Annual WWW Technical Progress Report

On the Global Data Processing System 2003

Meteorological Service Division (MSD), National Environment Agency, Singapore.

1.   SUMMARY

a) Adaptation of NCEP Regional Spectral Model for the Southeast Asian region.

b) Implementation of a coupled wave-ocean model.

c) In the process of upgrading of the SX4 supercomputer to the SX6.

2.   EQUIPMENT IN USE

Main equipment for the meteorological data processing system include
- ?? a NEC SX4 supercomputer (16GB main memory, 128 GB disk storage, 16 Gflops);
- ?? two Fujitsu M1600 mainframes;
- ?? a 8-processor Silicon Graphics Origin 2000 server with Onyx2 graphics supercomputer;
- ?? a few mini-computers (Fujitsu DS90);
- ?? workstations (Silicon Graphics Octane) and
- ?? network of PCs.

3.   DATA AND PRODUCTS FROM GTS IN USE

Data

The following reports were received daily. Figures denote the daily average number for the respective reports.

SYNOP	-	7000 reports
SHIP	-	400 reports
PPAA	-	400 reports
TTAA	-	600 reports
AIREP	-	1500 reports
SATOB	-	1200 reports
ECMWF	-	126 bulletins

AMDAR (from Australia only) – 2200 reports.

GRIB ECMWF (from GTS) – 126 Bulletins
GRIB EGRR (from SADIS) – nil
GRIB KWBC (from ISCS system) – 15,500 Bulletins
GRIB JMA (from Distributed Data Base server of RSMC Tokyo)

4. DATA INPUT SYSTEM

Automated.

5. QUALITY CONTROL SYSTEM

Quality control checks are performed during the decoding, pre-analysis and analysis stages. These include climatological check, vertical and horizontal consistency check and gross error check.

6. MONITORING OF THE OBSERVING SYSTEM

Monitoring is carried out at the national level.

7. FORECASTING SYSTEM

7.1 SYSTEM RUN SCHEDULE

Operational NWP runs are carried out twice a day for the 0000 UTC analysis.

		Early Run	Final Run
Pre-processing	:	0330 UTC	0530 UTC
Analysis	:	0340 UTC	0540 UTC
GSM 3-day forecast	:	0400 UTC	0600 UTC
LAM 3-day forecast	:	0440 UTC	0640 UTC
GSM 4-10 day forecast:		-	0700 UTC

7.2 MEDIUM-RANGE FORECASTING SYSTEM (4-10 days)

7.2.1 Data assimilation, objective analysis and initialization

No change to the existing model. The Global Analysis Model (GAM) primarily assimilates observation data from the international circuits such as SYNOP/SHIP, TEMP/PILOT, AIREP and METAR. It generates the input guess field by utilizing an optimal interpolation scheme using the previous day Global Spectral Model 24-hr forecast as the input guess field. The model has a 1.875-degree horizontal resolution and consists of 10 vertical levels.

7.2.2 Model

Global Spectral Model (GSM) : no change (1.875^{o} x 1.875^{o} latitude-longitude)

7.2.3 Numerical weather prediction products

As in Annex A.

7.2.4 Operational techniques for application of NWP products

Forecast winds and precipitation charts are generated as forecast guidance for forecasters and other users.

MOS techniques are employed to provide 2-day forecasts of temperature extremes and weather for selected cities worldwide.

NWP products are also used in the preparation of Significant Weather charts for aviation users, such as in the generation of CAT, jet streams, etc.

7.3 SHORT-RANGE FORECASTING SYSTEM (0-72 hrs)

7.3.1 Data assimilation, objective analysis and initialization

No change.

7.3.2 Model

Two regional limited area models
FLM-12 (40.0E-180.0E; 50.0N-45.0S), 127km grid size.
VFM-13 (92.4E-125.8E; 20.6N-12.2S). 63.5 km grid size.

7.3.3 Numerical weather prediction products

No change.

