2.3 Operational aspects

The operational suite of NWP consists of more than 10 000 batch jobs classified into more than 300 job groups. Figure 2.3.1 illustrates the planned schedule of major job groups operated on supercomputer when upgrades of GSM and MSM are completed in late 2007: GSM will have TL959L60 resolution and runs four times daily (84 hours forecast except for 216 hours on 12UTC); inner loop of Global Analysis will have T106L60 resolution; and MSM forecast will be extended to 33 hours on 03, 09, 15, and 21UTC (Takeuchi, 2005). This tight schedule is made of various models along wide spectrum of time scale from Hourly Analysis to 8-month EPS.

The operation of jobs must be planned under two key constraints: resources and dependencies. Limited number of jobs can be run at the same time for the best performance. LoadLeveler controls execution of the jobs within given resources. JNOS automatically submits the jobs to the LoadLeveler following the dependencies. JNOS has an interface to be used on the operational terminal at OCSO, such as display of real-time status of the jobs or alert to the operator in case of program failure.

Batch job is a UNIX shell script with LoadLeveler directives, although UNIX shell is less effective language to describe system operation than VOS3 JCL. The total number of lines of the job scripts is more than 3 800 000. A JCL-like language (Toyoda, 2002) is used to maintain high quality of job scripts by limited human resources. The JCL scripts to be manually managed have 190 000 lines, about 1/20 of resultant shell scripts. All input/output relationships are registered into a database to generate job dependency automatically. Another database is developed to automate program build process, such as generation of Makefile or compilation.

References

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Toyoda, E., 2005: NuSDaS ─ meteorological database for operational weather service. *21st International Conference on Interactive Information Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology*, Amer. Meteor. Soc., http://ams.confex.com/ams/Annual2005/techprogram/paper_87457.htm

Left panel

	Routine B 50 nodes			Routine A 80 nodes
00UTC	8-month EPS			12/18UTC GSM Assimilation Cycle
01UTC				00UTC MSM Analysis
				00UTC MSM Forecast
02UTC				00UTC Storm Surge
				00UTC GSM Analysis
03UTC	00UTC Typhoon EPS			00UTC GSM Forecast
				Ocean Wave
04UTC	Long-range EPS Pre-process	Reanalysis		03UTC MSM Analysis
05UTC				03UTC MSM Forecast
				03UTC Storm Surge
06UTC				← Hourly Analysis
07UTC				06UTC MSM Analysis
				06UTC MSM Forecast
08UTC				06UTC Storm Surge
				06UTC GSM Analysis
09UTC	06UTC Typhoon EPS			06UTC GSM Forecast
				Ocean Wave
10UTC			JCDAS	09UTC MSM Analysis
				09UTC MSM Forecast
11UTC	ODAS			09UTC Storm Surge
				00/06UTC Cycle

