The ETA Desktop Weather-forecast Station at DMN of Senegal

Aïda DIONGUE NIANG, Elarion SAMBOU, Mactar NDIAYE

DMN SENEGAL

Outline

- Opportunity to develop NWP
- Operational ETA DWS at the DMN of Senegal
  - Computer specifications and features
  - Operational runs characteristics
  - Ease to use
  - Development on model output fields and dissemination
  - Benefits of the Eta DWS
- Research activities and collaboration
- Perspectives
- Additional capacities needed

Opportunity to develop NWP model

- **Use of global model outputs from GTS to produce weather forecast bulletins. But:**
  - **prolems of availability of necessary fields, desired ranges …**
  - **no interacions between forecasters and modelers**
  - **No possibility of tunning and development to fit local/regional needs**

- **Development of:**
  1. **Portable Limited Area Models**
  2. **Performant small-plateform computers**

     possibility to run locally NWP models

- **Opportunity has been taken by Senegal to implement Eta model and thanks to NOAA's NWS collabartion:**
  - **providing the computer**
  - **installing model software**
  - **training people to run the model**

Computer specifications and features

- Dell Precision Workstation 470n
- Dual Intel Xeon processors, 3.40GHz, 2MB L2 cache per processor
- 6GB total memory
- 500GB total disk space
- Red Hat Enterprise Linux ES 4
- Intel Fortran Compiler 9.0 for Linux
- Intel MPI Library 2.0

Courtesy Kinter et al, COLA

Operational runs characteristics

Domain	1^{N}-28^{W}; 24^{N}-17^{E}
Horizontal resolution/grid	22 km / 166 x 165 points
Vertical grid	50 levels
Time Step	60s
Initial and lateral boundary Conditions	US NWS global NWP model
Coupling	Every 6 hours
Runs	00Z ans 12Z
Range	72 hours
Wall clock time	1h 47min

Ease to use:
Access to real time initial and boundary conditions data

- **Automated Run for batch mode access to US NWS global NWP model output for:**
  - **Atmospheric initial conditions**
  - **Initial soil wetness, snow depth**
  - **Surface boundary conditions (sea surface temperature, sea ice) and lateral boundary conditions (atmospheric circulation)**

Caveat: Availability of Initial and lateral boundary conditions data:

Data were available at COLA server first at 8 TU but now at 5 TU.
Sometimes, troubles on the COLA data server.
Fortunately problems are quickly fixed by our collaborators

