

**ANNUAL JOINT WMO TECHNICAL PROGRESS REPORT ON THE GLOBAL
DATA PROCESSING AND FORECASTING SYSTEM (GDPFS) INCLUDING
NUMERICAL WEATHER PREDICTION (NWP) RESEARCH ACTIVITIES
FOR 2012**

QATAR

1. Summary of highlights

- Upgrading of the communication and visualization synergies, messier systems in both the Doha airport forecasting unit (OTBD) and the marine unit.
- Installing of the real time visualisation system (visual weather system)/ IBL Software Engineering in the new airport (Hamad international airport-OTHH).
- Preparation of a Data centre with high specifications.
- Soon installing of a video conference system to serve flight briefing and weather presenting.

2. Equipment in use

- Communication and visualization synergies system from MFI.
- AMSS and visualization messier system from COROBOR
- RTVS visual-weather system from IBL
- DWSR-200/x/SDP transporter X-band Doppler radar from EEC
- The METEOR 1600CC-band Doppler radar from Gematronik– in the near time.
- MSG satellite images receiving and processing from Tecnavia
- Intel core -i7 desktop 8 cpu , 8 GB ram for running HRM and WRF models

3. Data and Products from GTS in use

- All in-situ information as SYNOP ,SYNOP SHIP , BUOY, AMADAR ,TEMP ,TEMPSHIP , PILOT , SATEM , METAR , SPECI , TAF, AIRME , SIGMET.
- T4 charts and sig charts
- BUFR bulletins
- Models : ECMWF (0.5, 2.5), UKMO (1.25), GME (1.5) and ARPEG (0.5, 1.5) products,GFS (0.5 , 1.0)

4. Forecasting system

4.1. System run schedule and forecast ranges

- ALADIN running twice a day in MFI/France – 48 hours
- HRM running locally on experimentally basis – 72 hours
- WRF running locally on experimentally basis – 72 hours

4.2. Medium range forecasting system (4-10 days)

4.2.1 Data assimilation, objective analysis and initialization

4.2.1.1 in operation

None

4.2.1.2 Research performed in this field

None

4.2.2 Model

4.2.2.1 in operation

None

4.2.2.2 Research performed in this field

None

4.2.3 Operationally available Numerical Weather Prediction Products

None

4.2.4 Operational techniques for application of NWP products

4.2.4.1 in operation

None

4.2.4.2 Research performed in this field

None

4.2.5 Ensemble Prediction System (EPS)

4.2.5.1 in operation

None

4.2.5.2 Research performed in this field

None

4.2.5.3 Operationally available EPS Products

None

4.3. Short-range forecasting system (0 – 72 hrs)

4.3.1 Data assimilation, objective analysis and initialization

4.3.1.1 in operation

None

4.3.1.2 Research performed in this field

None

4.3.2 Model

4.3.2.1 in operation

- HRM hydrostatic meso-scale model with resolution 0.0625deg and 60 vertical levels model runs twice a day, at 00 and 12 UTC to +78 hours based on GME global data.
- The non-hydrostatic WRF-ARW / NCAR meso-scale model is tested using GFS model data for the initial state and boundary conditions.

4.3.2.2 Research performed in this field

- Running WRF in different convection + cumulus physics

4.3.3 Operationally available NWP products

- ALADIN products
- Some WRF + HRM products

4.3.4 Operational techniques for application of NWP products

4.3.4.1 in operation

None

4.3.4.2 Research performed in this field

None

4.3.5 Ensemble Prediction System

4.3.5.1 in operation

None

4.3.5.2 Research performed in this field

None

4.3.5.3 Operationally available EPS Products

None

4.4. Nowcasting and Very short-range Forecasting systems (0 - 6 hrs)

4.4.1 Nowcasting system

4.4.1.1 in operation

None

4.4.1.2 Research performed in this field

None

4.4.2 Models for Very Short-range Forecasting Systems

4.4.2.1 in operation

None

4.4.2.2 Research performed in this field

None

4.5. Specialized numerical predictions

4.5.1 Assimilation of specific data, analysis and initialization (where applicable)

4.5.1.1 in operation

None

4.5.1.2 Research performed in this field

None

4.5.2 Specific Models (as appropriate related to 4.5)

4.5.2.1 in operation

None

4.5.2.2 Research performed in this field

None

4.5.3 Specific products operationally available

None

4.5.4 Operational techniques for application of specialized numerical prediction products (MOS, PPM, KF, Expert Systems, etc...) (As appropriate related to 4.5)

