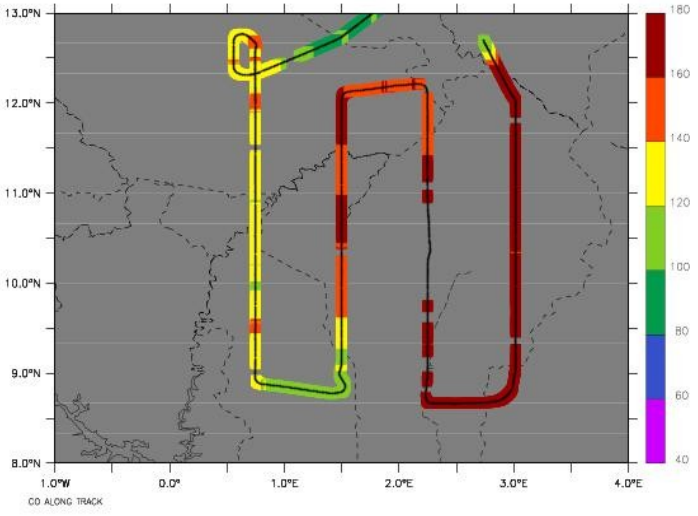
Dust forecast [Grini et al., 2006]

Synthetic satellite images [Chaboureau et al., 2005]

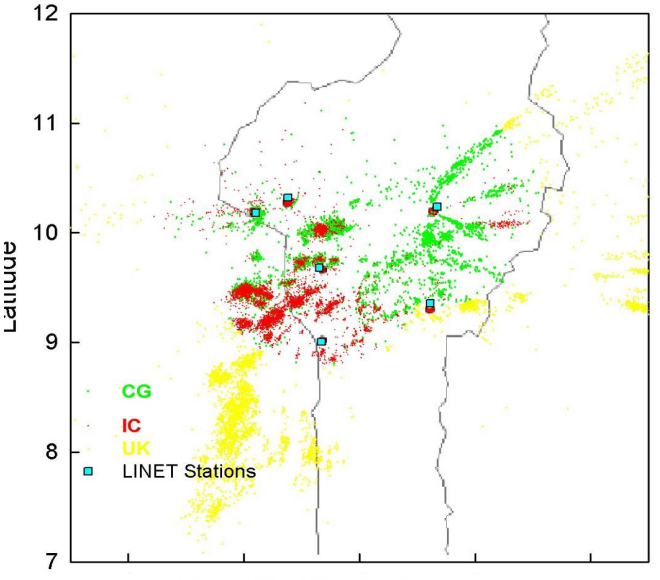
MESO-NH Future plans: simulations of IOP August 15th (CRM + trajectories)

In-situ + dropsondes from F-F20, D-F20 and Bae146 over northern Benin.
LiNET network + RONSARD radar

