

Upgraded Numerical Wind Wave Prediction Systems at KMA and their Validation

- **Current & Future NWP System at KMA**
- **Upgraded 2008 Wind Wave Prediction Systems**
- **Monthly Validation Statistics and Case Evaluation**
- **JCOMM Operational Global Wave Model Inter-comparison**

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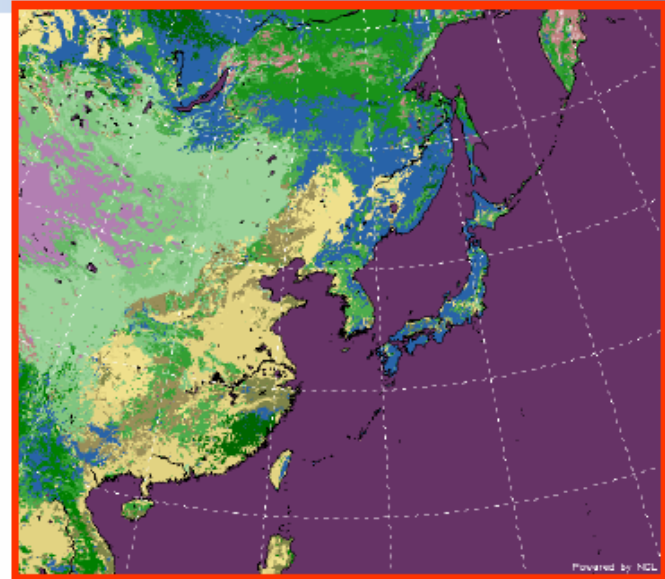
Cape Town, Oct. 13, 2008

● Operational NWP Models at KMA

Model	Analysis	Resolution (Layers)	Lead time (Days)	Remark
Global Spectral Model (GDAPS) → Unified Model (UKMO)	3DVAR	T426 (30km, 40 levels)	10.5	
	3DVAR	T213 (55km, 40 levels)	10	32 Ensemble
	3DOI	T106 (110km, 21 levels)	90	Ensemble
Regional Model (RDAPS) & KWRF	3DOI/ 3DVAR	30/ 10/ 5km(33)	2.5	Triple Mesh
Typhoon Model (DBAR)	Bogus	20km (barotropic)	3	Typhoon Track
Wave Model (ReWAM,GoWAM) → Upgraded	n/a	0.25°	2.5	Asian
	n/a	1.25° × 1.25°	10.5	Global
Statistical Model		-	2.5	Temp, PoP

● Summary of KWRF & RDAPS

- WRF Version 2.1.2
- WRFSI
- KWRF 10km(574x514x31)
- 48 Hours forecast
- U3VR 6 hour cycle
- DFI



Model Physics

	RDAPS	KWRF
Microphysics Scheme	Mixed Phase	WSM6
Radiation Scheme	Cloud radiation	Dudhia/RRTM
Cumulus parameterization	New Kain-Fritsch	New Kain-Fritsch
Land-Surface model	5-layer soil	Noah LSM
PBL Scheme	MRF PBL	YSU PBL

● KWRF & RDAPS Sea Surface Wind Comparison

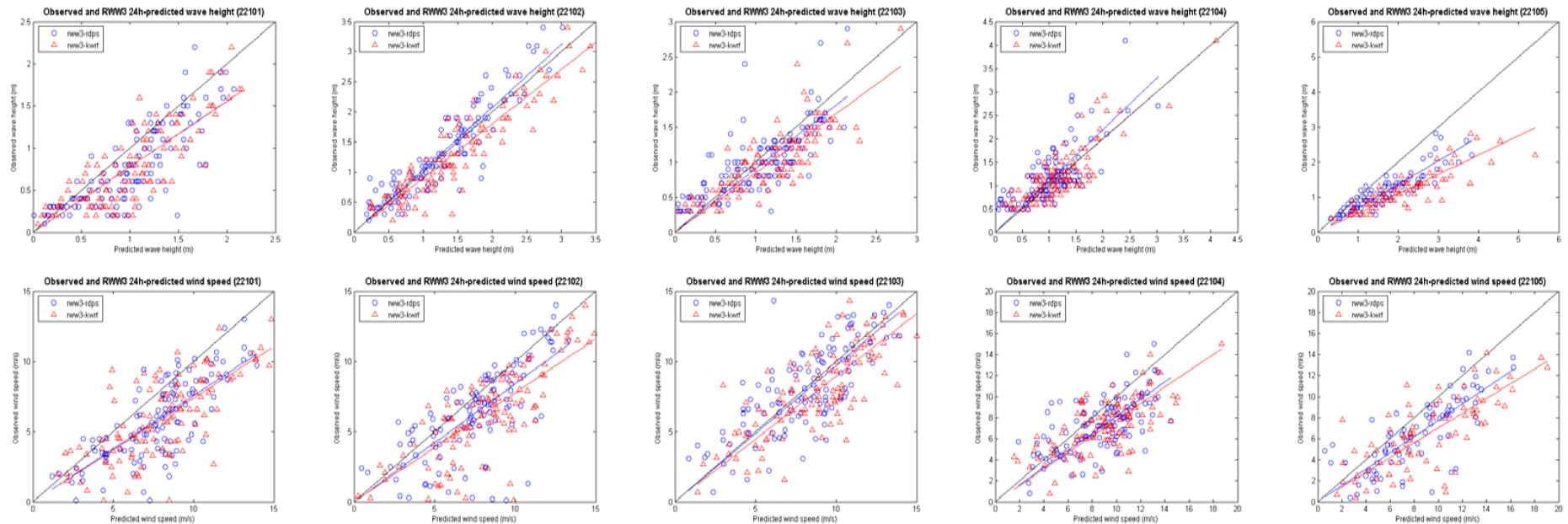
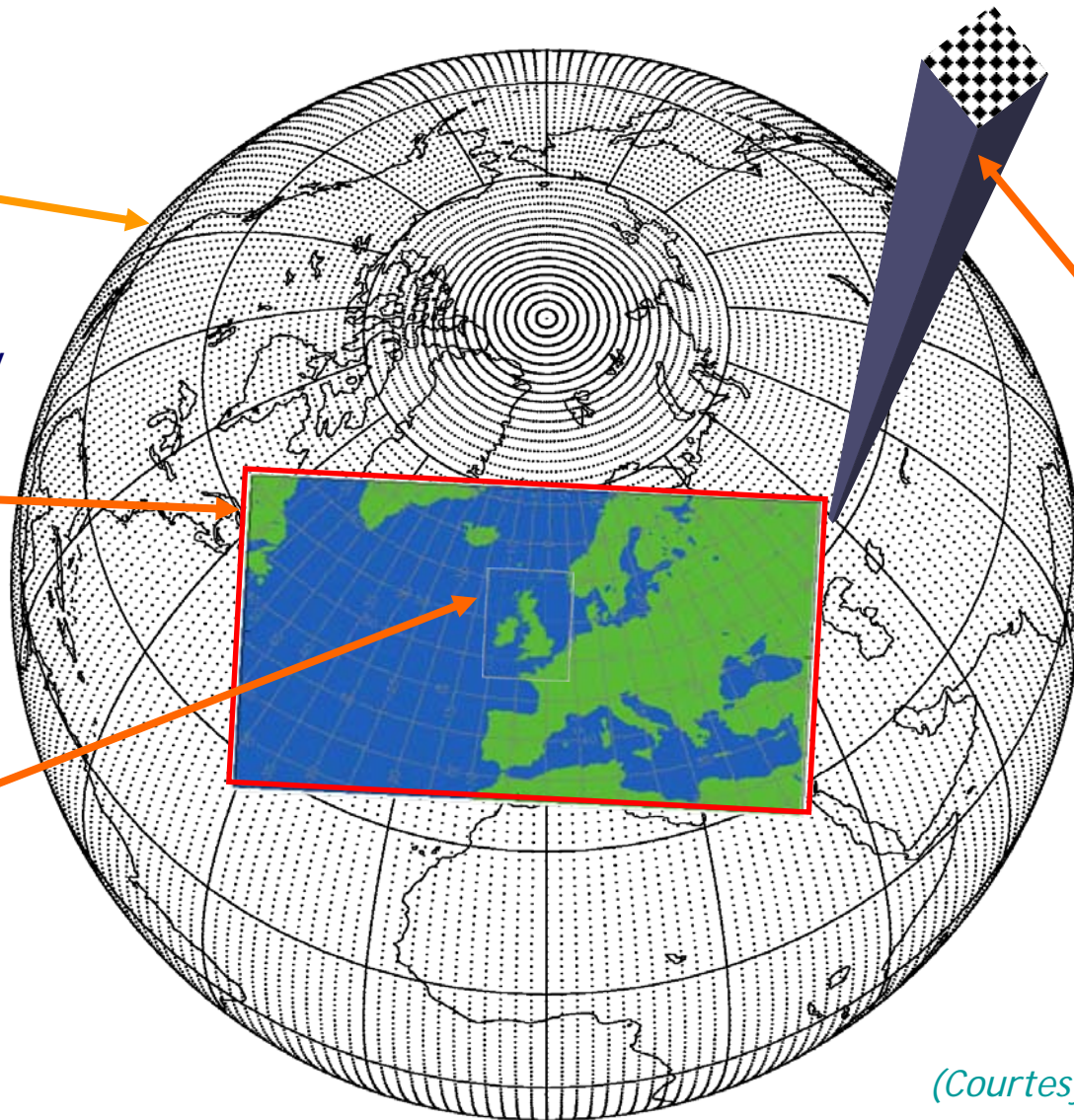