7.3.4   Operational techniques for application of NWP products

NWP products such as winds, relative humidity and precipitation are used as guidance tools in operational forecasting.

7.4   SPECIALISED FORECASTS

7.4.2   Model

Atmospheric dispersion forecasts
Hysplit-4 (Hybrid Single Particle Lagrangian Integrated Trajectory) model running on Linux platform was adapted from Air Resource Laboratory, NOAA.

Wave forecasts
The third generation WAM (Wave Modeling) model is run for two domains covering the globe (coarse run) and the Asia-Pacific region 60N-20S; 60E-180E (nested run).

Ocean Model
A coupled wave-ocean model is in the process of being implemented. This model was adapted from the Princeton Ocean Model and modified for the South East Asian region.

7.4.3   Numerical weather prediction products

Air dispersion models :
3-dimensional forward trajectories starting at 500m, 1500m and 3000m above the ground; time-integrated air concentrations within 500m layer above the ground; surface deposition (dry) of airborne pollutants.

Coupled Ocean-Wave model
Ocean current, temperature, salinity etc.

7.4.4   Operational techniques for application of NWP products

The main application of the dispersion models is to generate forecast products for environmental emergencies such as episodes of smoke haze, volcanic ash and nuclear accidents.

7.5   EXTENDED AND LONG-RANGE FORECASTS

7.5.1   The NCEP Regional Spectral Model has been adapted for the Southeast Asian region through a series of nesting to provide a high spatial resolution of up to 10 km for seasonal-interannual prediction.

8.   PLANS FOR THE FUTURE

a) To replace the NEC SX-4 supercomputer with an NEC SX-6.

b)To develop and implement higher resolution regional analysis and NWP models with more sophisticated physical parameterization schemes.

Annex A. NWP Products at Meteorological Services Division

	Global Spectal Model		Fine-mesh Limited-area Model		Very-fine Mesh Model		Ocean Wave Model
Grid Size	1.875 degree		127 km		63 km		1 degree
Vertical Levels	16		12		13		
Forecast Domain	Global (192 ? 97)		50 N -- 45 S 40 E -- 180E (114 ? 89)		20.6 N -- 12.2 S 92.4 E -- 125.8 E (55 x 55)		20 N - 10 S 80 E - 120 E
Forecast Period	240 hour for 00UTC		72 hour for 00UTC		72 hour for 00UTC		48 hour for 00UTC
Output Elements	Geopotential Height	1000,850,700,500,400, 300,250,200,150,100, 70,50,30,20,10	Geopotential Height	1000,850,700,500,400 ,300,250,200,150,100	Geopotential Height	900,850,700,600, 500,300	Surface Significant Wave Height/Direction
	Wind	Surface, 1000,850,700,500,400, 300,250,200,150,100, 70,50,30,20,10	Wind	Surface,1000,850,700, 500,400,300,250,200, 150,100	Wind	Surface, 900,850,700, 600,500,300	Significant Wave Period
	Temperature	Surface, 1000,850,700,500,400, 300,250,200,150,100, 70,50,30,20,10	Temperature	Surface,1000,850,700, 500,400,300,250,200, 150	Temperature	Surface, 900,850,700, 600,500,300	
	Dew-point Depression	Surface, 1000,850,700,500,400, 300,250,200,150,100, 70,50,30,20,10	Dew-point Depression	Surface,1000,850,700, 500,400	Specific Humidity	Surface, 900,850,700, 600,500,300	
	Omega	1000,850,700,500,400, 300,250,200,150	Omega	850,700,500,400,300	Omega	900,850,700, 600,500,300	
	Vorticity	850,700,500,200	Vorticity	850,700,500			
	Accumulated Precipitation Amount		Accumulated Precipitation Amount		Accumulated Precipitation Amount		
	Sea Level Pressure		Sea Level Pressure		Sea Level Pressure		
	Cloud Amount						
	OLR						
Time Interval	6 hour		6 hour		3 hour		6 hour