JOINT WMO TECHNICAL PROGRESS REPORT ON THE GLOBAL DATA PROCESSING AND FORECASTING SYSTEM AND NUMERICAL WEATHER PREDICTION RESEARCH ACTIVITIES FOR 2012

Israel

1.   Summary of highlights

- A new HPC, a SGI Altix XE1300 cluster having 1024 cores was installed at the second half of 2012 and in use for NWP - operational and research.
- Developing tools for aviation forecast and warnings.
- Developing tools for Burning Index forecast.
- INCA nowcasting based on ECMWF model
- Since January 1, 2012, all IMS's data and products are published free of charge. Data processing and dissemination systems were adjusted to comply with this policy.

2.   Equipment in use

- The IMS computing backbone is provided by
- SGI Origin 350 Unix server having 2 cpus, operated by IRIX operating system, version 6.5 (for database management and communication tasks).
- SGI Origin 300 Unix server having 8 cpus, operated by IRIX operating system, version 6.5 (for operational NWP, INTRANET site and external users activity)
- SGI Altix XE1300 cluster having 1024 cores, with 40TB SGI IS5000 storage, operated by Suse Linux operating system (for NWP – operational and research activities).
- 3 SGI Indy and O2 workstations are used for software development.
- A TP9100 storage array provides disc storage of 1 TB.
- Peripheral equipment includes 2 IBM Infoprint 1357 laser A3 color printers used mainly for charts printing and 1 Data Products CI-500e line dot matrix printer for long reports printing.

3.   Data and Products from GTS in use

- SYNOP, SYNOP SHIP, BUOY, AMDAR, TEMP, TEMP SHIP, PILOT, SATEM, METAR, SPECI, TAF mostly from the northern hemisphere are transmitted to IMS by RTH Offenbach.
- SYNOP, SHIP, TEMP, AMDAR bulletins in BUFR code are received and decoded.
- ECMWF decoding/encoding software has been integrated into IMS message switching system to process BUFR coded data.
- Gridded products in GRIB/GRIB2 code from:
- ECMWF global model
- DWD global model (GME)
- UKMO global model
- NCEP model
- UKMO LAM for Africa.
- METEOAM COSMO regional model

4.   Forecasting system

4.1   System run schedule and forecast ranges

Time (UTC)	System running
01:40	00 UTC preliminary analysis
02:50	00 UTC IMS HRM forecast (00h-78h)
03:40	00 UTC main analysis

05:30	00 UTC WAM forecast (00h-72h)
10:40	00 UTC final analysis
13:40	12 UTC preliminary analysis
14:50	12 UTC IMS HRM forecast (00h-78h)
15:40	12 UTC main analysis
17:30	12 UTC WAM forecast (00h-72h)
22:40	12 UTC final analysis

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
   ECMWF is used as the main source of information

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 *(MOS, PPM, KF, Expert Systems, etc.)*
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
   ECMWF is used as the only source of information

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
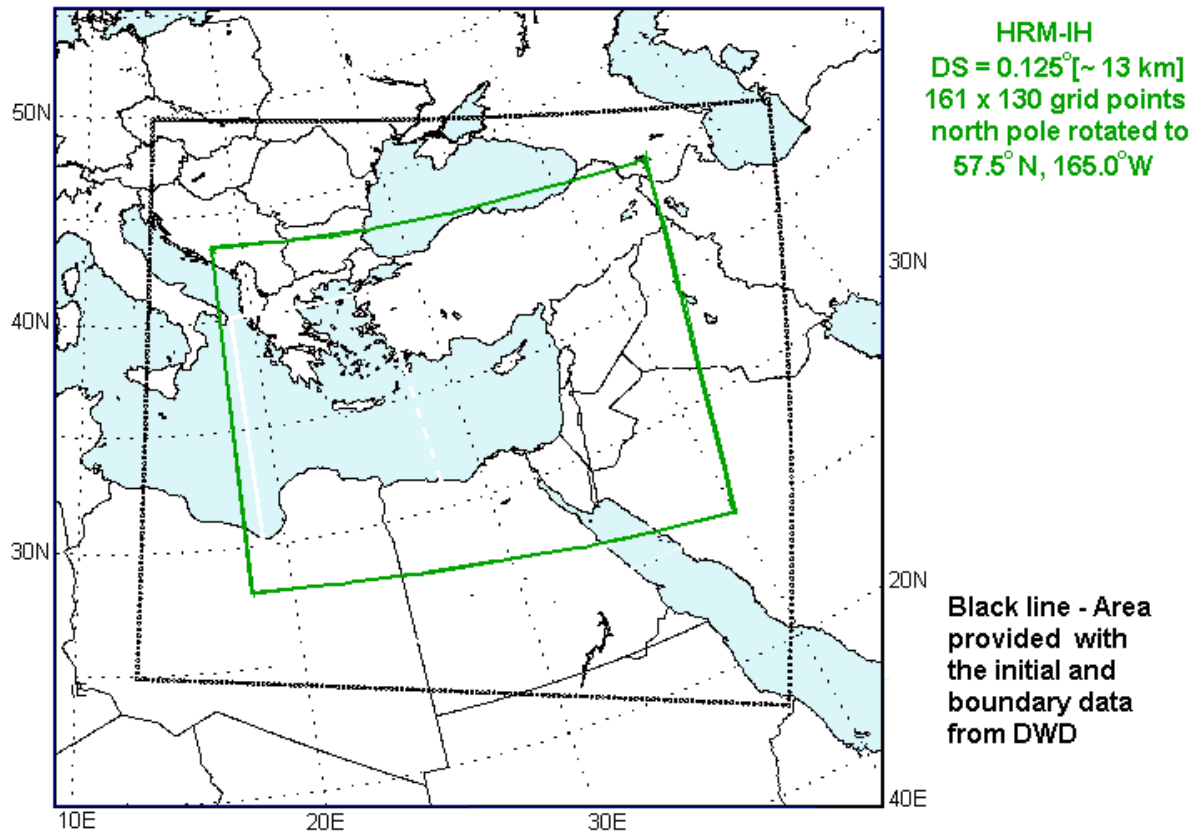   None