Fig. 1. Scatter plots of RWW3 predicted versus observed wave height (upper) and wind speed (lower) as well as line plots of regression between model and observed values from January to March 2008 for Deokjeok(22101), Chilbal(22102), Geomun(22103), Geoje(22104) and Donghae (22105) buoy stations. Blue circles and lines are for RWW3-RDPS and red triangles and lines are for RWW3-KWRF.

Operational NWP Models: 2007



Global

- 40Km
- 4DVAR
- 60 hour forecast twice/day
- 144 hour forecast twice/day
- +EPS 24member,90km

NAE

- 12Km 38 L
- 4DVAR
- 60 hour forecast
- 4 times per day
- +EPS 24member,24km

UK4

- 4km 38 L
- 3DVAR
- 36 hour forecast
- 4 times per day

50
levels
(70L in
Feb 08)

(Courtesy of S. Bell)

● Wind Wave Prediction System Development at KMA

- 1987 - 1991 : Base research on the characteristics of ocean wave near Korean peninsula, (MRI/KMA: Meteorological Research Institute)
- 1992 : Operation of Far East Asia Model and 1st generation ocean wave model (DSA-5) with Cardone Model for the generation of sea surface winds
- 1996 : Operation of Regional Data Assimilation and Prediction System(RDAPS, 40km) and adaptation of wave model to corresponding horizontal resolution
- 1998 : Semi-operation of the 3rd generation wave model (WAM) with 0.5 degree resolution on CRAY-C90 for the replacement of DSA-5 model
- 1999 : Installation of NEC SX5-16A, Upgrade of RDAPS(MM4=>MM5), Operation of Regional (ReWAM : 0.25 deg) and Global (GoWAM: 1.25 deg) Wave Prediction System

- 2003 - 2005 : Coastal Wave Prediction System development in cooperation with Korea Ocean Research and Development Institute, Installation of Cray X1E (2005)
- 2006 - 2007 : Test Operation of high resolution ReWW3 (1/12deg) and Coastal Wave Prediction System (CoWW3, 1/120deg)
- 2008 3. : Operation of ReWW3 and CoWW3
- 2008 7. ~ : Test Operation of GoWW3 (0.5 deg)

- 2009 9. : Installation of 3rd supercomputer (~ 200 Tera Flops)
- 2010 10. : Operation of UM-N512L70 (Unified Model,~25km) based Wave Prediction System

Operational Wind Wave Prediction Models

Global

- 60Km (1/2°)
- 252 hour forecast twice/day

Regional

- 8Km (1/12°)
- 66 hour forecast twice/day

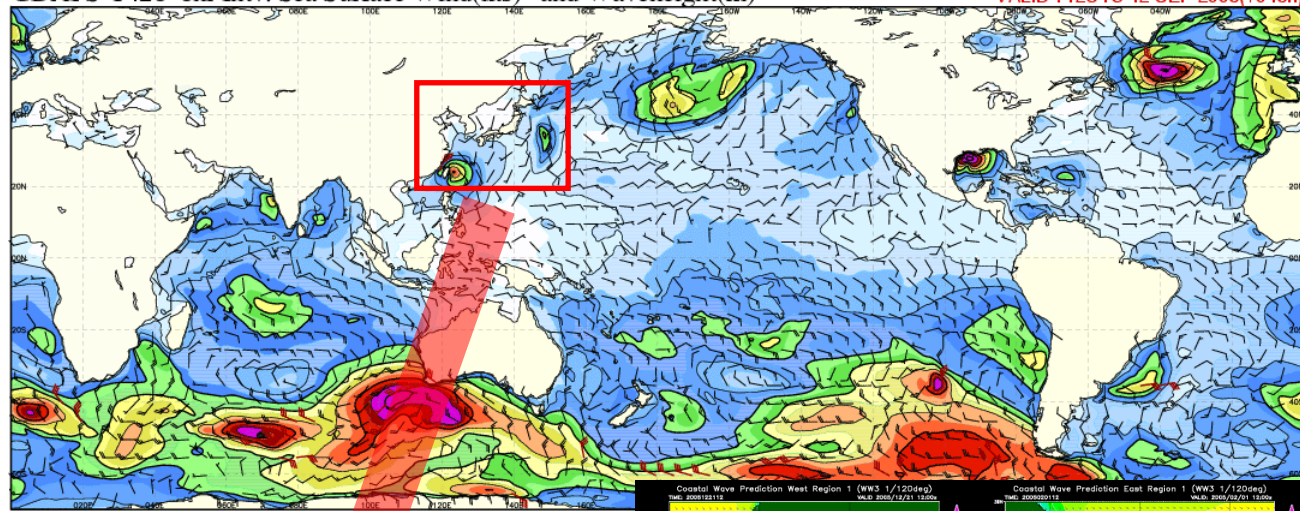
Coastal

- 1km (1/120°)
- 24 hour forecast twice/day
- 6 coastal domains

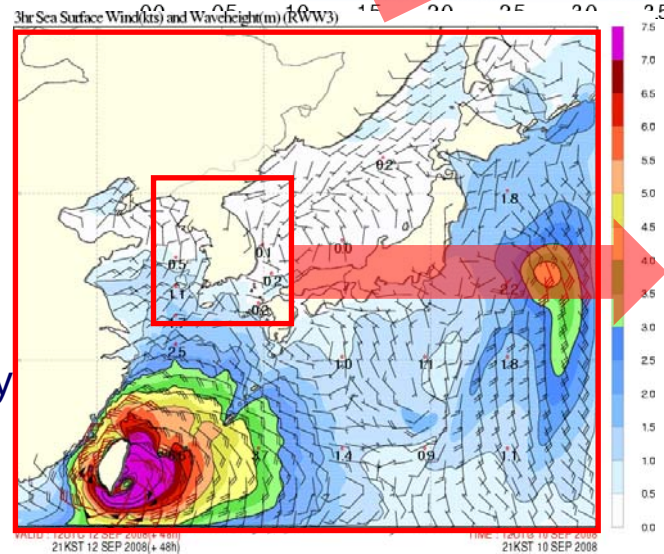
KMA Global Wave Model (GoWW3 : 0.5 deg)

GDAPS-T426 6hr Intv. Sea Surface Wind(kts) and Waveheight(m)

VALID : 12UTC 12 SEP 2008(+048h)

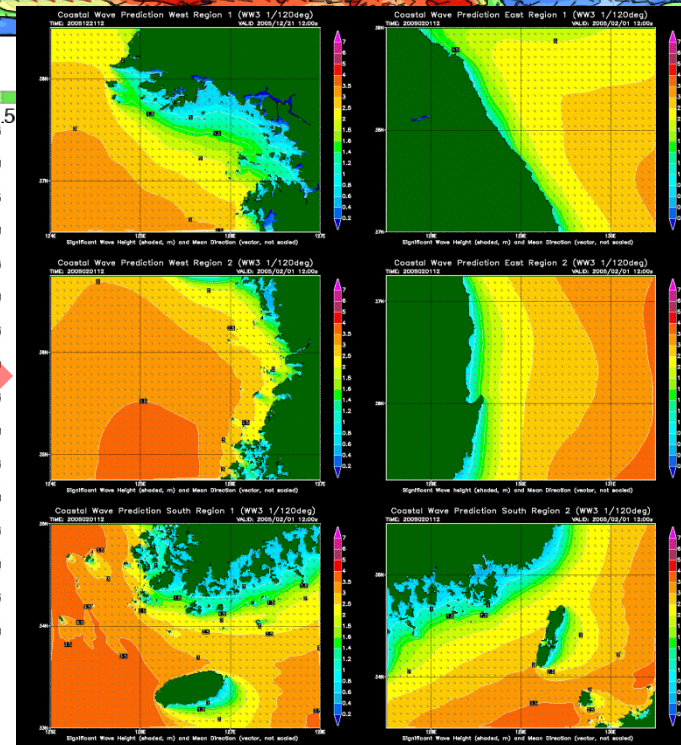


VALID : 12UTC 12 SEP 2008(+048h)



