

INTRODUCTION TO THE FORECAST METHOD DURING THE AMMA SOP

**HAMA Hamidou
CVM – ASECNA Niamey, NIGER**

What is Important for Convection Initiation, Organisation & Propagation over West Africa?

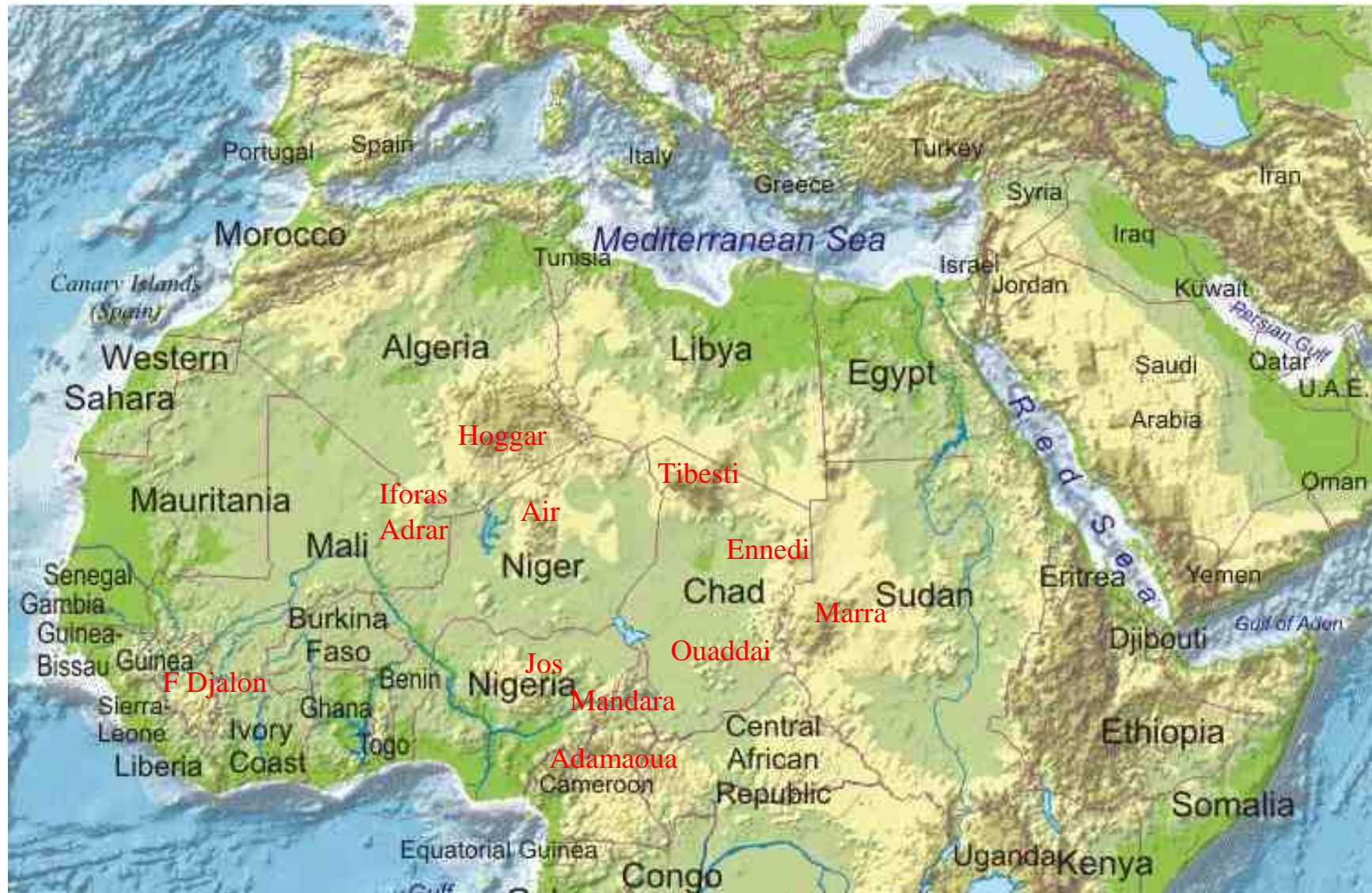
A. Geographical Features

B. Dynamic Features

C. Thermodynamic Parameters

D. Other Parameters/Products

A. Geographical Features



B. Dynamic Features

ITD & ITCZ

Pressure systems : Position and intensity

- Heat low;
- St. Helena high;
- Lybian high
- Other secondary highs and lows

Easterly waves

AEJ & TEJ

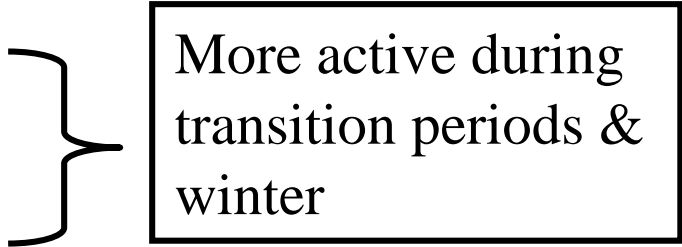
Mid-level dry air intrusion

STJ & PJ

Associated Troughs



Storm Organisation
& Propagation



More active during
transition periods &
winter

B. Dynamic Features

Monsoon Flux

What do we look for?

- a. The monsoon depth and strength:
 - 925 hPa for isolated convection : Sahel;
 - 850 hPa for organised convection;
- b. Vortices, asymptote of convergence, troughs;
- c. Anticyclones, ridges, asymptote of divergence;

C. Thermodynamic Parameters

CAPE & CIN

Temperature (Diurnal, SST)

Instability indices

- Cross Total Index (CTI);
- Total Total Index (TTI);
- Vertical Total Index (VTI);
- K Index (KI);
- Lifted Index (LI);
- Convective Temperature (CT); etc.

D. Other Parameters/Products

Total Precipitable Water (From Radiosonde Data)

Precipitable Water

RH (Mainly at Mid-level)

Vertical Velocity



Vertical X-section
and/or Hovmoller
very important

Divergence field

Gust front (from satellite images) important for Nowcasting

RDT for thunderstorm history and phase: Nowcasting

RR Forecast by NWP Centres: Well-organised MCS

The Data

1. Routine Weather Forecasting in the National Weather Forecast Centres

- Synop Messages (Main & Intermediate Synoptic Hours):
Pressure Systems
- Temp Messages (0000Z & 1200Z): Jets, Dry air Intrusion,
Waves
- Pilot Messages (Main Synoptic Hours): Monsoon Analysis,
Waves
- T- Φ grams (0000Z & 1200Z): CAPE, CIN, Instability Analysis,
Moisture Profile, Cloud Base and Top etc.
- Satellite Images
- Eventually Global Model Outputs (0000Z & 1200Z)