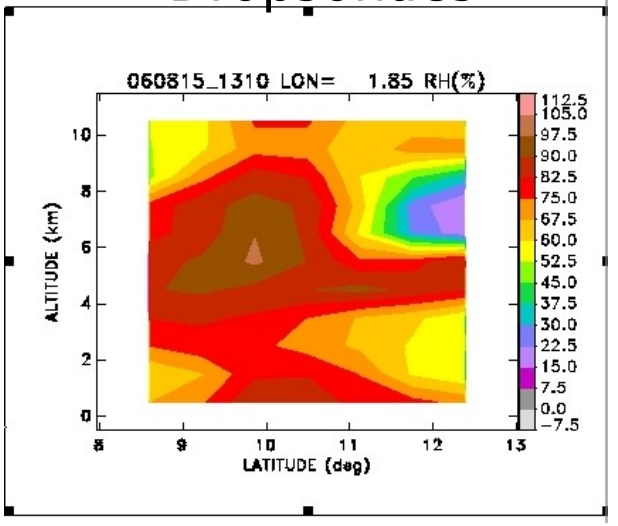
F-F20 CO



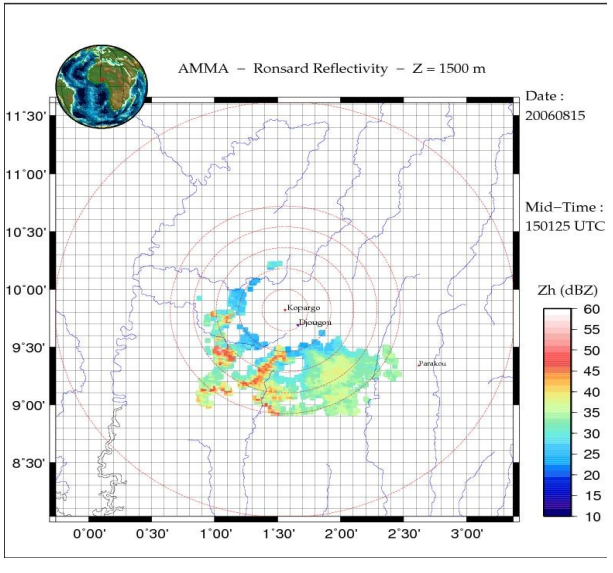
LINET - 15 Aug 06 - AMMA

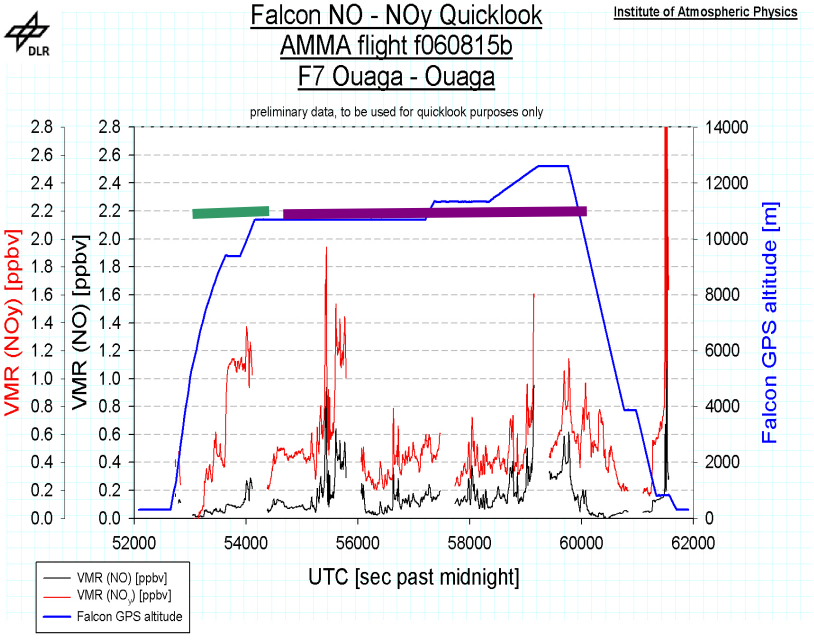


Dropsondes

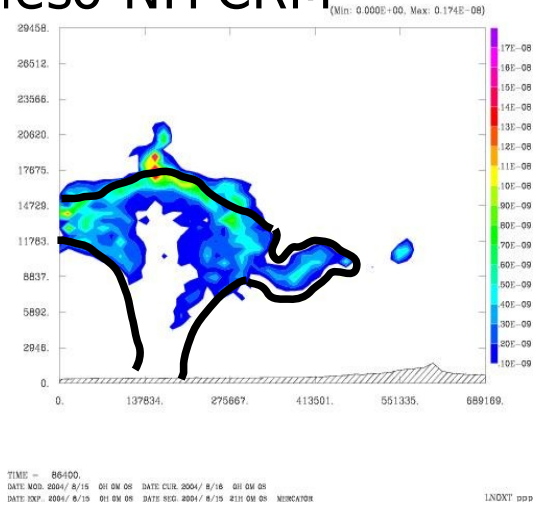


RONSARD radar





Meso-NH CRM



Additional simulations

1./ 2D CRMs to reproduce overshooting and latitudinal distribution

→Benchmark to test convective turrets hypothesis

→Link to 1D GCMs

2./ Lagrangian Chemistry CittyCat & CLAMS

3./ 2006 monsoon season regional simulations (3000 km domain)

--> Estimate cumulate convective impact

--> Tracer transport

Interactions with WP 4.1.3

Perform common tracer experiments

WP 413 --> WP 244

- Provide boundary conditions and tracer definition
- Provide GCM model outputs for comparison

WP 244 --> WP 413

- Tracer simulations to estimate convective impact and main pathways of transport in the UT-LS
- Analysis of dynamics and transport with aircraft data

Interactions with WP 2.1

Identify common events !

WP 21 --> WP 24

- Evaluation and exchange of model outputs
- Support in the validation with thermodynamical and radar data

WP 24 --> WP 21

- Estimates of convective transport
- Analysis of dynamics and transport with aircraft data