VALID : 12010 12 SEP 2008(+48h)

TIME : 12010 10 SEP 2008



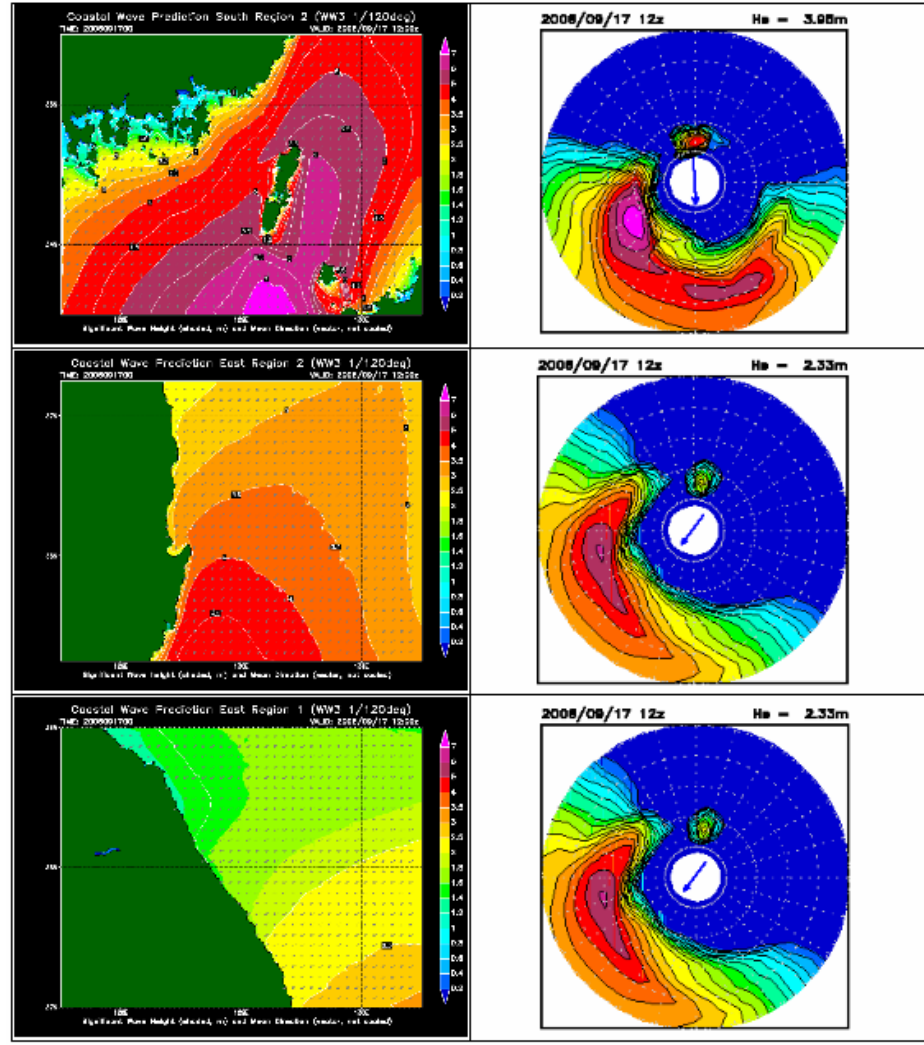
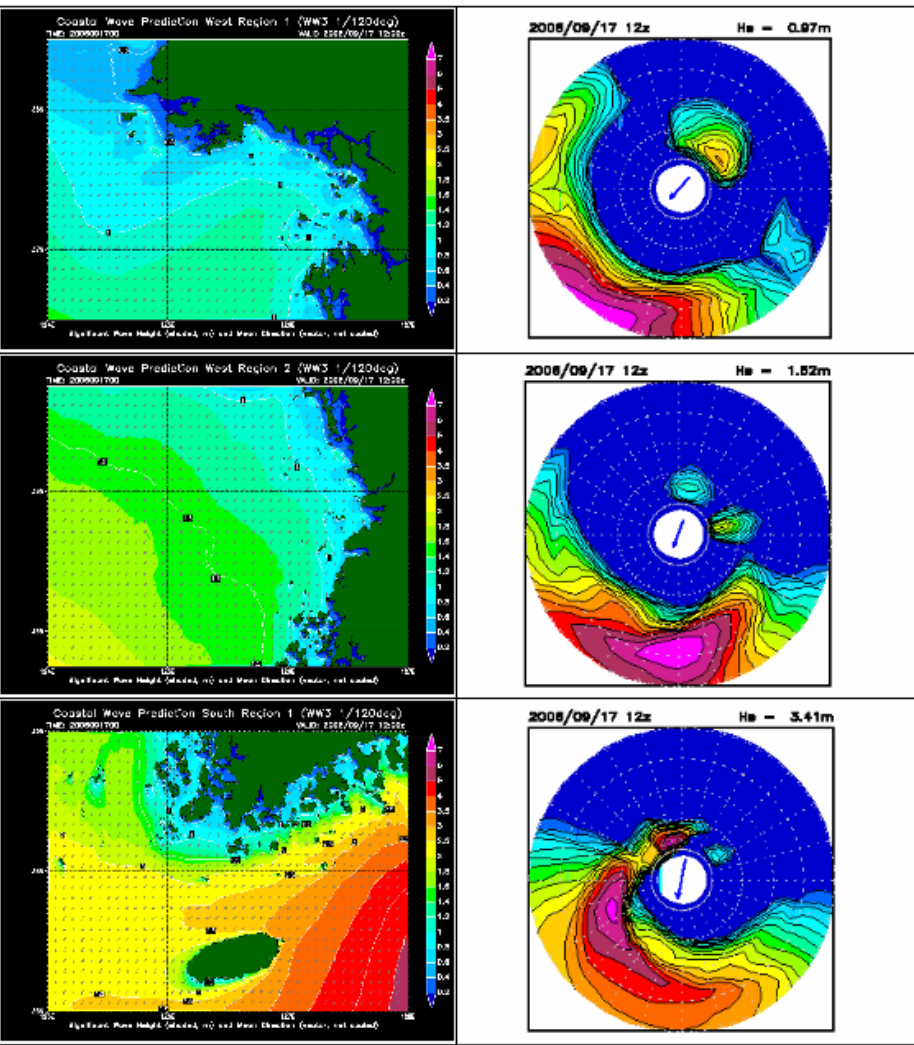


그림 4.2 서해중부(CoWW3-RGW1), 서해남부(CoWW3-RGW2), 남해서부(CoWW3-RGS1) 도메인의 유의파고, 파향 예상도 및 덕적도 브이, 칠발도 브이, 거문도 브이 지점에서의 스펙트럼 에너지 예상도

그림 4.3 남해동부(CoWW3-RGS2), 동해중부(CoWW3-RGE1), 동해남부(CoWW3-RGE2) 도메인의 유의파고, 파향 예상도 및 거제도 브이, 동해 브이 지점에서의 스펙트럼 에너지 예상도

	GoWW3	ReWW3	CoWW3	ReSTORM	CoSTORM*
Model Code	WAVEWATCH III Code (version 2.22)			POM Code (2D, Kantha)	
Model Coordinate	Spherical Coordinate			Spherical Coordinate	
Model Domain	70°S–70°N, 0°E–360°E	20°N–50°N, 115°E–150°E	RGW1:36.50°N–38.50°N,124.00°E–127.00°E RGW2:34.75°N–36.75°N,124.00°E–127.00°E RGS1:33.00°N–35.00°N,125.00°E–128.00°E RGS2:33.50°N–35.50°N,127.50°E–130.50°E RGE1:37.00°N–39.00°N,127.50°E–130.50°E RGE2:35.25°N–37.25°N,128.50°E–131.50°E	Same as ReWW3 area	Same as CoWW3 area
Spectral Resolution	25 Frequency 36 Direction		25 Frequency 36 Direction	N/A	
Spatial Resolution	0.5° (720×281)	1/12° (421×361)	1/120° (361×241)	1/12° (421×361)	1/120° (321×241)
ΔT	720sec	150sec	30sec	900sec	30sec
Prediction & Starting Time	256H (00,12UTC)	66H (00,12UTC)	24H (00,12UTC)	48H (00,12UTC)	
Initial & Boundary Data	-12H FCST	-12H FCST	-12H FCST/ ReWW3 Boundary Data	Warm Start	Warm Start ReSTORM Boundary Data
Input Forcing data	GDAPS Sea Surface Wind (0.5625 °)	RDAPS Sea Surface Wind (30km), KWRP Sea Surface Wind (10km)		RDAPS sea Surface Wind & Mean Sea Level Pressure	