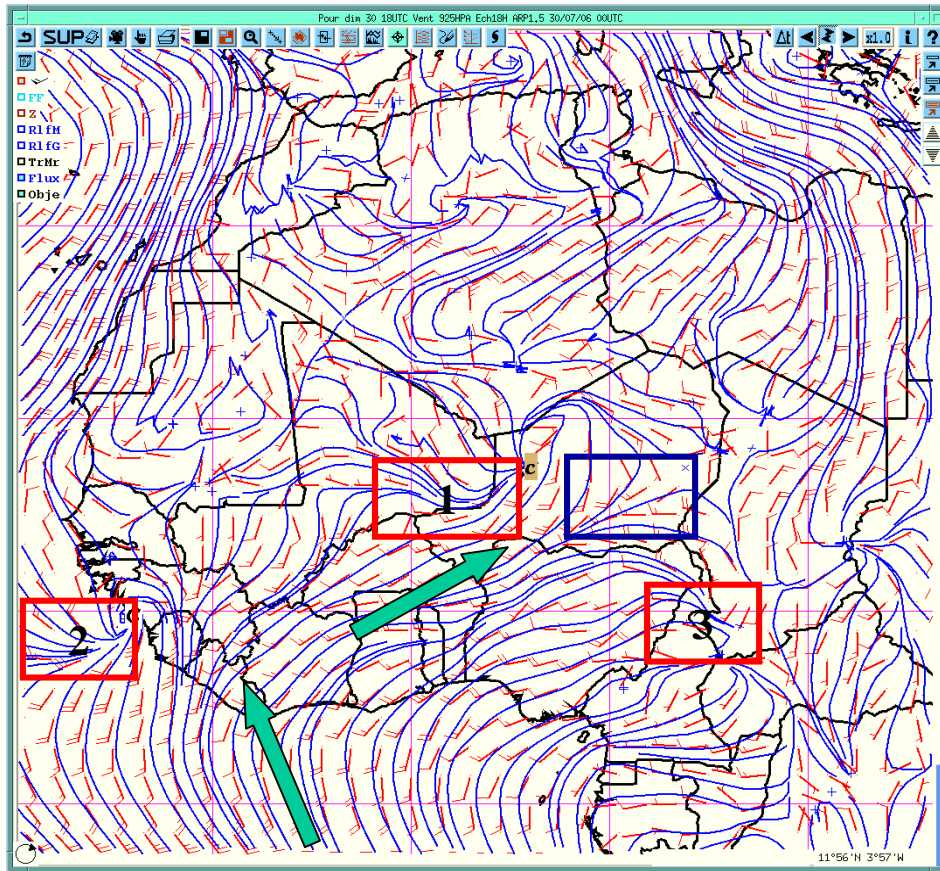
The Data

2. During the AMMA SOP Forecasting Exercise

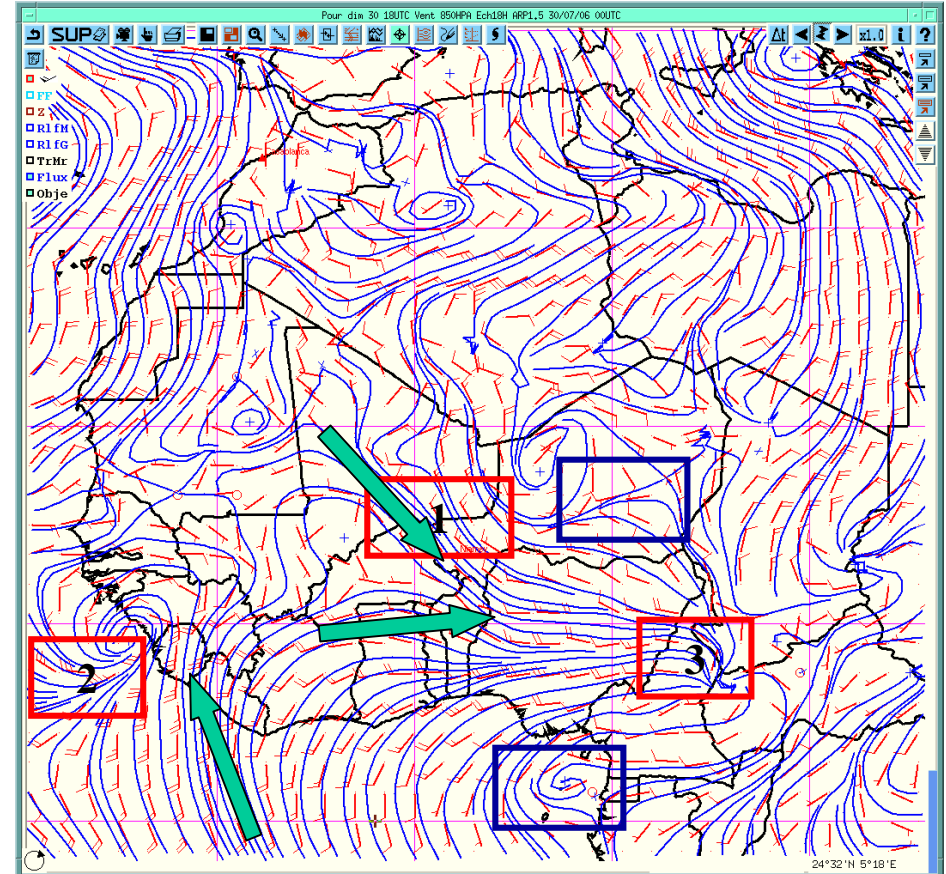
- Global Models: Arpege, Arpege Trop, ECMWF, UK, NCEP
- Limited Area Models: Aladin NORAF, Aladin MF, UK Africa-LAM, ETA/NCEP
- T- Φ grams
- Satellite Images
- AOC Web Site
- Synop (plotted charts)

All Integrated on Synergie which allows for Vertical X-sections, Thresholding, Superposition, Animation, Simultaneous Display, etc.

MONSOON FLUX AND ASSOCIATED CONVERGENCE/DIVERGENCE



WIND FLUX AT 925HPA
30-07-2006 1800Z



WIND FLUX AT 850HPA
30-07-2006 1800Z

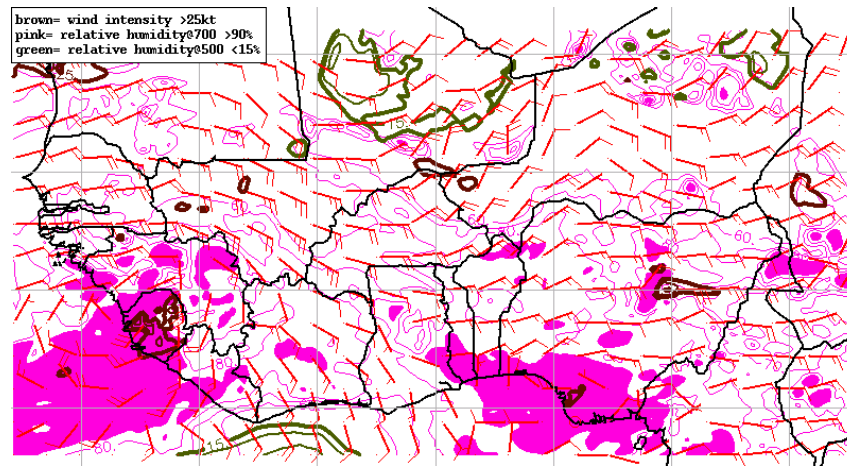
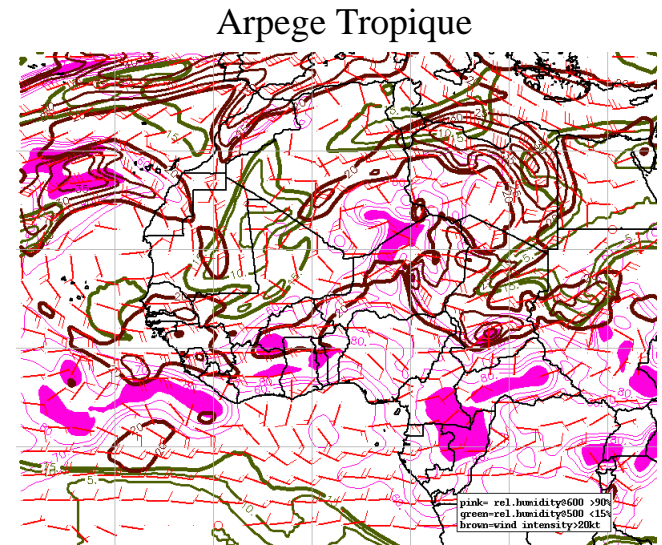
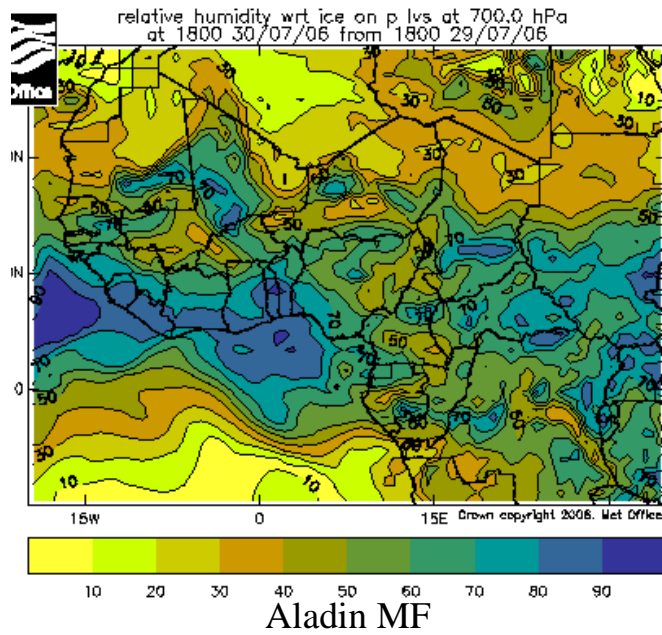
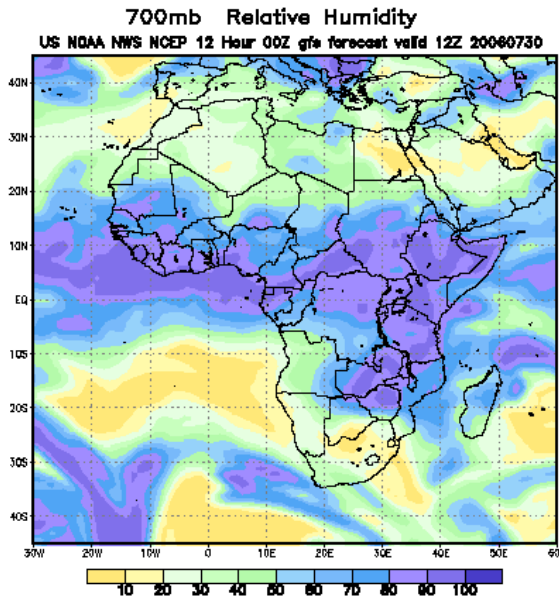