Ease to use:
Running the model

- **Graphical User Interface:**
  - **to « build » model configuration**

  (domain, resolution, other several variables)
  - **to « run » the simulation**

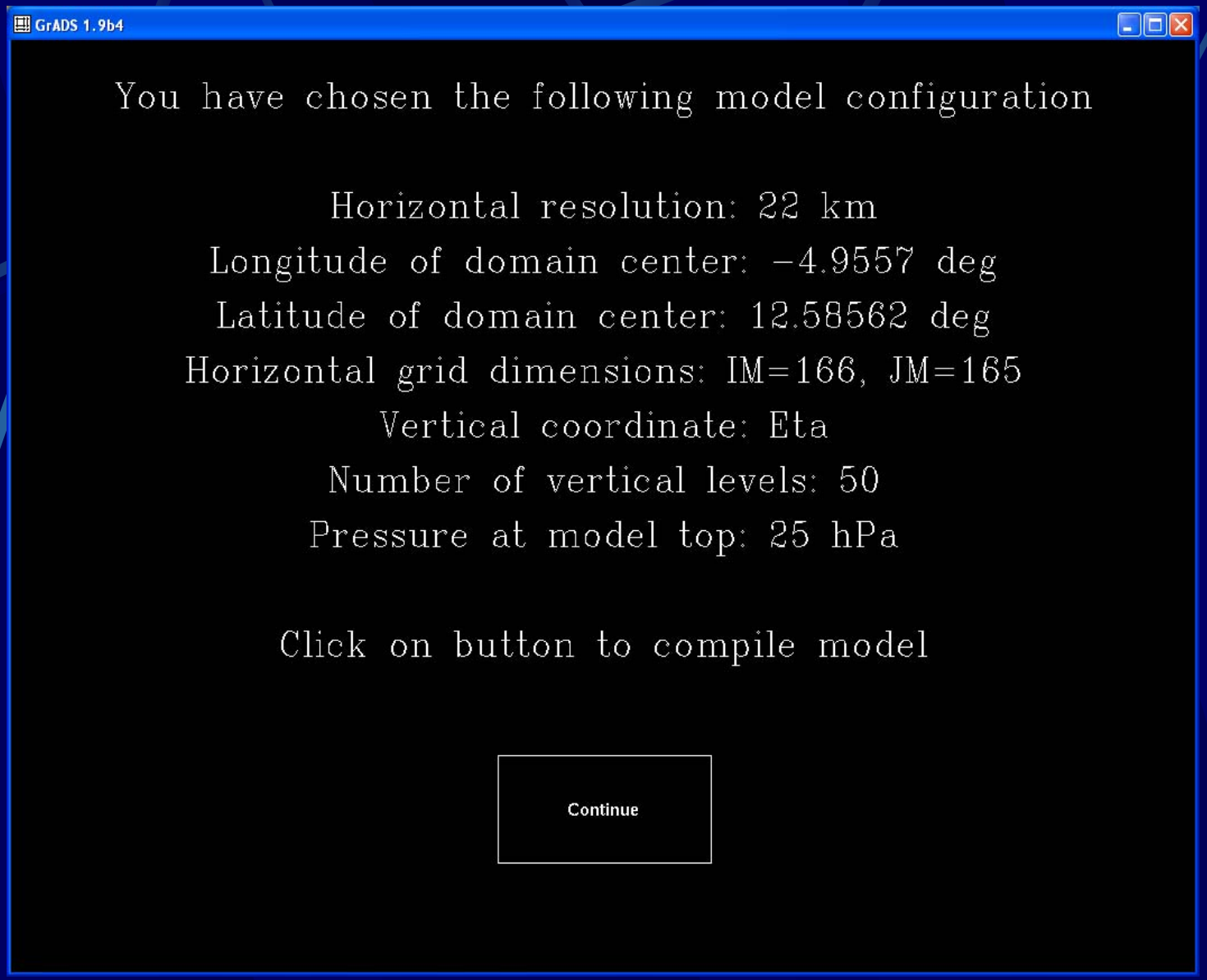
  (run-time variables, cumulus convection parameterization, model dynamics)

