JOINT WMO TECHNICAL PROGRESS REPORT ON THE GLOBAL DATA PROCESSING AND FORECASTING SYSTEM AND NUMERICAL WEATHER PREDICTION RESEARCH ACTIVITIES FOR "[*2017*]"

SAUDI ARABIA/ CENTRAL FORECASTING OFFICE- JEDDAH

1.   Summary of highlights

- New Saudi WRF model installed and running 4 times
- Installation and testing the Hadley Centre Regional Climate Model (PRECIS)
- New 64 kbps GTS connection with CAIRO
- New 64 kbps GTS connection with OMAN
- New 64 kbps GTS connection with BANKOK
- New 64 kbps GTS connection with ALGERIA
- New weather radar system at 13 location over KSA
- New SADIS system for   WMO messages and GRIB data reception (VSAT)
- MSG2 satellite reception

2.   Equipment in use

Weather Radar System
- IRIS system
- Sigmet (IRIS products generation)
- TITAN software
- Linux

Moving Weather (IBL System)

- Messages Switch System for GTS.
- Linux Fedora

UDCS (Unified Data Collection System)
- Integrate Meteorological Data Collection System for national observations. (Metar, Synop,Upper-air)
- Linux

Tecnavia (Meteosat MSG2) Satellite Images Receiving System
- Windows XP

Messir-MSG Satellite data processing and display system
- Windows XP

SADIS   Satellite Receiving System for the raw data and aviation products
- Linux

Visual Weather system server (IBL)
- Weather Data (grib , opmet) processing, analysis and visualization
- Linux fedora

Messir-Vision workstation (Corobor)
- Meteorological Data (grib, wmo) processing and visualization
- Windows XP

3. Data and Products from GTS in use

The daily bulletin of raw data:
SYNOP SM : 00/06/12/18 UTC   1248 messages
SYNOP SI : 03/09/15/21 UTC   637
TEMP   : 00/12 UTC   286
METAR   : 00   UTC   3600

The daily statistic of products:
GRIB (EGRR) : 00/ 12 UTC   447
GRIB (EDZW) : 00/ 12 UTC   827
GFS (NCEP) : 00/ 06/ 12 UTC   GRIB files
T4 charts   : 00/ 06/ 12/ 18 UTC

4. Forecasting system

4.1 System run schedule and forecast ranges
- WRF ARW Model for Saudi area 4 times a day 00/ 06/ 12/ 18 UTC, resolution:
18km for domain 1, and 07 km for domain2. , 02 km for domain3

4.2 Medium range forecasting system (4-10 days)
Using ECMWF GRIB data.

4.3 Short-range forecasting system (0-72 hrs)
Using Saudi WRF model 0-72 at 1 hour step

4.3.1 Data assimilation, objective analysis and initialization
4.3.1.1 In operation
Initial and boundary data are received from NCEP (HTTP) after being assimilated at that centre

4.3.1.2 Research performed in this field
None

4.3.2 Model
4.3.2.1 In operation
- WRF model (Country, resolution 07 km, 26 levels, time range 72hrs,Non Hydrostatic sigma coordinate with appropriate schemes for radiation, convection, boundary and surface layers, microphysics and land surface parameterization)

- WRF model (Province, resolution 02 km, 26 levels, time range 72hrs,Non Hydrostatic sigma coordinate with appropriate schemes for radiation, convection, boundary and surface layers, microphysics and land surface parameterization)

Hardware : DELL 670 Precision with 2 Processors . 4 GB RAM , 400 GB disk storage

Introduction of WRF-CHEM dust forecast model

In collaboration with PME, NCAR developed a WRF-CHEM based dust forecast system for Saudi Arabian area. The preliminary WRF-Chem dust forecasts for the Saudi Arabian domain at 21.6 km resolution were started on an operational mode on December 18, 2013. The daily WRF-Chem runs were configured for the 18Z cycle initially; however, due to some conflicts with the daily operational RTFDDA runs and their postprocessing, the WRF-Chem runs were switched to the 06Z cycle in the end of January 2014. The analysis period is 24-h and the forecast length is 48-h. During the analysis period, the hourly analysis fields from the operational RTFDDA system 4-cycle runs are used to provide dynamic information for WRF-Chem through grid nudging (Fig. 1). The chemical fields are also spun up during the analysis period.
The daily dust forecasts are displayed on the web. The displayed variables include aerosol optical depth (AOD) at 600 nm, dust concentrations at surface, and vertically integrated dust concentrations. The dust forecasts are constantly

examined and compared with WMO dust observations and forecasts in an effort to understand the strengths and weaknesses of the modeling system

- ETA Model (Saudi-Arabia,60 km,26 levels, time range72hrs,Non Hydrostatic eta coordinate with appropriate schemes for radiation, convection, boundary and surface layers, microphysics and land surface parameterization)

  Hardware : DELL 670 Precision with 2 Processors . 4 GB RAM , 400 GB disk storage
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4.3.2.2 Research performed in this field
None

4.3.3   Operationally available NWP products
Variables : Temperature, wind, specific humidity, soil moisture, surface potential temperature, Precipitation, vertical velocity , PMSL, HG, K- index, Total Index, ….

4.3.4   Operational techniques for application of NWP products
No automated procedures are in use so far for NWP output interpretation

4.4   Nowcasting and Very Short-range Forecasting Systems (0-6 hrs)
- Using The Saudi WRF(High resolution of 10km, small area and short time of 06 hrs), satellite and radar products

4.5   Specialized numerical predictions
Not in our operational system

4.6   Extended range forecasts (ERF) *(10 days to 30 days)*
Not in our operational system

4.7   Long range forecasts (LRF) *(30 days up to two years)*
Not in our operational system

5.   Verification of prognostic products
5.1   Not applied yet

5.2   Research performed in this field
None

6.   Plans for the future *(next 4 years)*

6.1   Development of the GDPFS

6.1.1   We are in the process of further developing a satellite-based air quality data and forecasting system.

6.1.2   - We have a plan to introduce an operational model for sea wave prediction to our present system.
- Modernization and upgrading the capability of our regional and international communication systems.
- The report that the National Centre for Atmospheric Research (NCAR) has Prepared previously (a comprehensive assessment report of the meteorological section

activities in PME), will continue to be used as a guideline in the advancement of our GDPFS.

6.2   Planned research Activities in NWP, Nowcasting and Long-range Forecasting

6.2.1 Planned Research Activities in NWP

6.2.2 Planned Research Activities in Nowcasting

6.2.3 Planned Research Activities in Long-range Forecasting

- An MOU was signed with King Abdul Aziz University, Faculty of Meteorology to jointly promote research activities in various meteorological orientations, but with special emphasis on NWP at all scales.
- The above mentioned NCAR report will also be used in guiding our intended research program on NWP.

7.   References