Convergence Zone



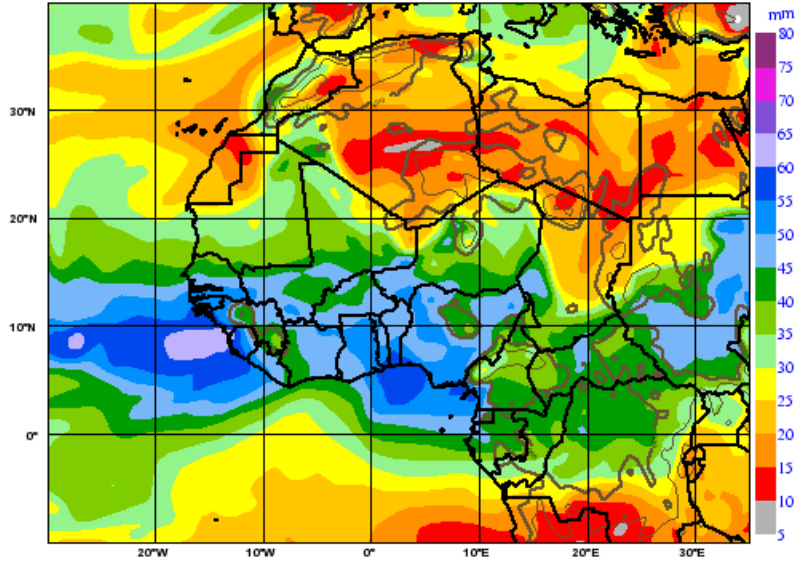
Divergence Zone

Relative Humidity

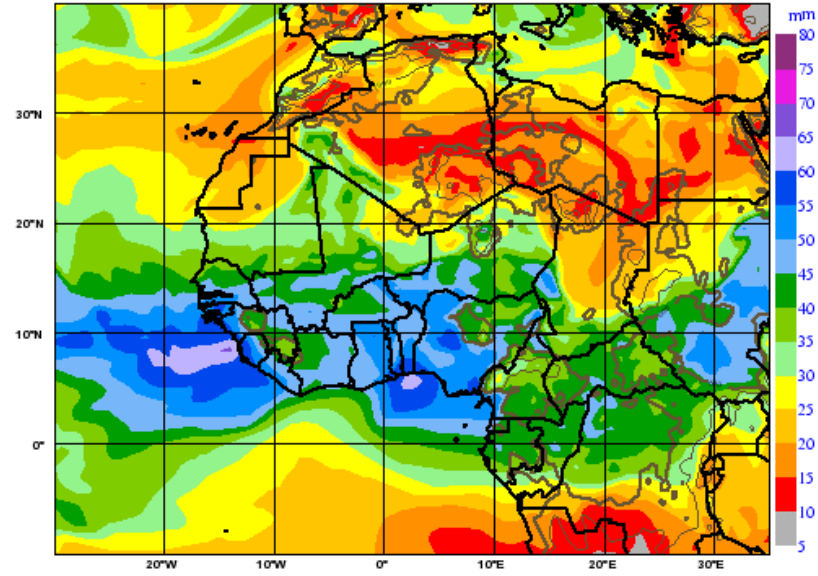


Precipitable Water

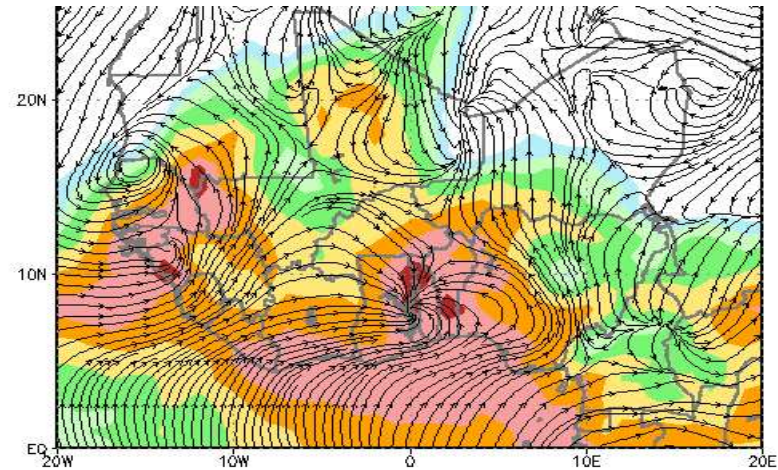
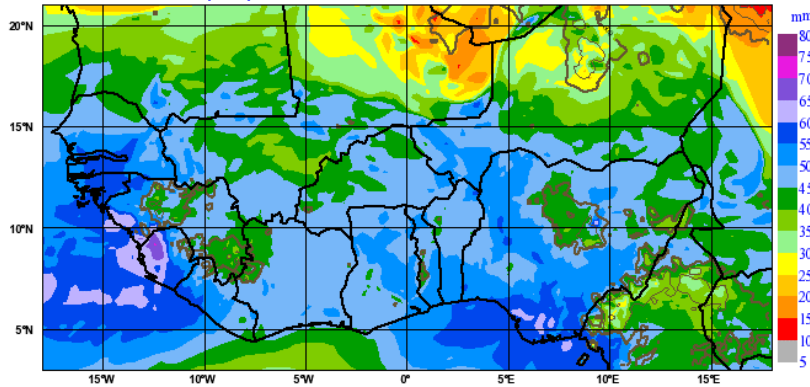
ArpTrop05 : precipitable water, from 20060730 00 UTC, Forecast t + 18 h