※ GDAPS: Global Data Assimilation and Prediction System

RDAPS: Regional Data Assimilation and Prediction System

KWRP: Korea Weather and Forecasting model

GoWW3: Global WAVEWATCH III

ReWW3: Regional WAVEWATCH III

CoWW3: Coastal WAVEWATCH III

ReSTORM: Regional Storm Surge Model

CoSTORM: Coastal Storm Surge Model

• The governing equation & source term parameterization

$$\frac{\partial E}{\partial t} + \nabla \cdot (c_g E) = S = S_{in} + S_{nl} + S_{ds} \quad \begin{matrix} E = E(f, \theta, \mathbf{x}, t) \\ c_g = c_g(f, \theta) \end{matrix}$$

- Initial Condition : hindcast or restart from previous run's spectra

- Wind Input :
controls the quality of wave prediction

- Dissipation :
bottom interaction and wave breaking

- Non-Linear Interactions :
most time consuming and energy transfer

- Propagation :
includes shallow water effect & currents

- Depth : shallow ($h < \lambda/4$) & deep
JONSWAP bottom friction (Hasselmann)

- Effects of Boundaries, Coast Lines, and Islands :
nested inside larger domain or zero energy flux along the boundaries

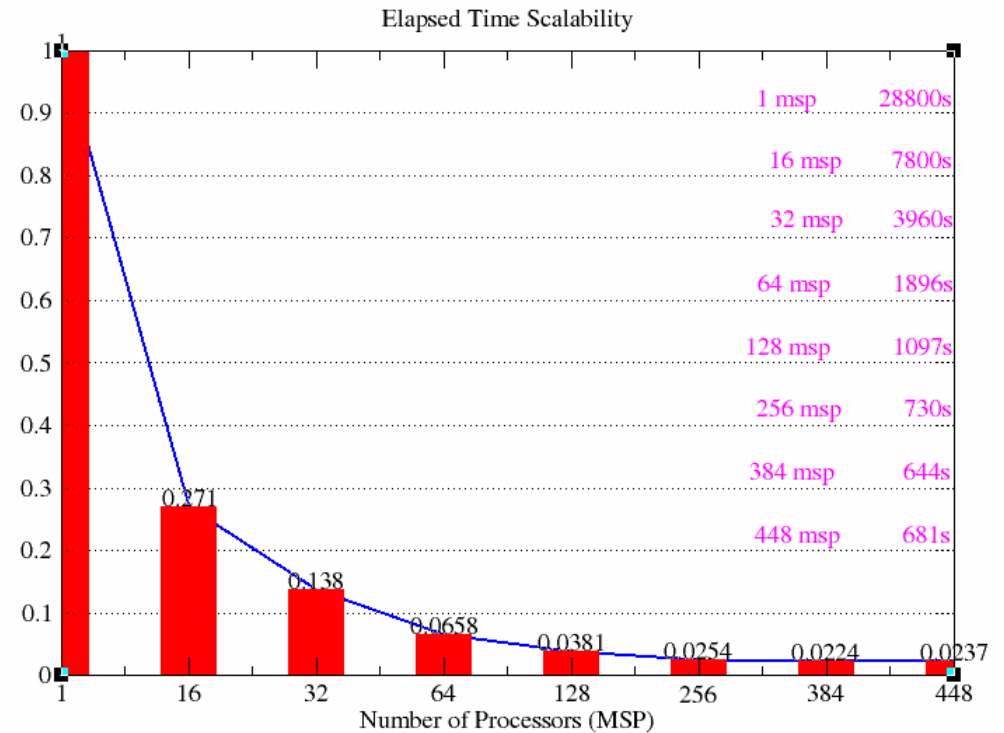
WAM-3	Komen (1984)
Tolman & Chalikov ✓	1996

Discrete Interaction Approx. ✓	Hasselmann
Webb-Resio-Tracy	Exact

PR 1	1 st order propagation
PR 2	Booij (1987) dispersion correc.
PR 3 ✓	Tolman (2002) averaging
PR 4	Tolman (2002) divergence

● Scalability Test of WAVEWATCH-III

CPU	Cray X1E	NCEP Linux
1	11.49	246.80
2	6.65	130.99
3	4.73	89.46
4	3.84	68.05
5	3.37	65.11
6	2.98	54.11
7	2.93	47.23
8	2.79	43.35
9	3.03	54.26
10	2.89	48.35
11	2.91	46.54
12	2.75	41.00
13	2.70	50.94
14	2.66	47.04
15	2.64	44.52
16	2.76	46.32



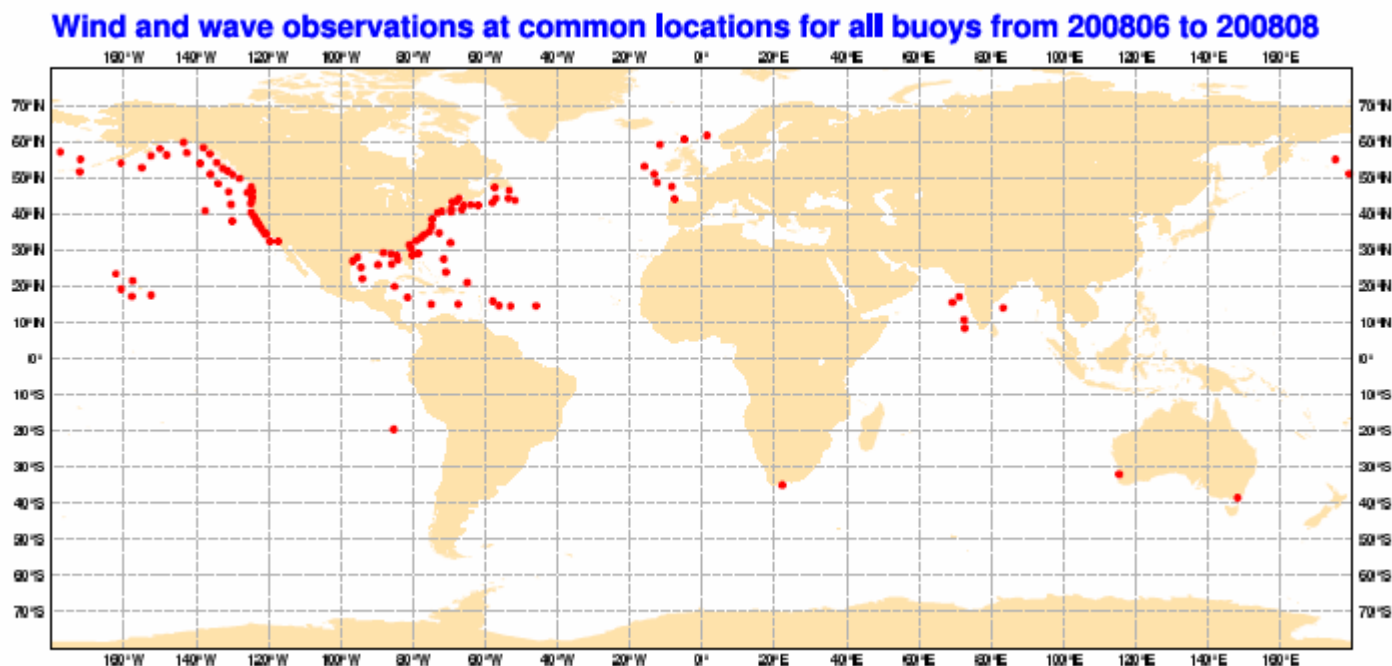
Scalability of 1/12deg ReWAM upon number of used processors

Comparison of WW-III test version computation in different platform
Cray X1E at KMA and Linux Cluster at NCEP