- **Automated Run for batch mode used for operational runs**

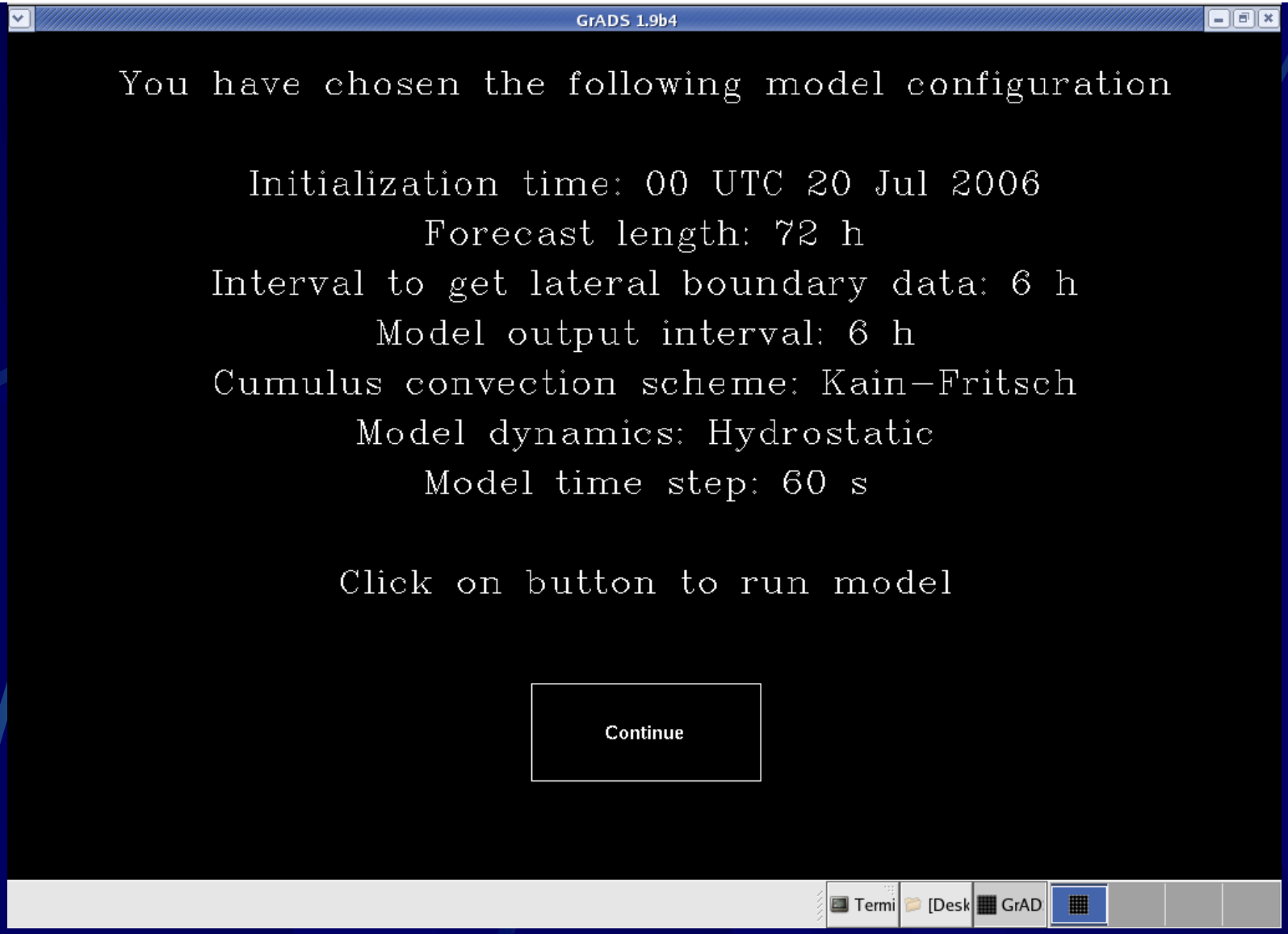
Caveat:

Scientific documentation for the model: **quasi unexistant**

Eta postprocessor: **not performant for some variables**



Building the model: summary of choices



Running the model: Summary of choices.