Arp05 : precipitable water, from 20060730 00 UTC, Forecast t + 18 h



Aladin01: precipitable water, from 20060730 00 UTC, Forecast t + 18 h

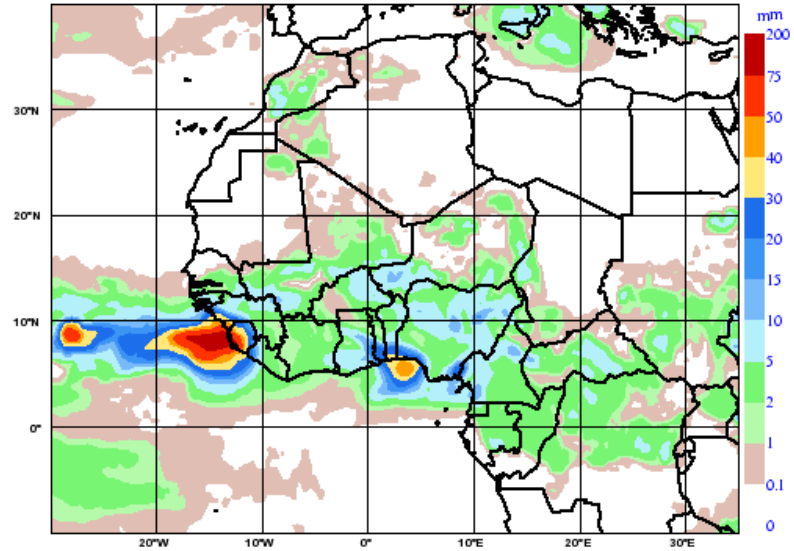


HAMA Hamidou

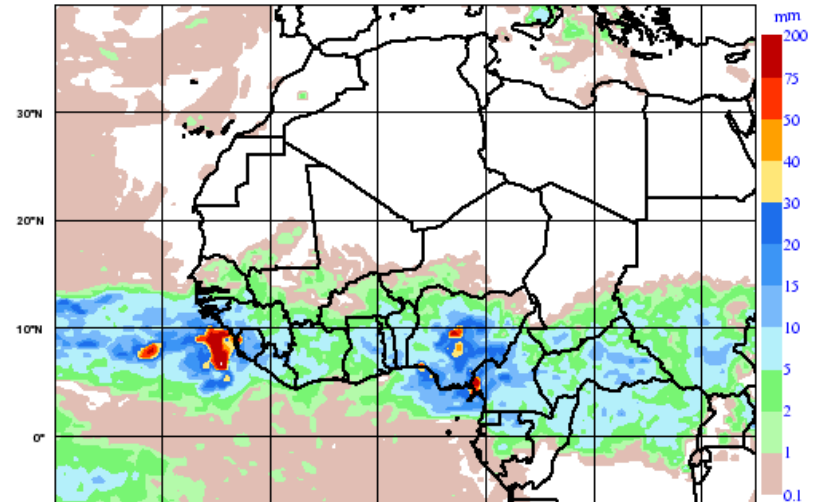


24 Hours RR Forecast

ArpTrop05: cumul précip 24h, réseau du 20060730 00 UTC - échéance 6 à 30 h

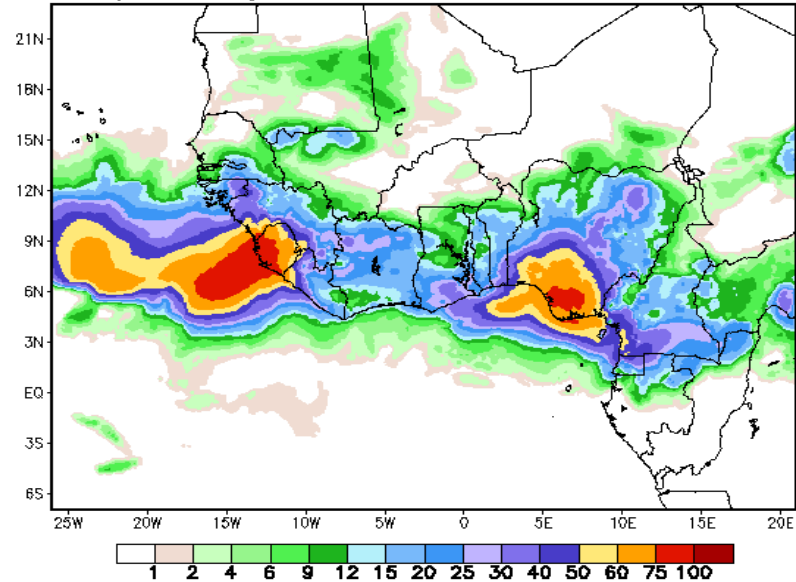
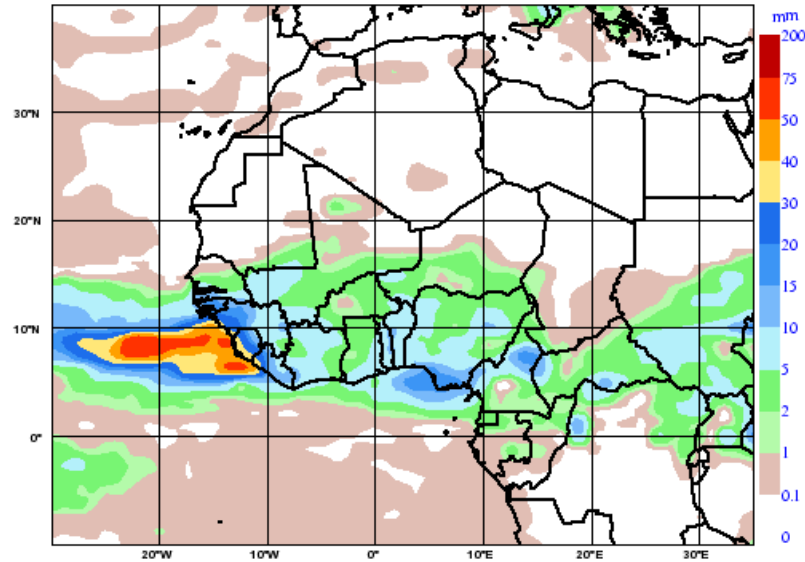


