



Progress Report on Global Data Processing System For 1999

ISRAEL METEOROLOGICAL SERVICE

1. Summary of Highlights

During 1999 an effort was devoted to adapt all the operational systems to be Y2K compliant.

DWD multi-processor HRM version was regionally adapted. Since November 1999 it was put into quasi-operational run up to 48 hrs.

Till November 1999 a workstation version of "Euroupa-Model" was in use.

A version of the regional WAM model for Eastern Mediterranean has been fully implemented .

2. Equipment in Use

2.1 operational equipment

Computer	memory (MB)	Operating system
1xSGI Origin 2000 server, 2 cpu	256	IRIX 6.4
2xSGI Origin 200 servers, 1 cpu	128 each	IRIX 6.4
1xSGI O2 workstation	64	IRIX 6.3
3xSGI INDY workstations	64 each	IRIX 6.2
4xSGI INDY workstations	32 each	IRIX 6.2
1xIBM RS/6000 320H	48	AIX 3.2.5

Total disc storage is about 95 GB (including external SCSI RAID)

External devices : 1 Roland DPX-2700 plotter
 1 Roland DPX-3600 plotter
 1 Dataproducts CI-500e line dot matrix printer

One of the Origin 200 computers is used as a database server and the other is used as a communication server (backing up each other), while Origin 2000 is used mainly for NWP operational and research activities.

2.2 Communications

- ETHERNET
- Point to point links
- National public network
- Frame Relay link to RTH Offenbach (64 KB)

3. Data and Products from GTS in Use

3.1 Data

Number of observations/day in average

SATEM	900
TEMP/PILOT (TTAA, PPAA, UAAA)	1000
TEMP (TTBB, UUBB)	600
SYNOP/SHIP/BUOY	9300
AVIATION DATA	34000

3.2 Products

GRID KWBC	32 bulletins
GRID EGRR	875 bulletins
GRID EDZW	1112 bulletins
GRIB EDZW	150 bulletins
GRIB ECMF	42 bulletins
CDF in T.4 format	90 charts

4. Data Input System

Fully automated. INFORMIX DBMS is used for the data management.

5. Quality Control System

no change

6. Monitoring

no change

7. Forecasting System

7.1 System run schedule

<u>Time (UTC)</u>	<u>System running</u>
01:40	00 UTC preliminary analysis
02:00	00 UTC MM4 forecast (00h-24h)
03:05	00 UTC quasi-operational regional forecast (00h-48h)
03:40	00 UTC main analysis
07:15	00 UTC WAM forecast (00h-48h)
10:40	00 UTC final analysis
13:40	12 UTC preliminary analysis
14:00	12 UTC MM4 forecast (00h-24h)
15:05	12 UTC quasi-operational regional forecast (00h-48h)
15:40	12 UTC main analysis
19:15	12 UTC WAM forecast (00h-48h)
22:40	12 UTC final analysis

MSL pressure analysis is carried out every 3 hours with cut-off of 0:40 and 2:40 hrs.

7.3 Short - range forecasting system.

There is no essential change in MM4 model run which is now used for a preliminary guidance.

Hereby are the characteristics of a new regional model used quasi-operationally.

7.3.2 Model

Analysis and forecast data of GME from DWD are used as an initial and lateral boundary data.

Basic equations - primitive equations

Independent variables λ - longitude in rotated coordinate system
 φ - latitude in rotated coordinate system
 η - vertical coordinate
 t - time