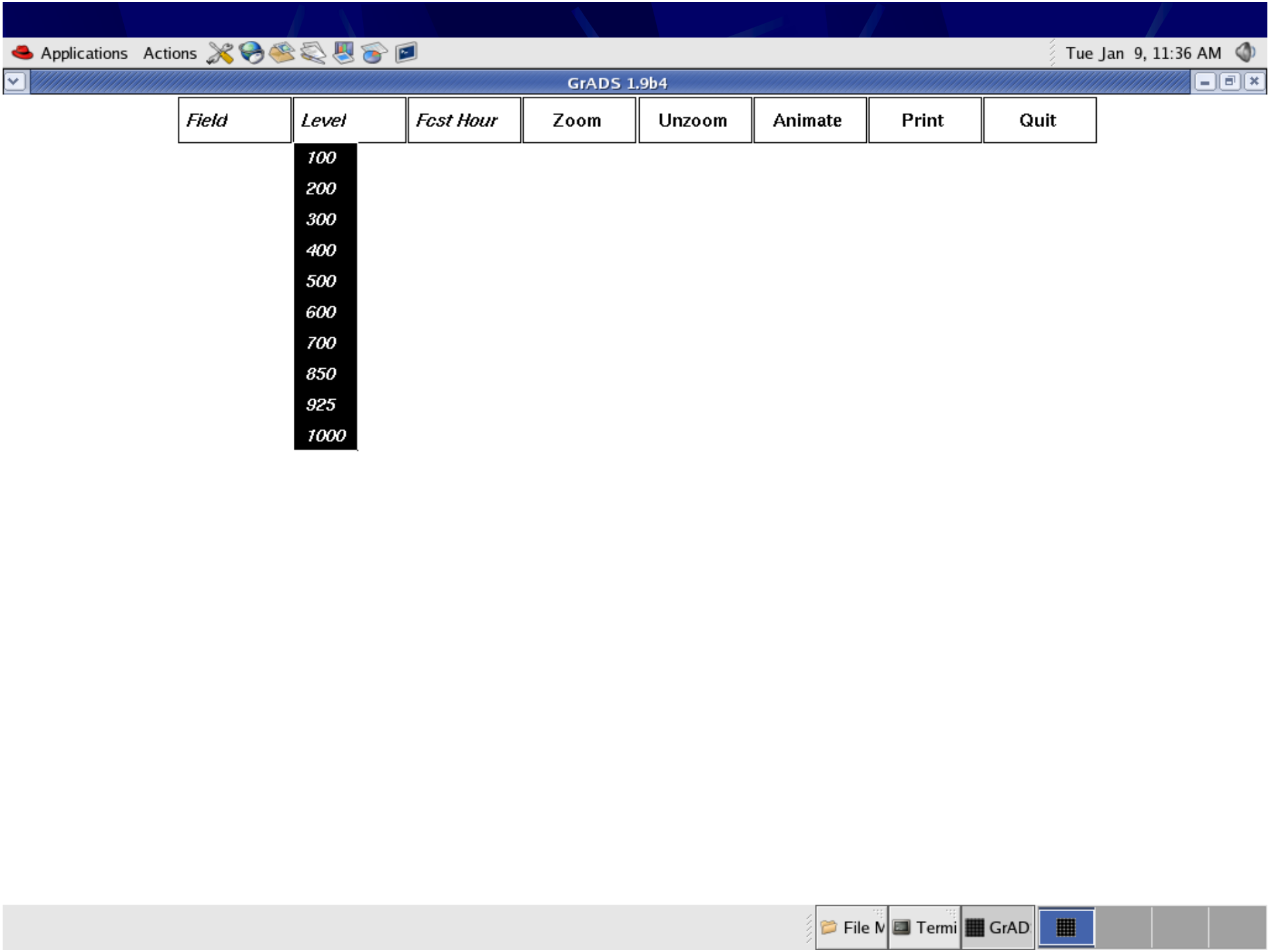
Ease to use: Displaying model output fields

- **Automated linkage to a desktop display program (GrADS) to visualize results of forecast with a GUI**
  - **different model output fields,**
  - **for all available vertical levels**
  - **for all available forecast times**
  - **also animation, zooming, saving plots to a file.**

GrADS 1.9b4

Field | Level | Fcst Hour | Zoom | Unzoom | Animate | Print | Quit

- Height
- Temp
- Wind
- Wind Stream
- U Wind
- V Wind
- VVEL700hPa
- Vort
- Div
- Rel Hum
- SLP
- 2-m Tmp & 10-m Wind
- 2-m TD & 10-m Wind
- 2-m Qv & 10-m Wind
- Precip
- CIN
- CAPE
- Prc Wat
- Mconv850hPa