4.5.4.1 in operation

None

4.5.4.2 Research performed in this field

None

4.5.5 Probabilistic predictions (where applicable)

4.5.5.1 in operation

None

4.5.5.2 Research performed in this field

None

4.5.5.3 Operationally available probabilistic prediction products

None

4.6. Extended range forecasts (more than 10 days to 30 days)

4.6.1 in operation

None

4.6.2 Research performed in this field

None

4.6.3 Operationally available NWP model and EPS products

None

4.7. Long range forecasts (30 days up to 2 years)

4.7.1 in operation

None

4.7.2 Research performed in this field

None

4.7.3 Operationally available products

None

5. Verification of prognostic products

5.1. Annual verification summary

None

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 Next few months

➤ Installing of HPC cluster system with the following specifications:

1 - HPC Master (1 x Master / Head Node) :

- 2 x Socket CPU, 8-Core with in total 16 cores

- Intel Xeon E5-2690,8.00 GT/s QPI
- 2.9GHz (3.8GHz Turbo Boost)
- 20MB L3 Cache,64-bits
- 128 GB DDR3-1600 Memory
- 1 TB local high performance storage (SAS /SATA disks, 10k rpm)
- Single QSFP port Infiniband 4x EDR (100 Gbit/s) card (Ethernet) HCA
- PCIe 3.0 x16 slots gen 3
- PCIe 3.0 x8 slots
- Super DVD-RW Drive
- Four ports Gigabit Ethernet Controllers
- USB ports
- Power Efficient
- Redundant PSU and fans

2 - HPC Salves (23 Computing Nodes):

- 2 x Socket CPU,8-Core with in total 16 cores
- Intel Xeon E5-2690, 8.00 GT/s QPI
- 2.9GHz (3.8GHz Turbo Boost)
- 20MB L3 Cache,64-bits
- 128 GB DDR3-1600 Memory
- 1 TB local high performance storage (SAS /SATA disks, 10k rpm)
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- PCIe 3.0 x16 slots gen 3
- PCIe 3.0 x8 slots
- Super DVD-RW Drive
- x ports Gigabit Ethernet Controllers
- USB ports

- Redundant PSU and fans

3 - HPC Network:

- High speed (HDR) Infiniband 4x EDR(100 Gbit/s) switch ,min 36 QSFP ports
- Infiniband cables.

4 – Other Hardware Accessories with following specifications:

- ISO Certified Rack (chassis) & KVM
- 2U rack Double Twin model with 4 computers
- Rack servers with sliding rack rail
- 24 Port Gigabit Switch with required cables

5 – Operating System/Compilers :

- Pre-installed Linux operating system and MPI (Red Hat Linux Enterprise latest Release.)
- Intel C/C++ and Fortran compilers

6 – Data Server (1 node):

- 2 X 2.66 GHz, Intel Xeon 6-core Processor,64-bits
- 12 MB cache
- 48 GB DDR3 memory
- System should be with minimum 18DIMM Slots for future scalability
- 2 X 146 GB SAS 10K RPM Hard Disk
- 6 X 600 GB SAS 10K RPM Hard Disk
- System should be with minimum 16 HDD Bays for future scalability
- Single Port Infiniband 100 Gbps 4x EDR HCA
- 4 Expansion Slots

- Redundant power supply
- DVD-RW

7 – SAN STORAGE system (192 TB total):

- 96 TB HP-StorageWorks P2000 with 6Gbit/sec SATA
- 96 TB HP-StorageWorks P2000 with 6Gbit/sec SATA

➤ Running of the COSMO/DWD

6.1.2 Next year

- Joining the Consortium for Small-scale Modeling-COSMO
- Running of the wave models WAM and WaveWatch-3

6.1.3 In the coming 4 years

- Further development of the HPC in order to run the WRF globally with a high resolution (20 km) and WRF climatological model
- Installation of a new LAN with higher speeds

6.2. Planned research Activities in NWP, Nowcasting, Long-range Forecasting and Specialized Numerical Predictions

6.2.1 in NWP

- Verification of the HRM , WRFs, WAM, WaveWatch-3 and COSMO
- Research of running of the WRF on different courses each course with different physics.
- Conducting a data assimilation program locally for the WRF and COSMO

6.2.2 in Nowcasting

- Running cosmo on a very high resolution for the airport , and integrating these run with a real time data assimilation system for the airport weather detecting equipments such as the radar , LLWAS and the wind profilers (LIDAR)
- Verification on the output of the previous step
- Verification of the Instability indexes from the models

6.2.3 in LRF

- Not planned

6.2.4 in Specialized NWP

- Not planned

7. Consortium

Not applicable

8. References.