CEP05: cumul précip 24h, réseau du 20060730 00 UTC - échéance 6 à 30 h

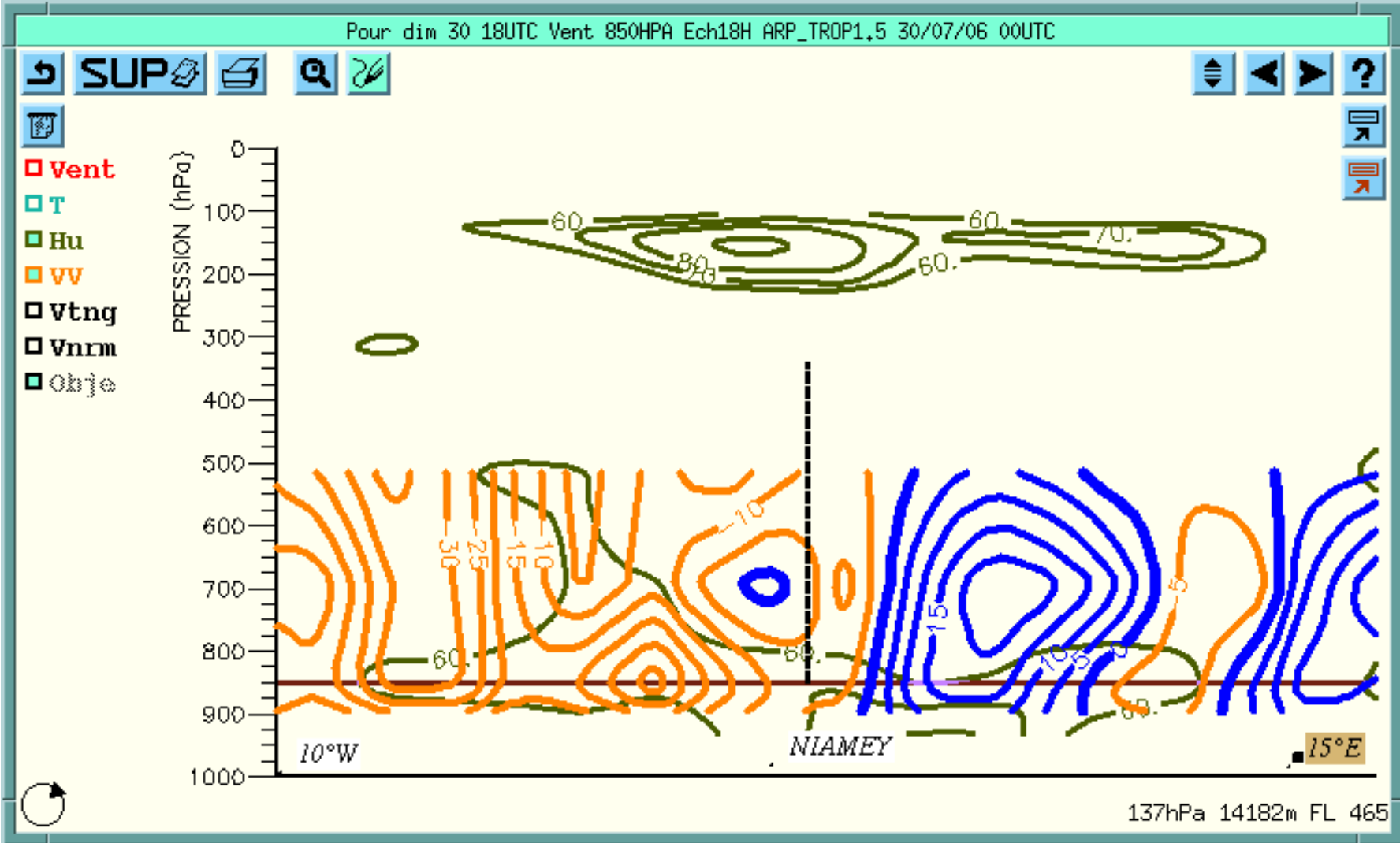


24h FCST 24h Total Precipitation (in mm)
NCEP/ETA 00zCycle 24hr FCST VALID 00Z 20060731

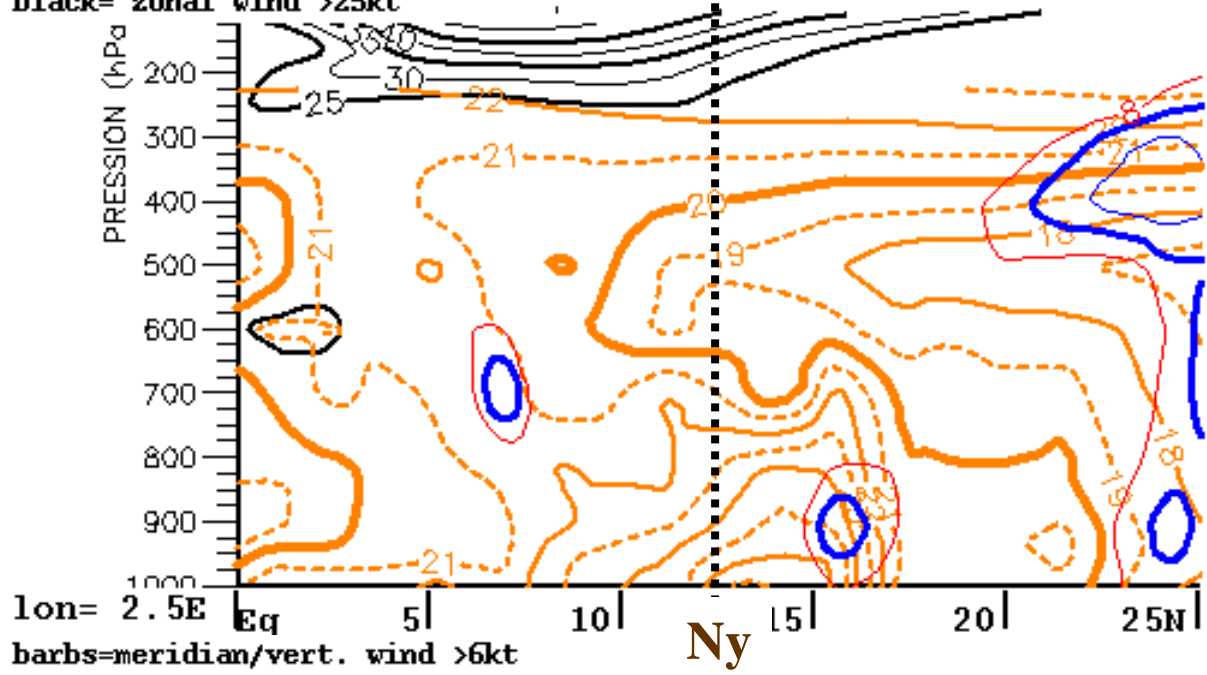
GB125: cumul précip 24h, réseau du 20060730 00 UTC - échéance 6 à 30 h



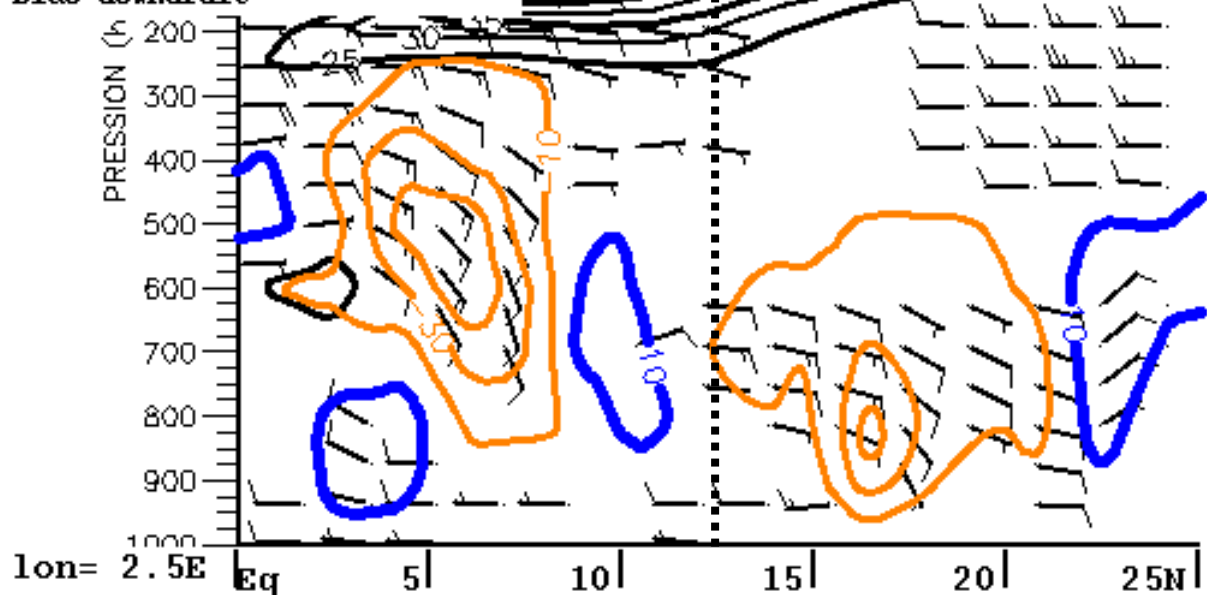
VCS of RH and VV



absolute vorticity: red=8 blue>8
 orange= wet bulb pot. temp.
 black= zonal wind >25kt



lon= 2.5E Eq 5 10 Ny 15 20 25N
 barbs=meridian/vert. wind >6kt
 black=zonal wind >25kt
 orange=updraft
 blue=downdraft