Applications
Actions
Tue Jan 9, 11:36 AM
GrADS 1.9b4
Field
Level
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Zoom
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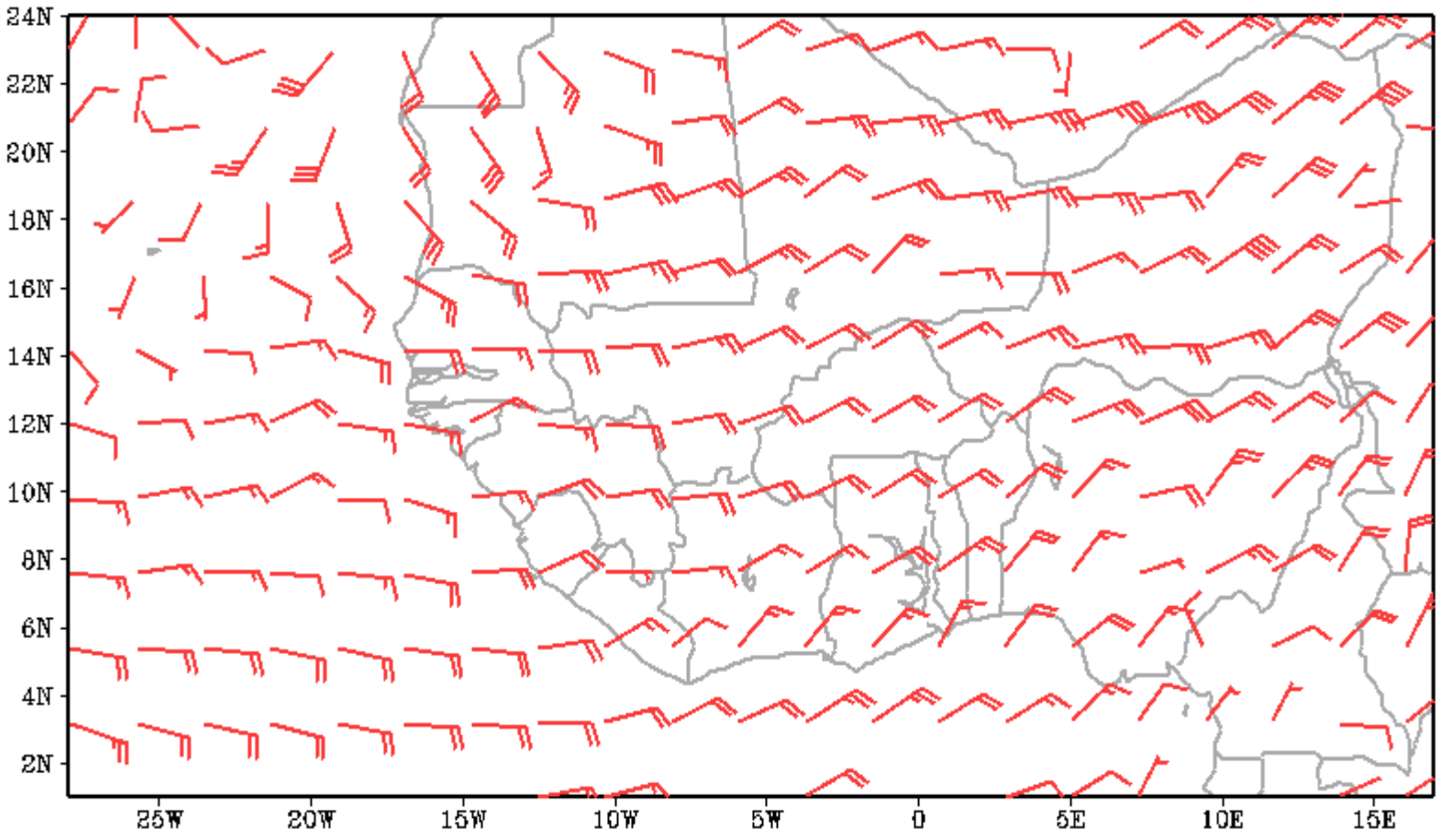
Field	Level	Fcst Hour	Zoom	Unzoom	Animate	Print	Quit



850-hPa wind (noeuds) 36-hr forecast valid 00Z12JAN2007

Development on model Output fields and dissemination

- **First, the GUI for model output fields has been customized to fullfill forecasters requirements: six more fields, more levels, desired appearence…**

- **Also to enable model output fields easier to be exploited outsite the DMN and by neighbouring countries, a webpage has been developped.**

  http://213.154.77.58/PrevisionNumerique/

Prévision Numérique du Temps - DMN -Sénégal - Mozilla Firefox

le Edit View Go Bookmarks Tools Help

http://213.154.77.58/PrevisionNumerique/

Go

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PNT-DMN-Sénégal

PNT-DMN-Sénégal

La Prévision Numérique du Temps au service du Développement

SOMMAIRE

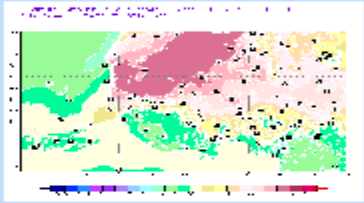
- Prévisions HRM
- Prévisions ETA
- Meteo-Senegal.net
- Partenaires
- CONTACT

Bienvenue sur le site de la PNT à la DMN

La disponibilité d'un modèle à aire limitée constitue un outil supplémentaire pour les météorologistes du Sénégal et de la sous région, en particulier les prévisionnistes.