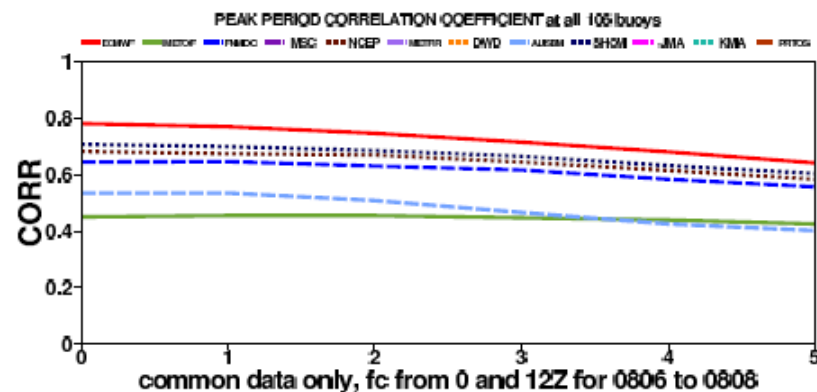
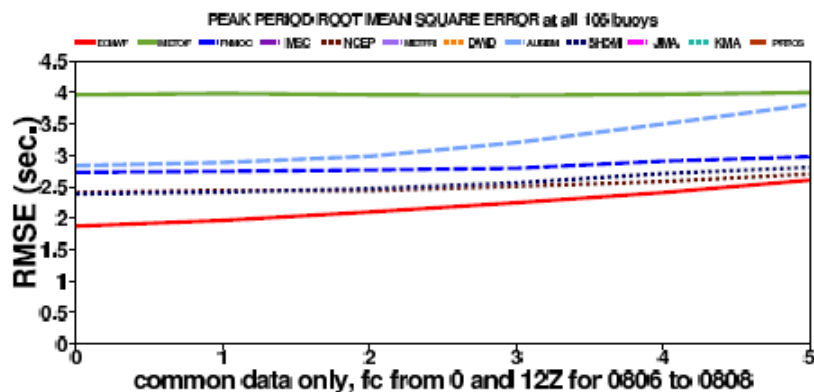
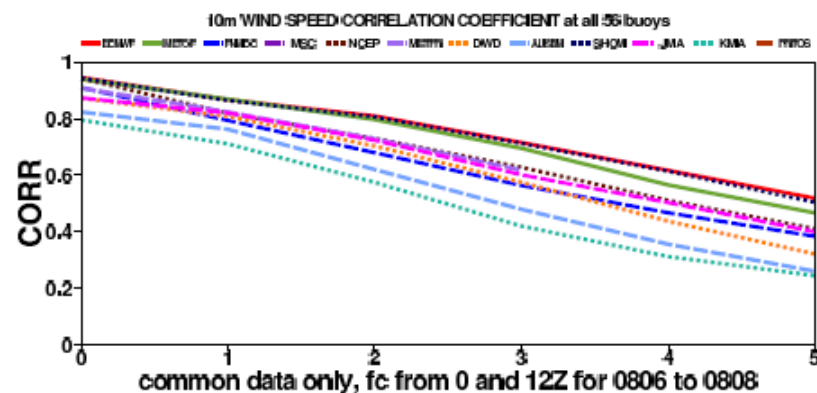
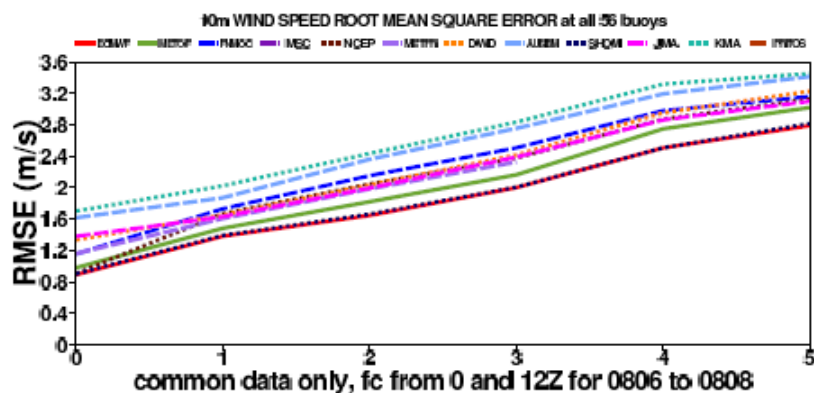
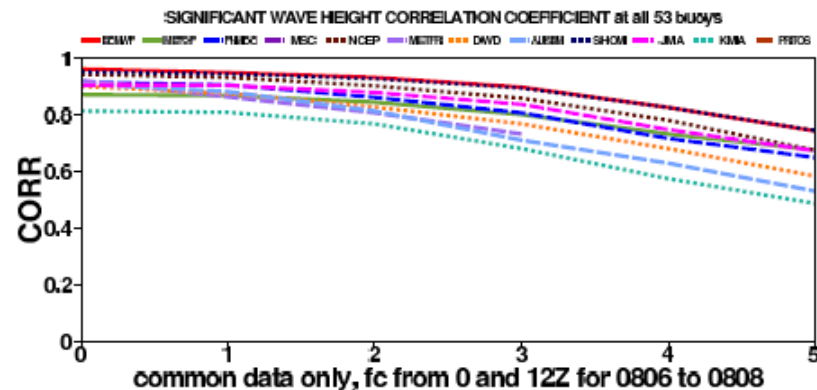
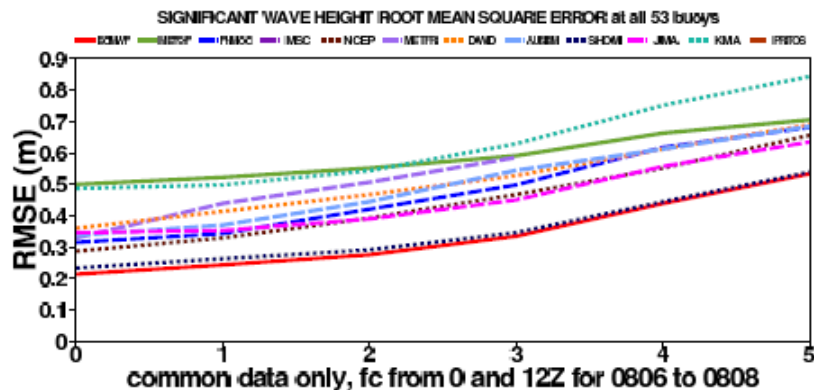
Intercomparison of operational wave forecasting systems against buoys: data from ECMWF, MetOffice, FNMOC, NCEP, MeteoFrance, DWD, BoM, SHOM, JMA and KMA June 2008 to August 2008

Jean-Raymond Bidlot, European Centre for Medium-range Weather Forecasts, jean.bidlot@ecmwf.int

September 17, 2008



(Courtesy of J. Bidlot)

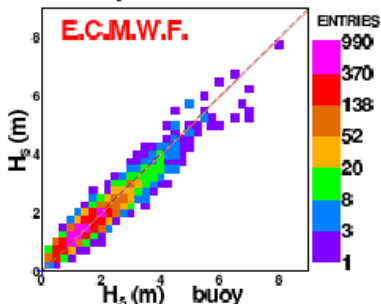


(a) R.M.S.E.

(b) Correlation Coefficient

(Courtesy of J. Bidlot)

all buoys 0806 to 0808



E.C.M.W.F.

ENTRIES = 7975

MODEL MEAN = 1.59 STDEV = 0.677

BUOY MEAN = 1.57 STDEV = 0.761

LSQ FIT: SLOPE = 0.857 INTR = 0.247

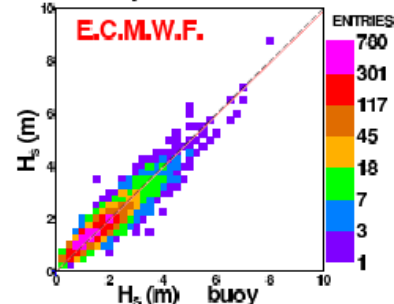
RMSE = 0.213 BIAS = 0.022

CORR COEF = 0.953 SI = 0.135

SYMMETRIC SLOPE = 0.692

Comparison of analysed ECMWF wave height with averaged buoy data. fc from 0 and 12Z.

all buoys 0806 to 0808



E.C.M.W.F.

ENTRIES = 7172

MODEL MEAN = 1.58 STDEV = 0.688

BUOY MEAN = 1.57 STDEV = 0.768

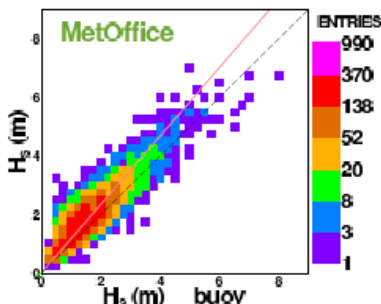
LSQ FIT: SLOPE = 0.837 INTR = 0.270

RMSE = 0.276 BIAS = 0.014

CORR COEF = 0.934 SI = 0.176

SYMMETRIC SLOPE = 0.698

Comparison of forecast (t+48) ECMWF wave height with averaged buoy data. fc from 0 and 12Z.