4.3.1.2 Research performed in this field
   None

4.3.2 Model

4.3.2.1 In operation

We use HRM hydrostatic mesoscale model. The HRM used rotation grid with resolution 0.125deg, 38 vertical levels (subgrid system (h & P)). The model runs twice a day, at 00 and 12 UTC to +78 hours.

Domain of the
HRM_IH

HRM-IH
DS = 0.125°[~ 13 km]
161 x 130 grid points
north pole rotated to
57.5°N, 165.0°W

Black line - Area
provided with
the initial and
boundary data
from DWD

4.3.2.2 Research performed in this field

1. The non-hydrostatic WRF-ARW / NCAR mesoscale model (version 3) is tested using NCEP model results for the initial state and boundary conditions.
2. The non-hydrostatic COSMO is tested using DWD and ECMWF initial and boundary condition with 7 km and 2.8 km domains.

4.3.3 Operationally available NWP products

The temperature, humidity, wind, cloud cover, precipitation, pressure fields are given as maps together with meteograms and cross sections.

4.3.4 Operational techniques for application of NWP products

4.3.4.1 In operation

MOS and an application for mixed human automated forecast.

4.3.4.2 Research performed in this field

MOS - an application for bias correction for the temperature, humidity and wind speed for station forecasts is developed.

4.3.5 Ensemble Prediction System

4.3.5.1 In operation
ECMWF is used as the only source of information.

4.3.5.2 Research performed in this field
None

4.3.5.3 Operationally available EPS Products

ECMWF maps (temperature, MSLP, Geopotential, wind, precipitation, waves), meteograms, EFI maps.
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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
Testing the Integrated Nowcasting through Comprehensive Analysis (INCA) system is used for nowcasting the coming 6 hours. The ECMWF data is ingested and interpolated to the INCA grid which is 1 km.

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
The Wave analysis model (WAM) runs operationally twice a day at 00 and 12 UTC.

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
The Wave analysis model (WAM) runs operationally using UKMO global model output for initial and boundary conditions.

4.5.2.2 Research performed in this field
None

4.5.3   Specific products operationally available
Significant and maximum wave height in the Eastern Mediterranean

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 (ERF) *(10 days to 30 days)*

4.6.1   Models

4.6.1.1 In operation
None

4.6.1.2 Research performed in this field
None

4.6.2   Operationally available NWP model and EPS ERF products
None

4.7   Long range forecasts (LRF) *(30 days up to two years)*

4.7.1   In operation
ECMWF system 4 is used to produce seasonal forecast for DJF and JJA.

4.7.2   Research performed in this field
Development of verification tools to assess the model ability for seasonal forecast in Israel and the SEECOF and MedCOF domains.

4.7.2   Operationally available EPS LRF products
All forecast and verifications are done with EPS data.

5.   Verification of prognostic products

5.1   HRM verification against station measurements:

Mean 60-hours RMSE score without bias correction				
	T2m [C]	Wind Speed [m/s]	Wind Dir [deg.]	RH [%]
Bet Dagan	2.44	2.54	29.67	10
Jerusalem	2.32	3.33	18.59	14.7
Haifa	1.96	3.52	33.72	12.3
Har Knaan	2.8	7.84	21.5	16.4

Mean 60-hours RMSE score with bias correction				
	T2m [C]	Wind Speed [m/s]	Wind Dir [deg.]	RH [%]
Bet Dagan	1.73	2.32	27.15	7.9
Jerusalem	1.74	2.4	19.12	14.2
Haifa	1.69	2.98	30.95	8.8
Har Knaan	1.99	4.43	21.94	16.3

5.2   Research performed in this field
    Implementing the bias correction to forecast fire related indexes as burning index and ignition component.
    Verification against reanalysis.

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

6.1   Development of the GDPFS

6.1.1 Further improvement of the regional model in collaboration with the COSMO consortium.
    An on-going improvements of the users' tools.

6.1.2   Further implementation of BUFR decoding.

6.1.3   Checking for "of the shelf" data processing and forecasting systems to replace/upgrade IMS's systems.

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

6.2.1 Planned Research Activities in NWP
    We plan to run COSMO and WRF regional models for short-range forecasting.

6.2.2 Planned Research Activities in Nowcasting
    We plan to Implement INCA as the operational nowcasting tool.

6.2.3 Planned Research Activities in Long-range Forecasting
    Continue to develop verification tools. Contribute to the WMO Climate Outlook Forums , SEECOF and MedCOF.

6.2.4 Planned Research Activities in Specialized Numerical Predictions
None

7. **References**