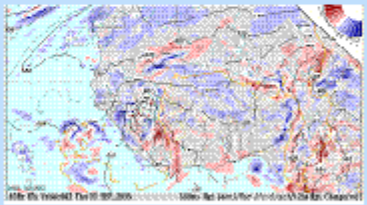
Historique de la Prévision Numérique à la DMN

Modèles actuellement opérationnels



DWD-HRM

En savoir plus ...



DWS-ETA

En savoir plus...

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Prévisions ETA : Paramètres Niveaux Modèle

Prévisions ETA : Paramètres Niveaux Pression

Model Level Parametrs - Mozilla Firefox

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http://196.207.237.182/PrevisionNumerique/html/mod_parm.html

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Model Level Parameters

Réseau : 20070109, 00 UTC

Centre : DMN,ETA_22

Choisissez le paramètre et l'échéance de la prévision

Mean Sea Level Pres | 66H | Afficher le produit

Done

http://196.207.237.182 - MSLP.66H.gif (GIF Image, 800x600 pixels) - Scaled (96%) - Mozilla Firefox

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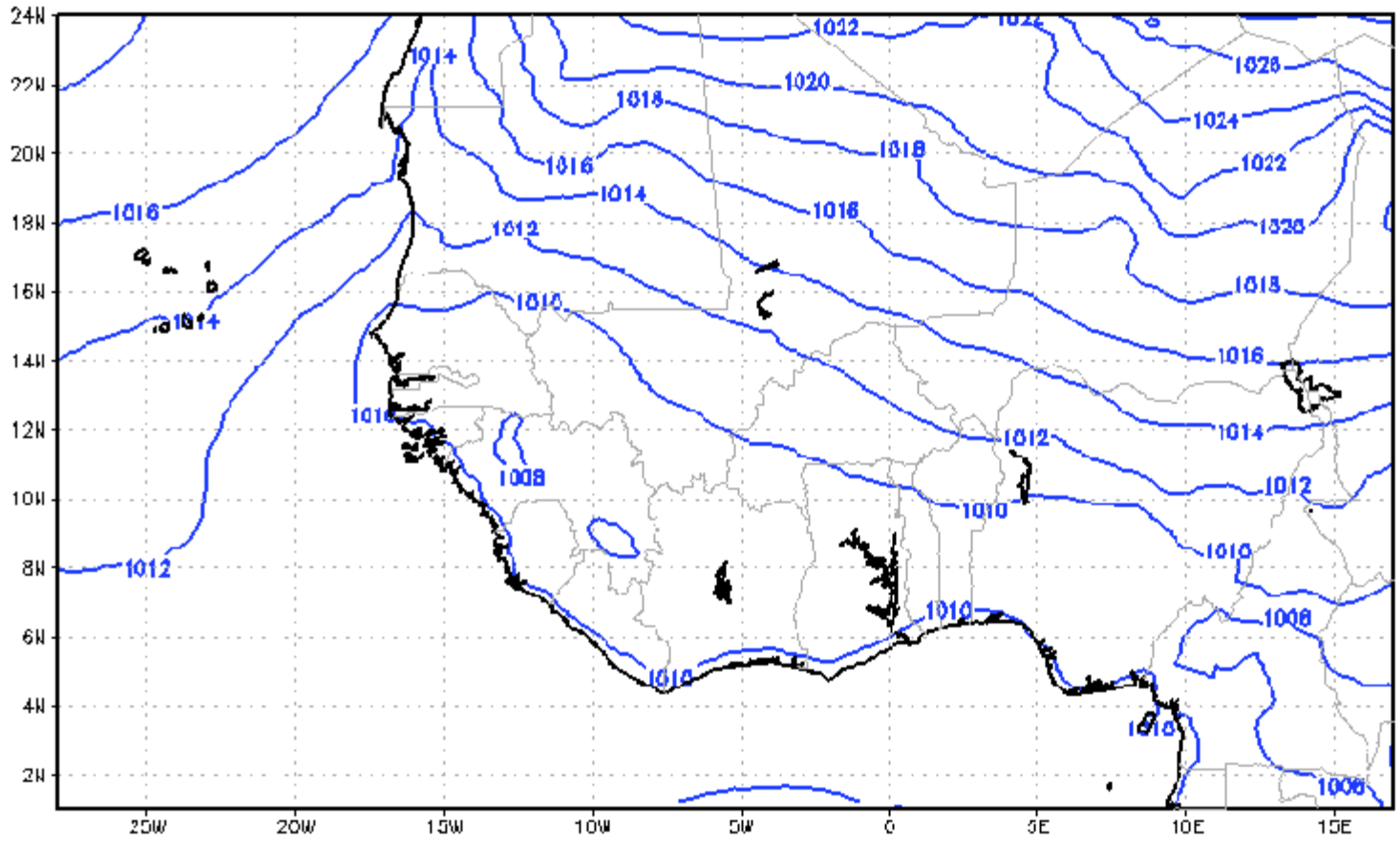
Go