MetOffice

ENTRIES = 7975

MODEL MEAN = 1.88 STDEV = 0.787

BUOY MEAN = 1.57 STDEV = 0.761

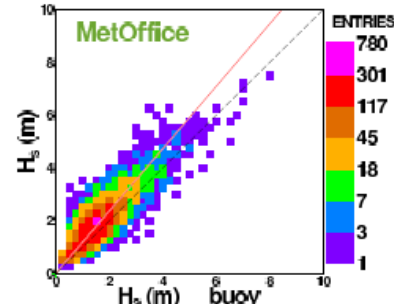
LSQ FIT: SLOPE = 0.903 INTR = 0.464

RMSE = 0.499 BIAS = 0.312

CORR COEF = 0.873 SI = 0.249

SYMMETRIC SLOPE = 1.169

Comparison of analysed NCEP wave height



MetOffice

ENTRIES = 7172

MODEL MEAN = 1.90 STDEV = 0.829

BUOY MEAN = 1.57 STDEV = 0.768

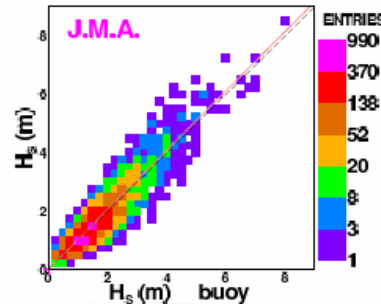
LSQ FIT: SLOPE = 0.913 INTR = 0.462

RMSE = 0.582 BIAS = 0.325

CORR COEF = 0.846 SI = 0.284

SYMMETRIC SLOPE = 1.183

Comparison of forecast (t+48) NCEP wave height



J.M.A.

ENTRIES = 7975

MODEL MEAN = 1.58 STDEV = 0.822

BUOY MEAN = 1.57 STDEV = 0.761

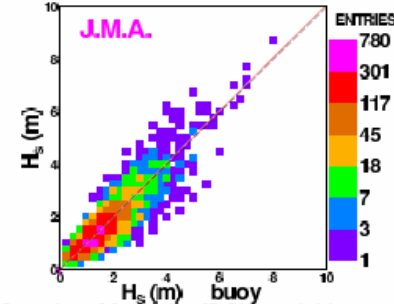
LSQ FIT: SLOPE = 0.890 INTR = 0.038

RMSE = 0.346 BIAS = 0.006

CORR COEF = 0.907 SI = 0.220

SYMMETRIC SLOPE = 1.019

Comparison of analysed JMA wave height with averaged buoy data. fc from 0 and 12Z.



J.M.A.

ENTRIES = 7172

MODEL MEAN = 1.56 STDEV = 0.812

BUOY MEAN = 1.57 STDEV = 0.768

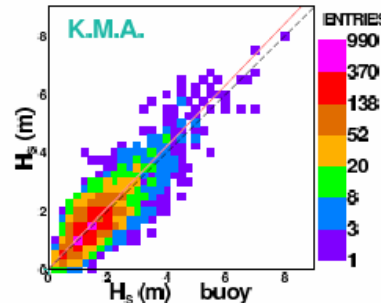
LSQ FIT: SLOPE = 0.930 INTR = 0.104

RMSE = 0.389 BIAS = -0.005

CORR COEF = 0.880 SI = 0.248

SYMMETRIC SLOPE = 1.008

Comparison of forecast (t+48) JMA wave height with averaged buoy data. fc from 0 and 12Z.



K.M.A.

ENTRIES = 7975

MODEL MEAN = 1.65 STDEV = 0.814

BUOY MEAN = 1.57 STDEV = 0.761

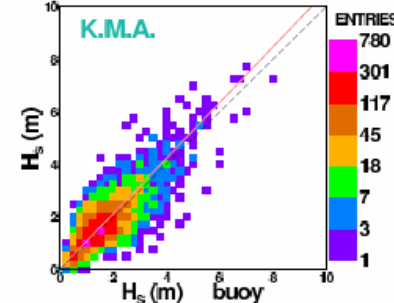
LSQ FIT: SLOPE = 0.872 INTR = 0.276

RMSE = 0.487 BIAS = 0.076

CORR COEF = 0.915 SI = 0.207

SYMMETRIC SLOPE = 1.052

Comparison of analysed KMA wave height with averaged buoy data. fc from 0 and 12Z.



K.M.A.

ENTRIES = 7172

MODEL MEAN = 1.67 STDEV = 0.799

BUOY MEAN = 1.57 STDEV = 0.768

LSQ FIT: SLOPE = 0.799 INTR = 0.415

RMSE = 0.543 BIAS = 0.100

CORR COEF = 0.769 SI = 0.240

SYMMETRIC SLOPE = 1.059

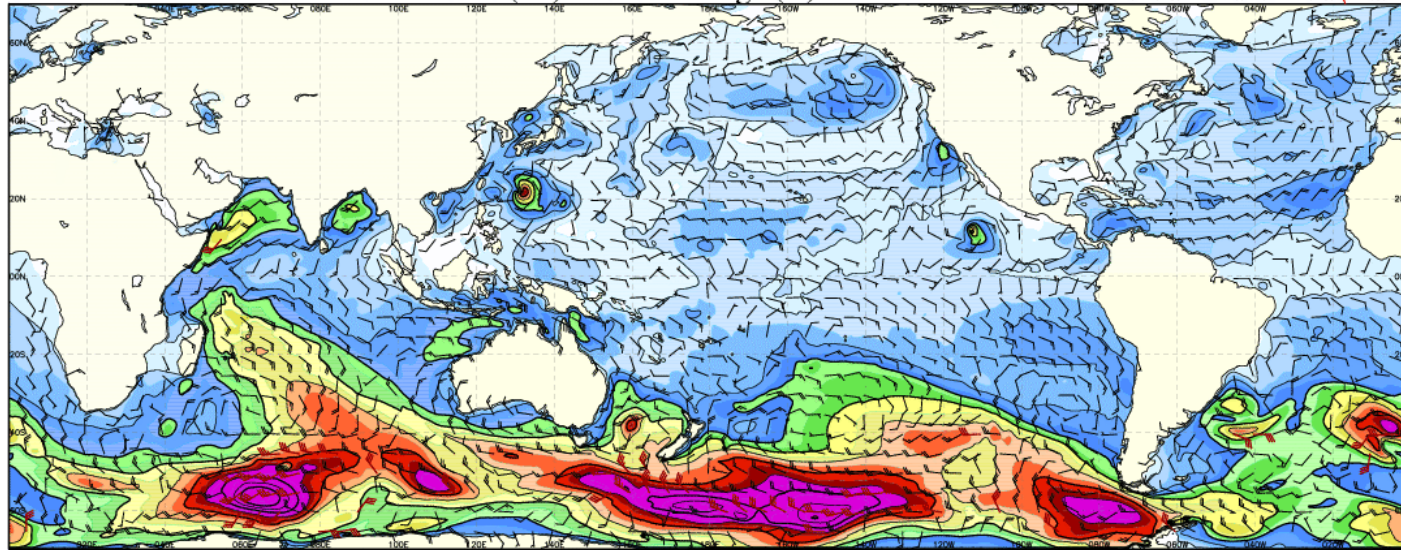
Comparison of forecast (t+48) KMA wave height with averaged buoy data. fc from 0 and 12Z.

(Courtesy of J. Bidlot)

KMA Global Wave Model (GoWW3 : 0.5 deg)

GDAPS-T426 6hr Intv. Sea Surface Wind(kts) and Waveheight(m)

VALID : 00UTC 23 JUN 2008(+108h)