North-South
 VCS

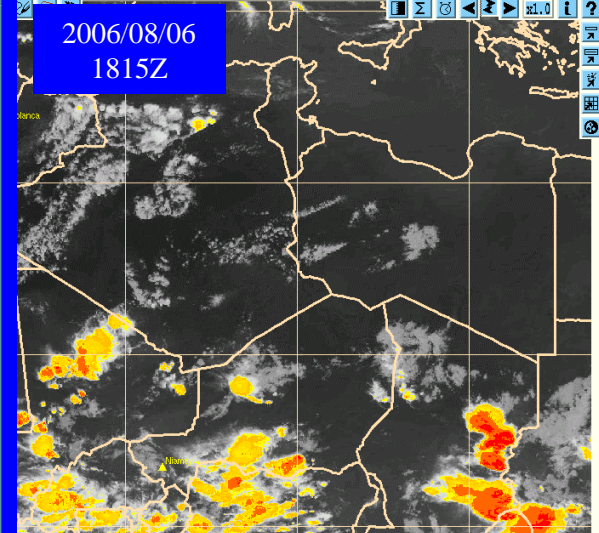
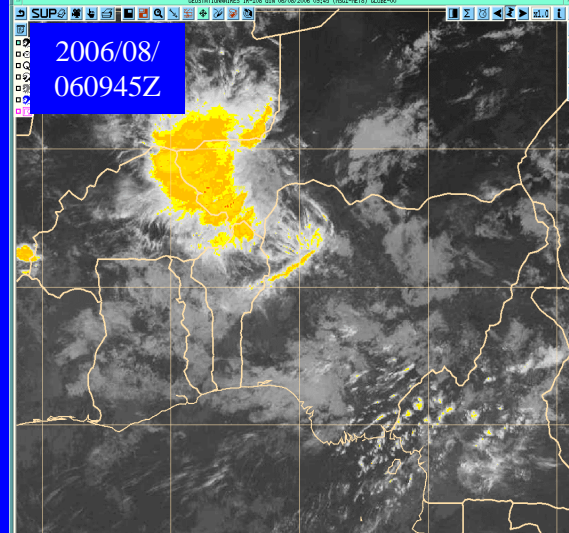
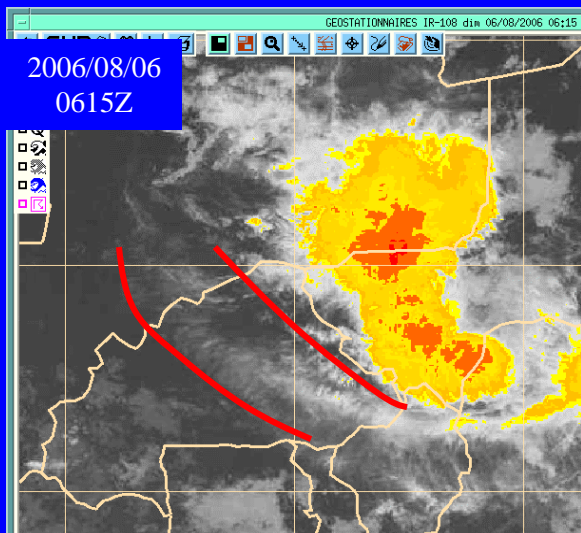
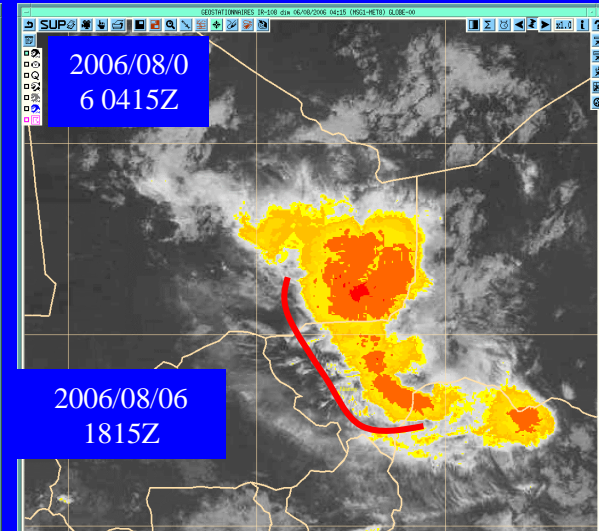
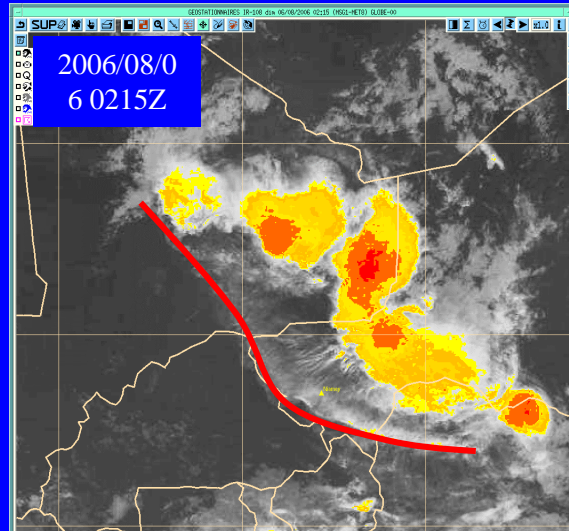
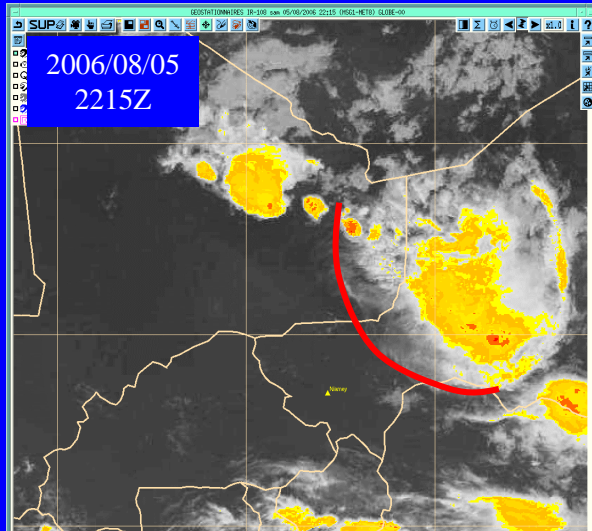
Today
 30 July
 18UTC