Mean Sea Level (hPa) Based: 00Z 09/01/2007 FTA
DMN T+66 VT 18Z11jan2007



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Pressure Level Parametrs - Mozilla Firefox

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http://196.207.237.182/PrevisionNumerique/html/pres_parm.html

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Pressure Level Parameters

For 20070109, 00 UTC

Center DMN,ETA_22

Please Select the Parameter, Pressure level and the Forecast Range

Select Pressure Level | Select Parameter | Select Forcast Range | Show Product

Done

Pressure Level Parametrs - Mozilla Firefox

ile Edit View Go Bookmarks Tools Help

http://196.207.237.182/PrevisionNumerique/html/pres_parm.html

Go

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Pressure Level Parameters

For 20070109, 00 UTC

Center DMN,ETA_22

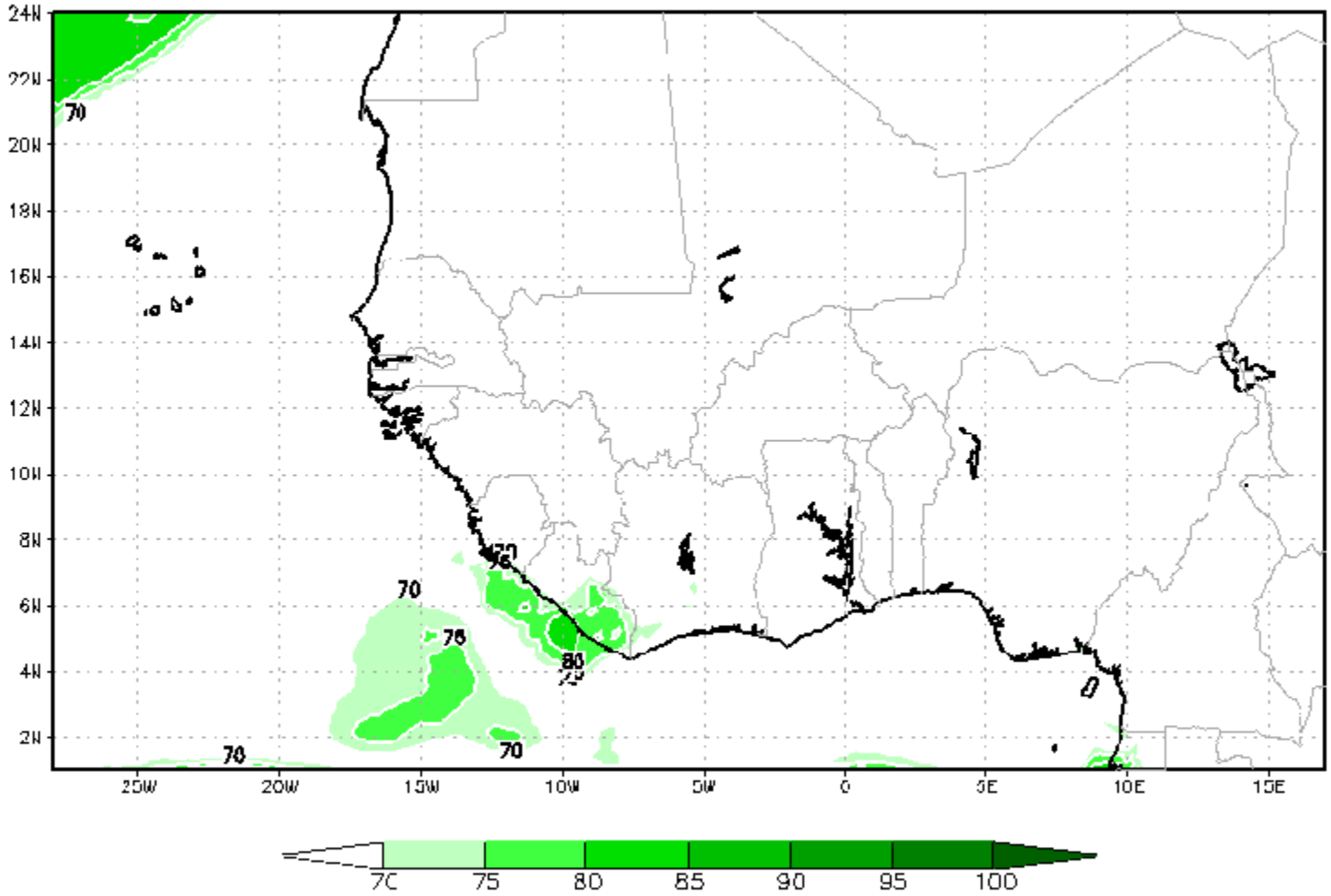
lease Select the Parameter, Pressure level and the Forecast Range