Right panel

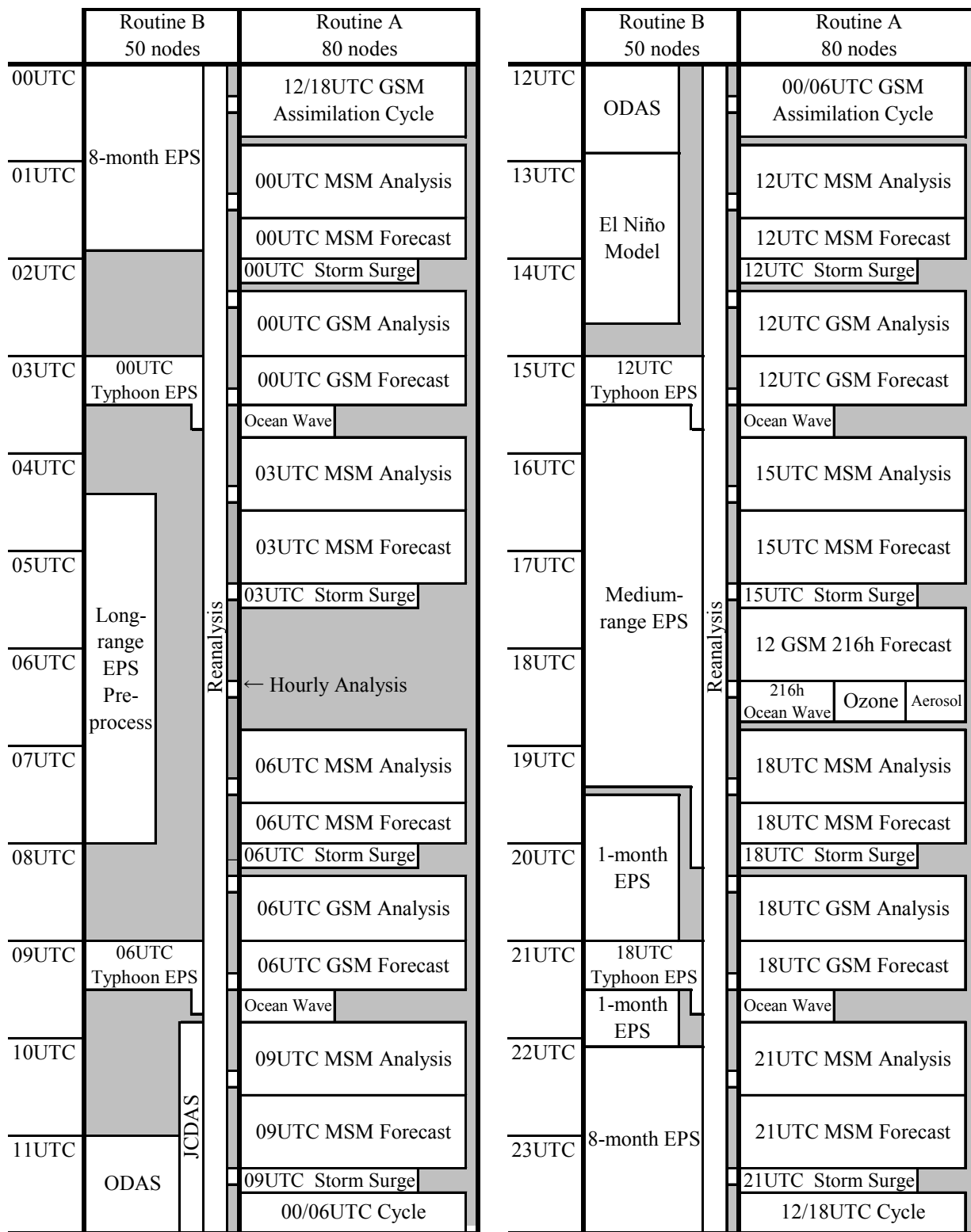|	Routine B 50 nodes			Routine A 80 nodes
12UTC	ODAS			00/06UTC GSM Assimilation Cycle
13UTC	El Niño Model			12UTC MSM Analysis
				12UTC MSM Forecast
14UTC				12UTC Storm Surge
				12UTC GSM Analysis
15UTC	12UTC Typhoon EPS	Reanalysis		12UTC GSM Forecast
				Ocean Wave
16UTC	Medium-range EPS			15UTC MSM Analysis
17UTC				15UTC MSM Forecast
				15UTC Storm Surge
18UTC				12 GSM 216h Forecast
				216h Ocean Wave / Ozone / Aerosol
19UTC				18UTC MSM Analysis
20UTC	1-month EPS			18UTC MSM Forecast
				18UTC Storm Surge
				18UTC GSM Analysis
21UTC	18UTC Typhoon EPS			18UTC GSM Forecast
	1-month EPS			Ocean Wave
22UTC	8-month EPS			21UTC MSM Analysis
23UTC				21UTC MSM Forecast
				21UTC Storm Surge
				12/18UTC Cycle

Figure 2.3.1 Planned daily schedule of NWP at JMA for late 2007. Height and width of each box indicate approximate time range and number of nodes, respectively.