Niamey

ER

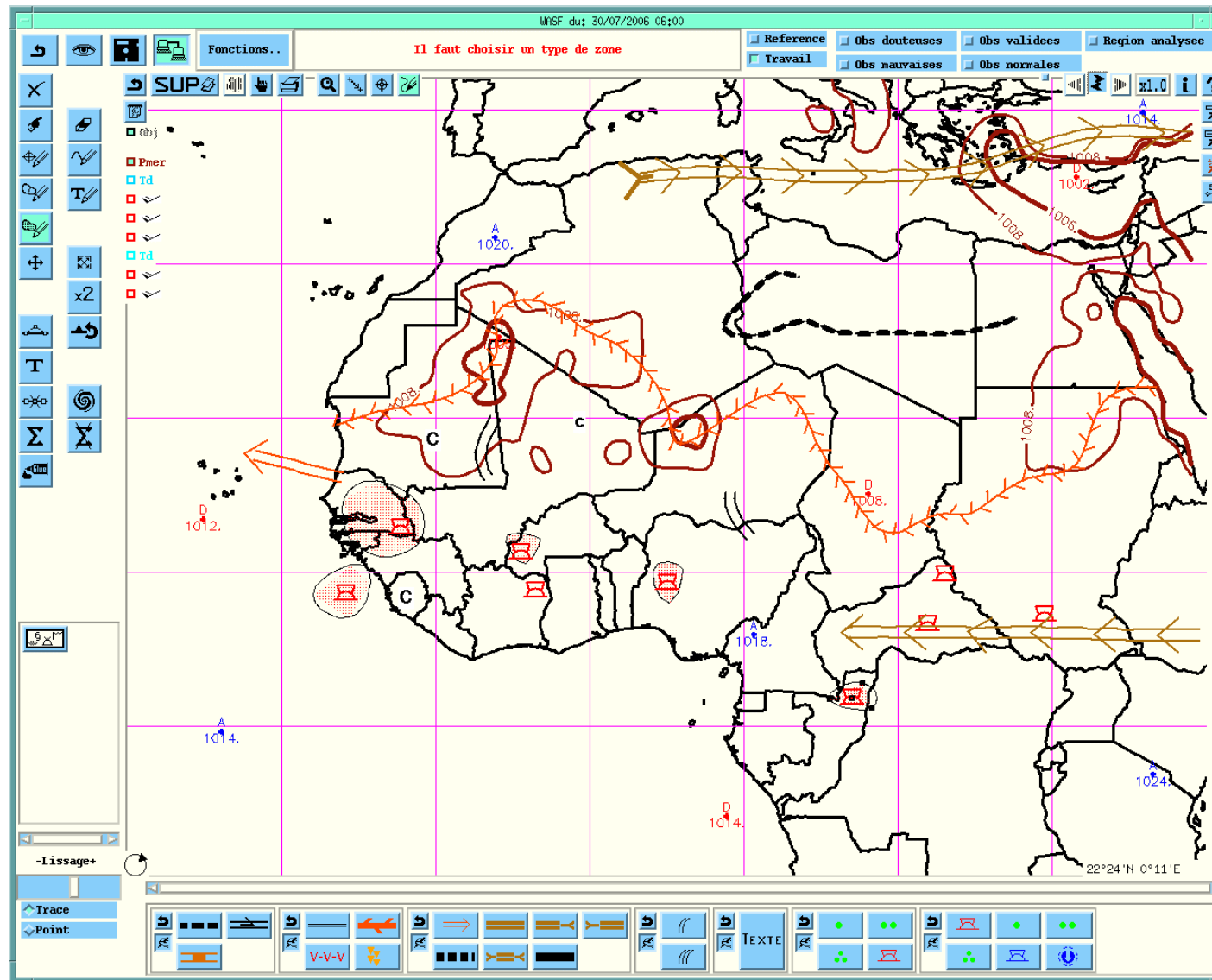
15

Propagation of an organised MCS and its Associated Gust Front

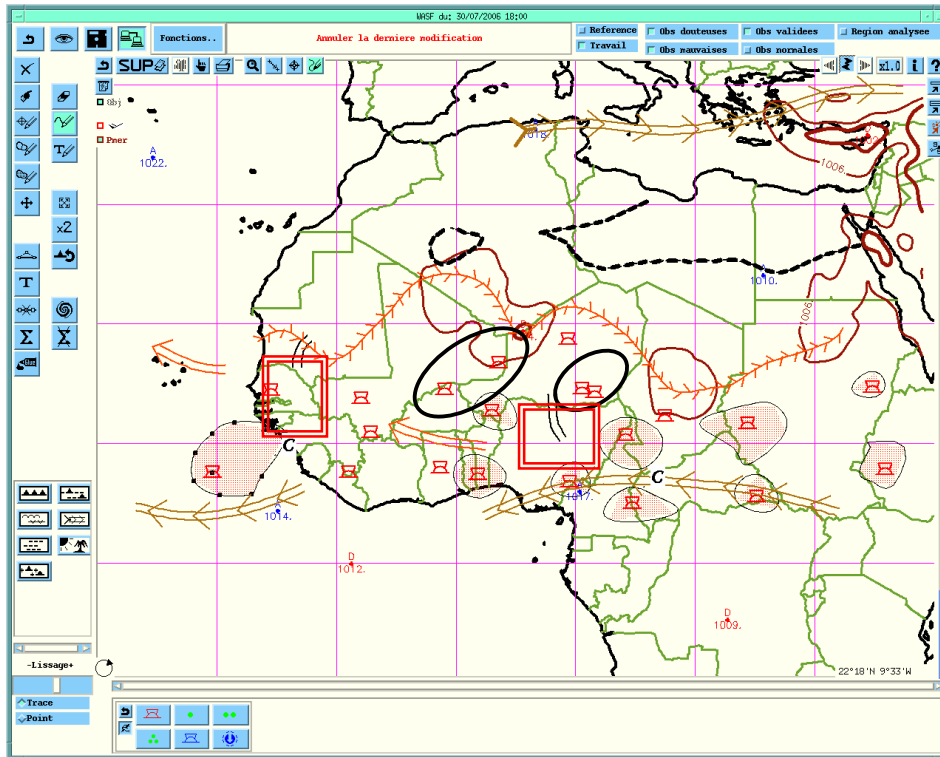


HAMA Hamidou ASECNA-NIGER

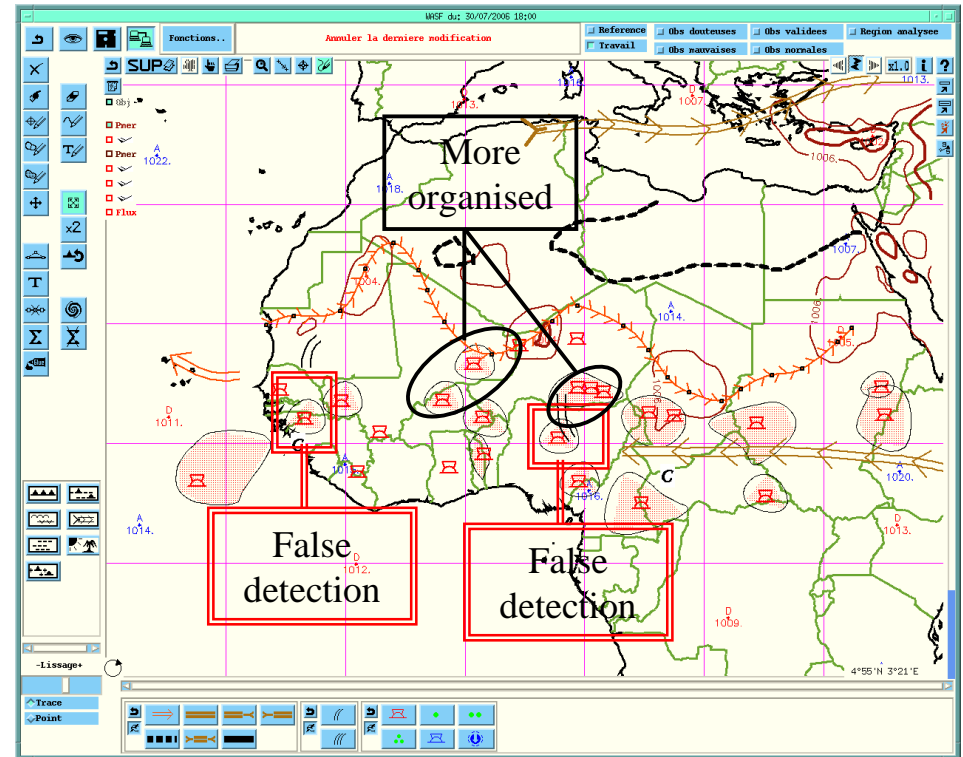
The West African Synthetic Analysis (WASA)