Time dependent variables	<ul style="list-style-type: none"> - P_s - surface pressure - T - temperature - q_d - water vapor - q_w - cloud water content - u, v - horizontal wind components
Diagnostic variables	<ul style="list-style-type: none"> - p - sea level pressure - ϕ - geopotential - ω - vertical velocity
Numerical Technique	<ul style="list-style-type: none"> - Rotated spherical grid, mesh size=0.25° (~ 27 km), Arakawa C-grid. - Hybrid vertical coordinates, 20 layers - Second order central differencing in space is combined with a leap frog time scheme and a split semi-implicit correction step, 150 sec. time step ; Asselin filter. - Lateral boundary formulation due to Davies (1976) - Fourth-order linear horizontal diffusion, slope-correction for the diffusion of temperature.
Integration domain	<ul style="list-style-type: none"> - the rectangular area in rotated spherical coordinates, the corners are located at: <ul style="list-style-type: none"> (11.88 E, 25.47 N) (38.34 E, 18.77 N) (13.12 E, 50.45 N) (53.46 E, 40.12 N) 121 x 101 grid points
Physical parametrization	<ul style="list-style-type: none"> - Grid-scale precipitation including parameterized cloud microphysics. - Mass flux convection scheme after Tiedtke (1989). - Vertical diffusion after Louis (1979) for the surface layer, an extended level-2 scheme after Mellor and Yamada (1974) higher up. - δ - two-stream radiation scheme after Ritter and Geleyn (1992) for short and longwave fluxes, full cloud-radiation feedback. - Two-layer soil model after Jacobsen and Heise (1982) including snow and interception storage. - Climate values changing monthly (fixed during forecast) in third layer. - Fixed analysed sea surface temperature.
Topographic data sets	<ul style="list-style-type: none"> - Received from DWD for all grid points.

7.3.3 The products of short-range model run

The products are: sea level pressure, geopotential, temperature, wind and relative humidity at 1000, 975, 950, 925, 900, 850, 700, 500 and 300 hpa

Surface level: temperature, max/min temperature, wind, relative humidity, cloud amount and accumulated 6-hours precipitation.

All products are predicted for 6 to 48 hours with output every 6hr.

Model runs twice per day based on 00 UTC and 12 UTC.

7.7 Regional WAM model version

The regional wave model version is identical to the WAM model, cycle 4, in all aspects, except the following:

- | | |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Model type: | - Spectral model (third generation) |
| Integration domain: | - Eastern Mediterranean sea |
| Grid : | - From 30°N to 39°N and from 15°E to 37°E.
Resolution: 0.25° latitude; 0.25° longitude. |
| Frequency resolution: | - 25 frequency components spaced between 0.04 Hz and 1 Hz. |
| Direction resolution: | - 12 equally spaced direction components. |
| Forecast range: | - +24, +36, +48 hours.
(2 times/day) |
| Source timestep: | - 600 sec |
| Data inputs: | - surface (10m) analysis and forecast maps (+12, +24, +36,+48 hours) of the wind components are used. These maps are produced by GME, DWD. |
| Surface classification: | - No sea ice |

8. Verification of prognostic products

Verification against analysis for region (27E-37E , 28N-40N)

EM										HRM	
RMS error of mean sea level pressure (hPa)											
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
24h	1.6	1.6	1.2	1.2	1.2	1.3	1.2	1.1	0.9	0.9	1.4
48h	2.2	2.1	1.6	1.7	1.8	2.2	2.0	1.4	1.1	0.6	2.1
72h	2.5	2.6	2.0	2.3	2.1	2.7	2.8	1.6	1.3		
RMS error of geopotential height at 500 hPa (m)											
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
24h	18	16	13	10	12	9	9	11	11	11	14
48h	25	25	17	20	18	16	12	15	15	17	20
72h	32	31	21	24	19	19	16	16	19		
RMS error of temperature at 850 hPa (C°)											
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
24h	1.6	1.5	1.6	1.5	1.4	1.3	1.4	1.3	1.3	1.2	1.1
48h	1.9	1.8	1.9	2.0	1.6	1.8	1.9	1.6	1.6	1.4	1.5
72h	2.0	2.0	2.1	2.3	1.8	2.1	2.3	1.9	1.8		

- From the end of January 1999 the verifications have been performed on regular basis.

9. Plans for the future

- The regional model will be fully implemented.
- Further development and improvement of the regional WAM model.
- An ongoing improvement of the GDPS operations at IMS.