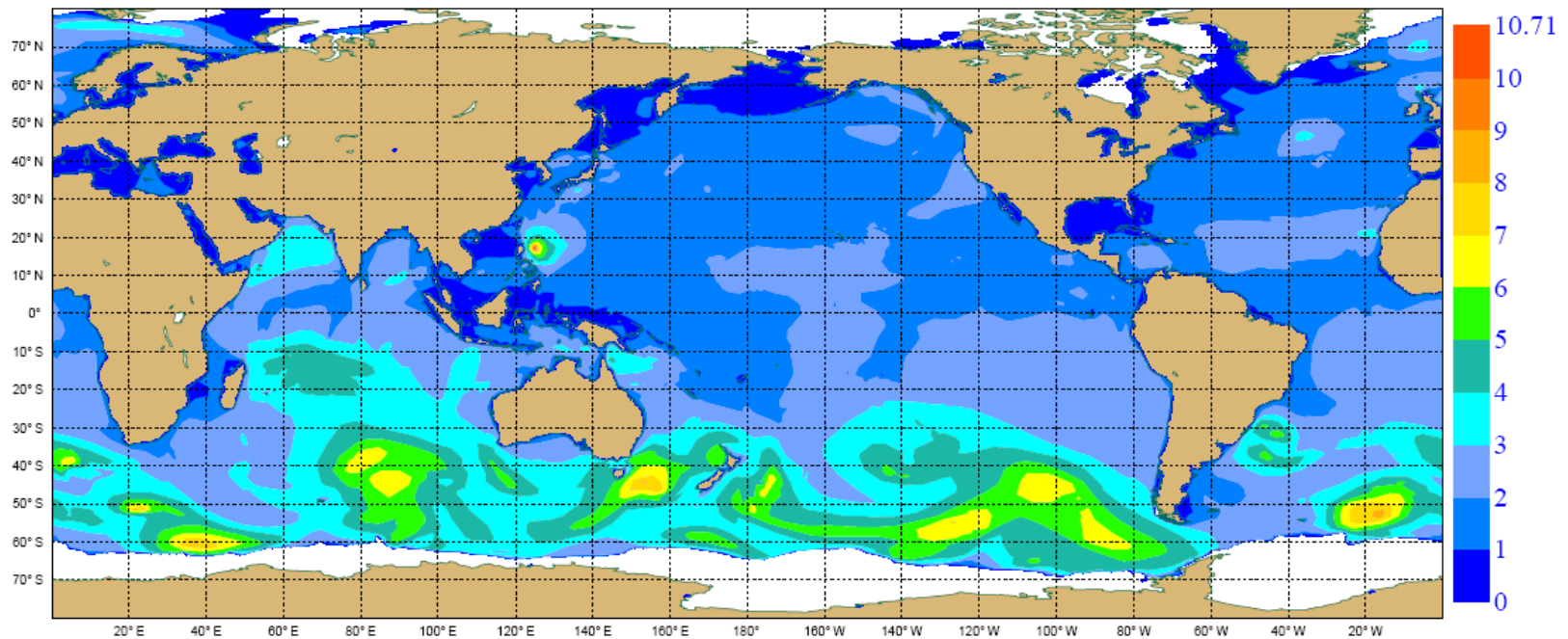
VALID : 00UTC 23 JUN 2008(+108h)

TIME : 12UTC 18 JUN 2008



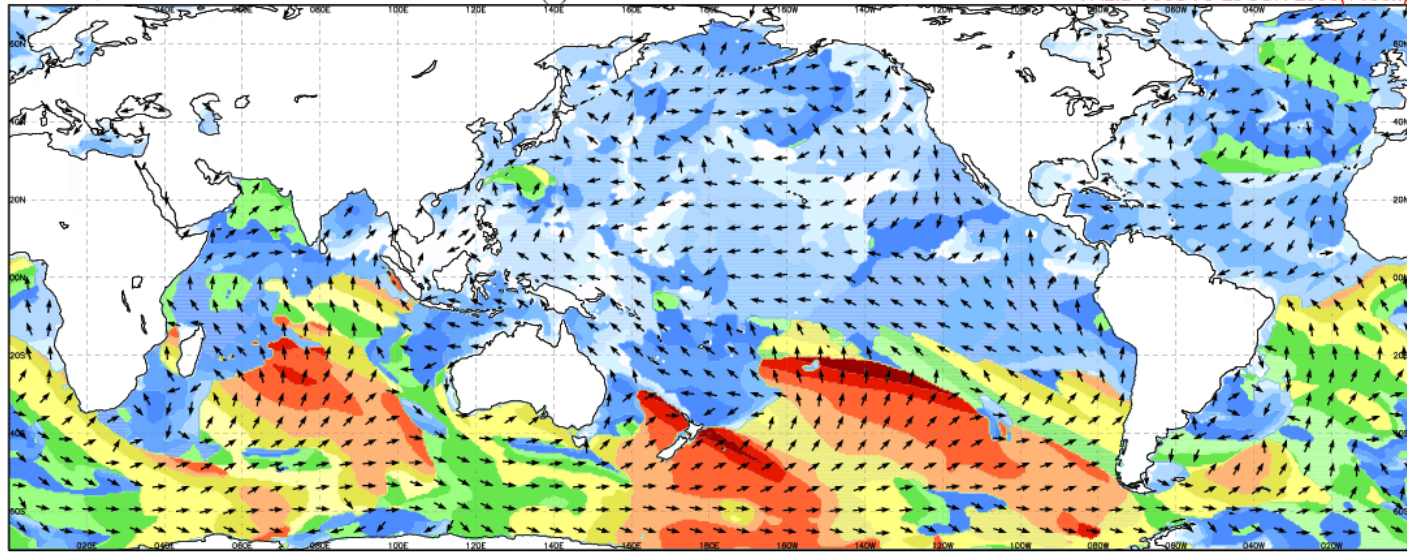
(Courtesy of J. Bidlot)

Wednesday 18 June 2008 12UTC ECMWF Forecast t+108 VT: Monday 23 June 2008 00UTC Surface: Significant wave height (Exp: 0001)



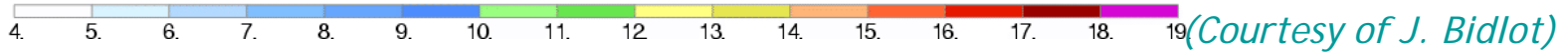
KMA Global Wave Model (GoWW3 : 0.5 deg)
GDAPS-T426 6hr Intv. Peak Wave Periods (s) and Wave Direction

VALID : 00UTC 23 JUN 2008(+108h)

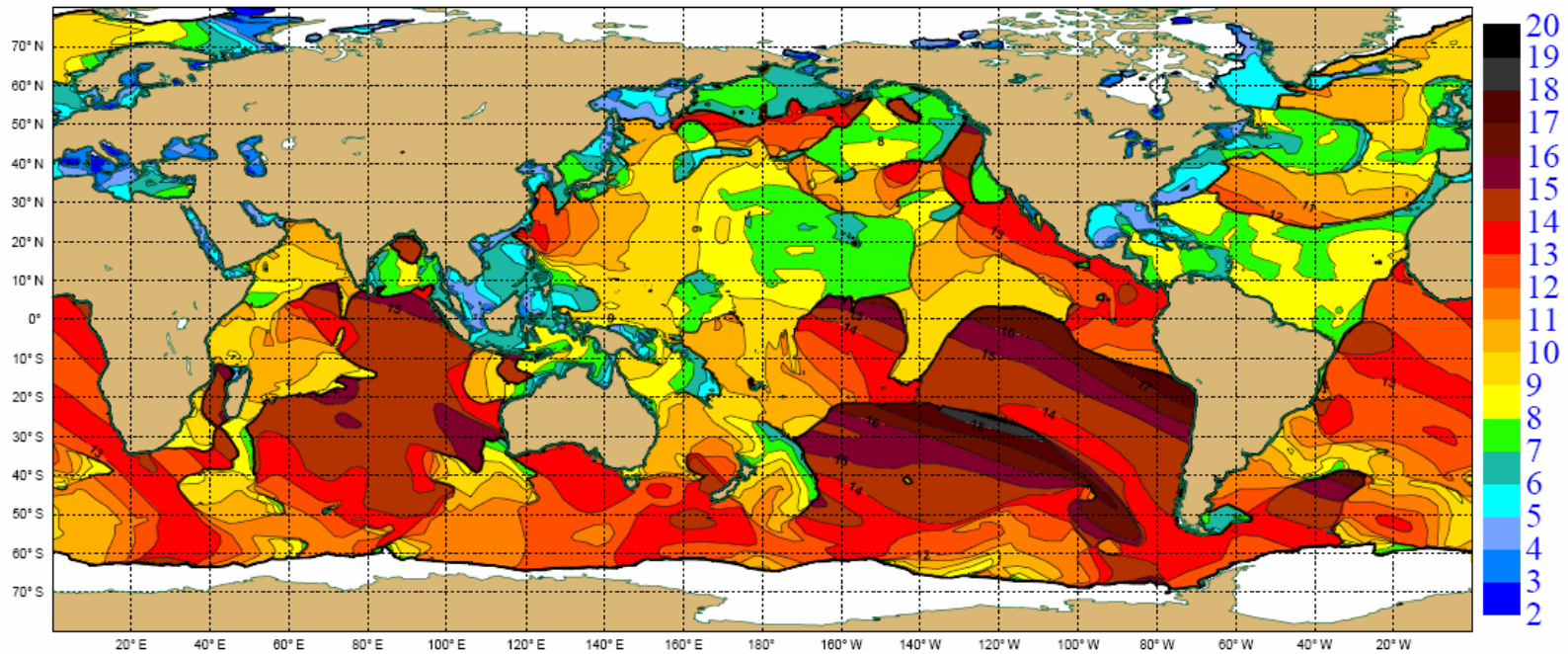


VALID : 00UTC 23 JUN 2008(+108h)