EXAMPLE OF A SYNTHESIS FORECAST vs OBSERVATIONS

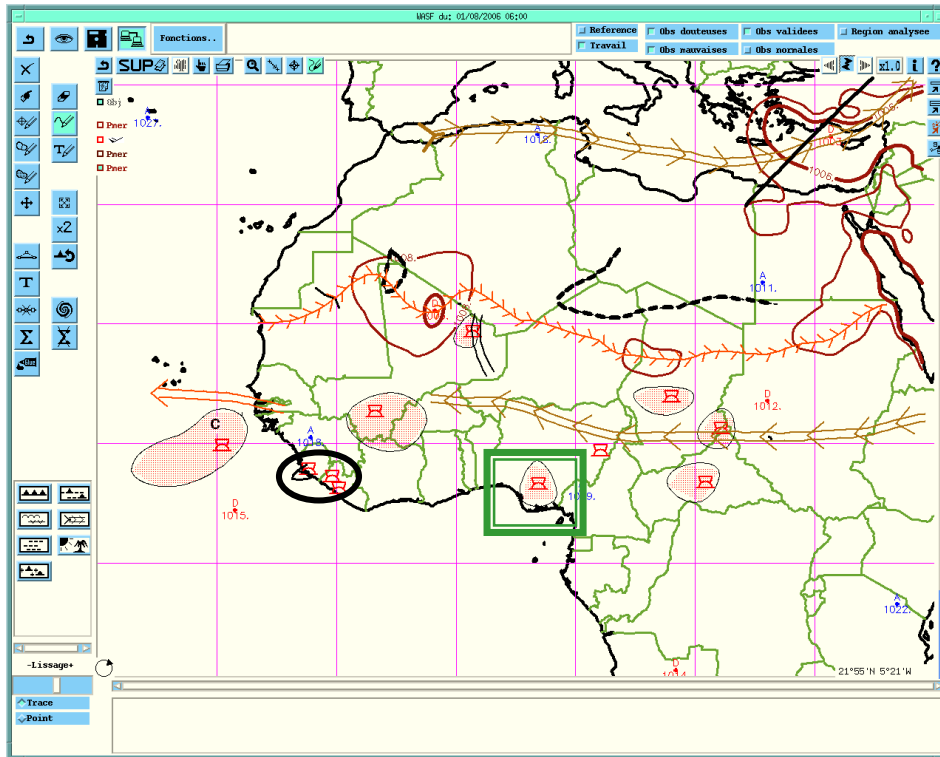


WASF 30-07-06 1800Z
Base: 30-07-06 0000Z

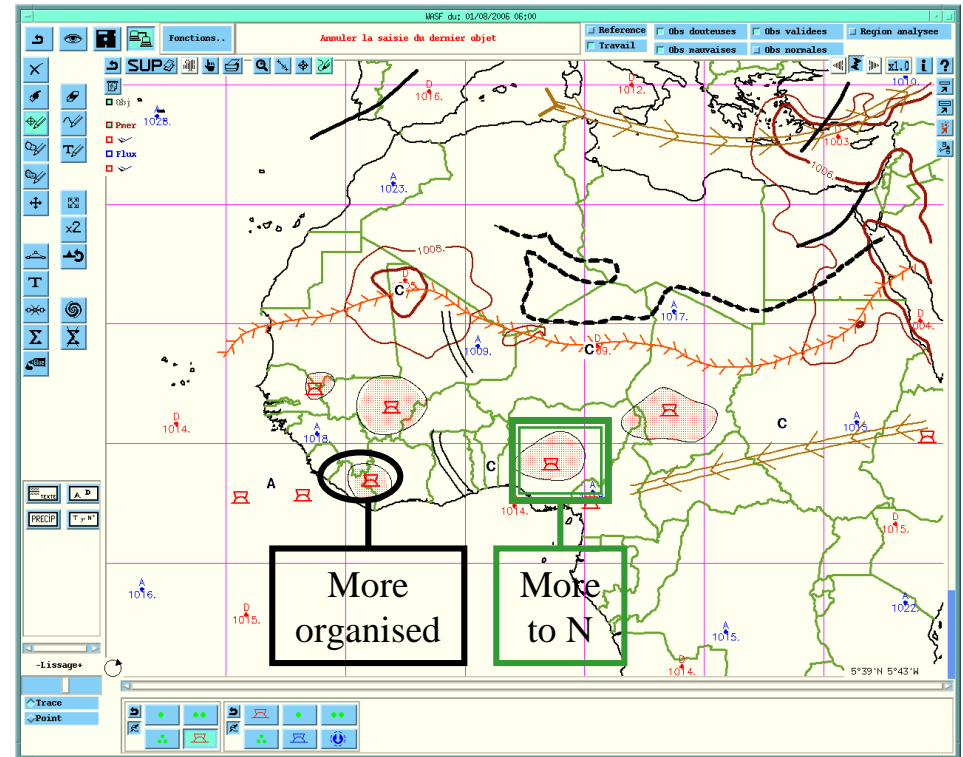


WASA 30-07-06
1800Z

EXAMPLE OF A SYNTHESIS FORECAST vs OBSERVATIONS



WASF 01-08-06 0600Z
Base: 30-07-06 0000Z



WASA 01-08-06
0600Z

Summary of the statistics

STAT	D 1800Z	D+1 0600Z	D+1 1800Z	D+2 0600Z	D+2 1800Z
BIAS	0.978	1.708	1.022	1.782	0.911
POD	0.673	0.750	0.622	0.608	0.488
CSI	0.515	0.382	0.444	0.280	0.343

A. Forecasts Made at D for D 1800Z

$$\text{Bias} = 45/46 = 0.978 \quad \text{POD} = 0.673$$

$$\text{CSI} = 0.516$$

B. Forecasts Made at D for D+1 0600Z

$$\text{Bias} = 1.708 \quad \text{POD} = 0.750$$

$$\text{CSI} = 0.382$$

C. Forecasts Made at D for D+1 1800Z

$$\text{Bias} = 1.022 \quad \text{POD} = 0.622$$

$$\text{CSI} = 0.444$$

D. Forecast Made at D for D+2 0600Z

$$\text{Bias} = 1.782$$

$$\text{POD} = 0.608$$

$$\text{CSI} = 0.280$$

E. Forecast Made at D for D+2 1800Z

$$\text{Bias} = 0.911$$

$$\text{POD} = 0.488$$

$$\text{CSI} = 0.343$$

SOME SIMPLE STATISTICS

$$\text{Bias} = (\text{Hits} + \text{False Alarms}) / (\text{Hits} + \text{Misses})$$

$$\text{POD} = \text{Hits} / (\text{Hits} + \text{Misses})$$

$$\text{CSI} = \text{Hits} / (\text{Hits} + \text{False Alarms} + \text{Misses})$$

SOME SIMPLE STATISTICS

Jour	Forecast D 1800Z			Forecast D+1 0600Z			Forecast D+1 1800Z			Forecast D+2 0600Z			Forecast D+2 1800Z		
	Hits	FA	Mis ses	Hits	FA	Mis ses	Hits	FA	Mis ses	Hits	FA	Mis ses	Hits	FA	Mis ses
03/08/2006	4	3	2	2	3	1	2	4	1	2	2	1	3	3	3
04/08/2006	1	0	2	2	2	1	3	2	3	2	3	1	5	1	2
05/08/2006	4	3	2	4	5	0	5	2	3	2	7	1	5	0	2
06/08/2006	5	3	4	4	2	0	5	0	2	1	2	3	3	0	6
07/08/2006	8	1	0	2	3	2	4	0	5	1	5	1	1	6	3
08/08/2006	7	0	3	1	6	1	4	7	1	3	2	2	2	4	5
09/08/2006	2	4	2	3	2	1	5	3	2	3	6	0	3	5	2
TOTAL	31	14	15	18	23	6	28	18	17	14	27	9	22	19	23