850HPA | Relative Humidity | 48H | Show Product

one

Go

Relative Humidity (%) At 850HPA Based: 00Z 09/01/2007 FTA
DMN: T+48 VT 00Z1 jan2007



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Benefits of the Eta DWS

- Eta model outputs are used to produce weather forecasts bulletins or warning bulletins by DMN forecasters.
- At this stage it is difficult to quantity the improvements of weather forecasts due to the Eta DWS facility:
  - Forcasters are using as well global model output products
  - Not yet systematic evaluation of the model performance
- However, it is clear the the ETA DWS has enhanced:
  - Production of weather bulletins at the DMN
  - Interactions betwwen forecasters and Research & Development team
  - Capacity building by the possibility to initiate DMN persons to NWP
  - Reaserch activities

Research activities and collaboration

- A commun study has been just set up between the « Atmospheric Physics Laboratory » of the University of Dakar and the DMN: model intercomparison for 2006 rainy season and evalution with observations in the framework of AMMA (African Monsson Multidisciplinary Analyses)

- Analysis of forecasts up to 72 hours (run by COLA prior the installation of a the whole year, July 2005-June 2006) has been proposed for master thesis to the students of the « ASECNA school of Meteorology » to determine how the Eta model forecast products represent the mean West African Monsson features

Perspectives

- **In 1-2 years**
  - **Promote the Web page in norder to enable neighbouring countries to use the Eta model output products**
  - **Systematic verification by forecasters during monsoon seasons**
  - **Objective verification against observations to establish model performance and scores**
  - **2006 rainy season case study to investigate in particular the performance of the convective schemes.**
- **In 5 years**
  - **Applications: interface with a wave model, an air pollution model**
  - **Higher-resolution Local models nested to the regional Model:**
    Limited Area Models vs Global models
  - **Assimilation of non conventional data: *eg. Radar, Lightning?***

Additional capacities needed

- Scientific documentation of the Eta Model
- Move to WRF model
- Training for forecasters and researchers about model outputs use
- Archive facilities
- More powerful computer

Acknowledgements

NOAA's NWS:

to have chosen Senegal as a pilot country

- COLA:

for the technical collaboration

Thanks you for your attention