TIME : 12UTC 18 JUN 2008

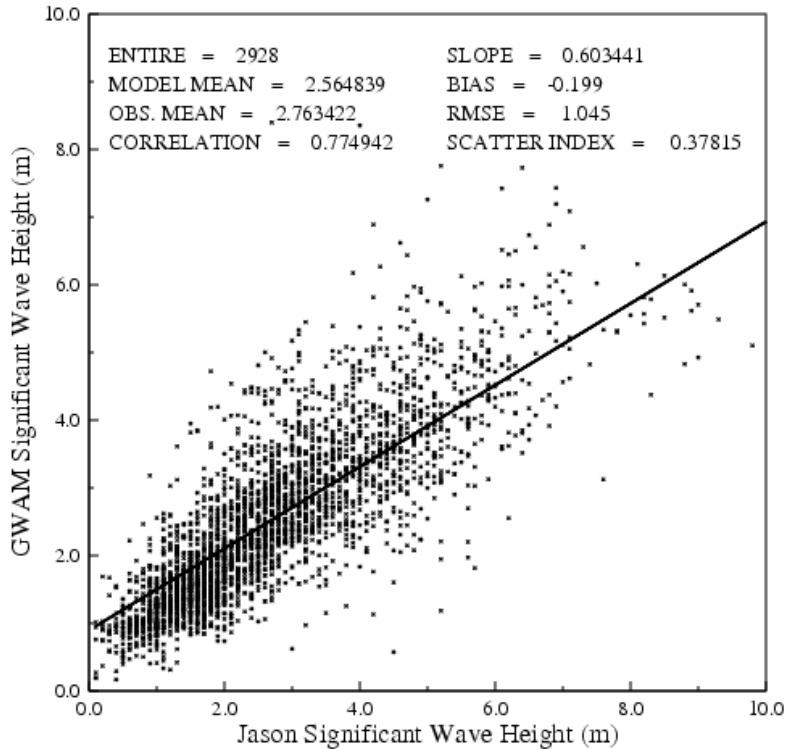


Wednesday 18 June 2008 12UTC ECMWF Forecast t+108 VT: Monday 23 June 2008 00UTC Surface: Peak period of 1D spectra



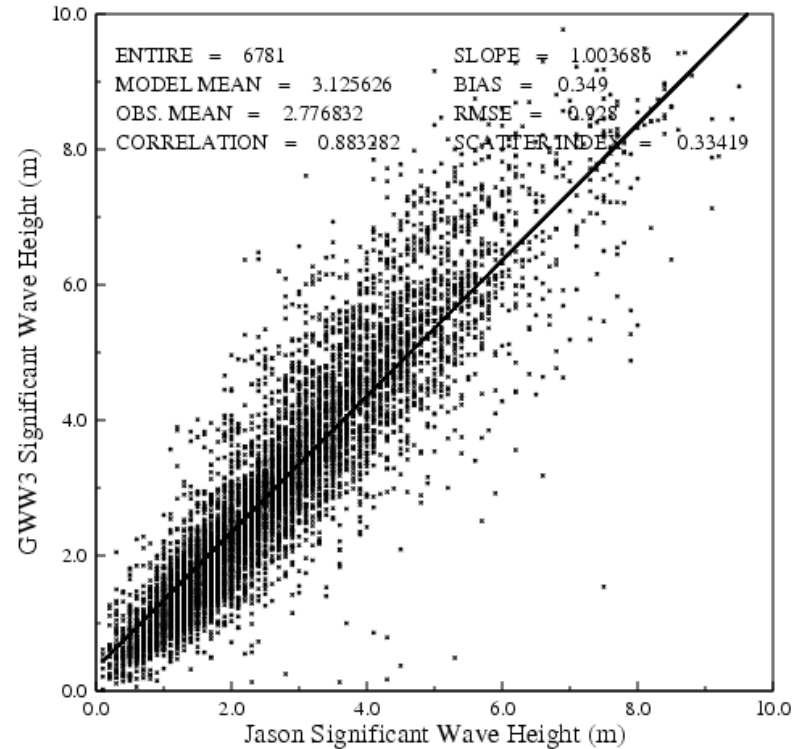
- Comparison of GoWAM(1.25) & GoWW3(0.5) against Jason Significant Wave Height

000HR FCST



200807

000HR FCST

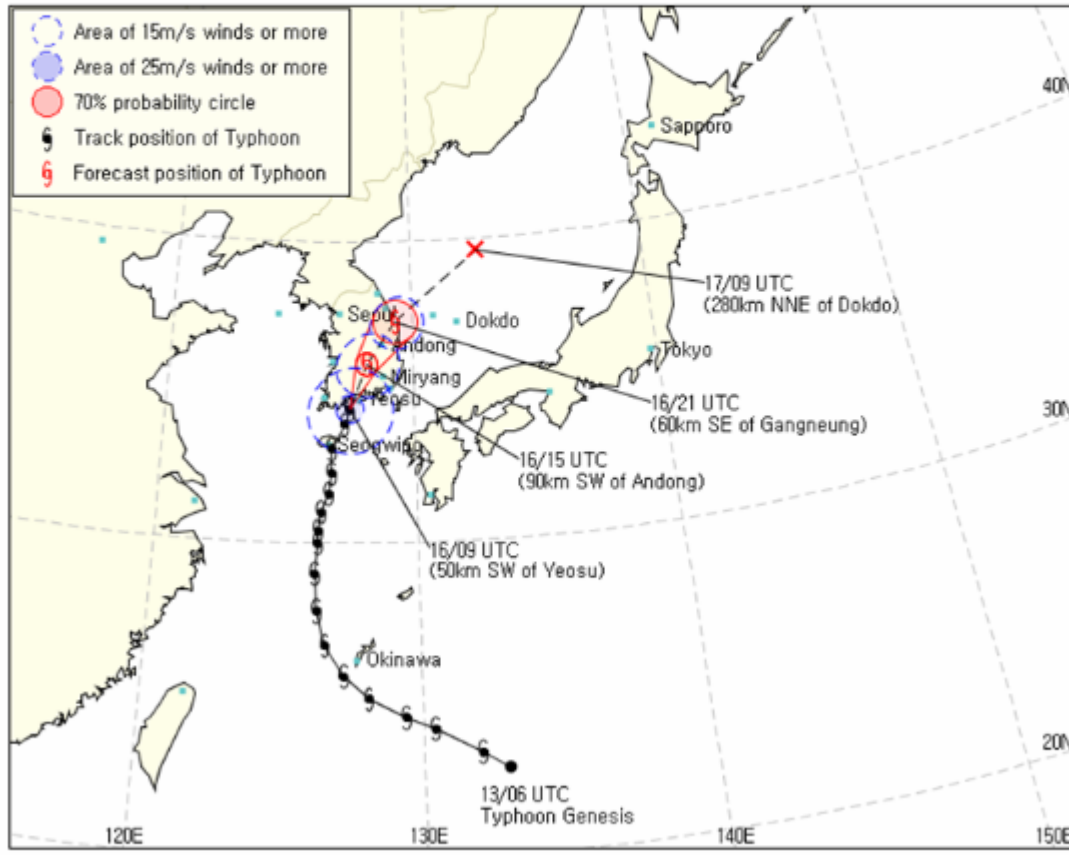


200807

No. 11 Typhoon NARI

KMA | 2007.9.16 19:00

ANALYSIS	Present Position	Minimum Surface Pressure(hPa) Maximum Sustained Wind (m/s)	Radius of 15 m/s (km)	Moving Direction and Speed(km/h)
ANALYSIS 1800 UTC 16 Sep.	34.4 N, 127.4 E	990, 27 (97km/h)	160 (NW 140)	NNE, 25
FORECAST 0000 UTC 17 Sep.	35.9 N, 128.1 E	990, 23 (83km/h)	120 (NW 100)	NNE, 30
FORECAST 0600 UTC 17 Sep.	37.3 N, 129.3 E	995, 19 (68km/h)	100 (NW 80)	NE, 32
FORECAST 1800 UTC 17 Sep.	39.6 N, 132.9 E	1002		ENE, 33

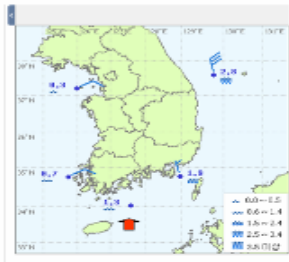


- The 11th Typhoon of the year 2007 - 'NARI' was chosen for comparing with spectral wave model results. Left figure shows the best track of 'NARI'

- Just before landing, the 'NARI' passed over 'Geomundo' buoy. The highest wind (SSE, 27.1 m/s), significant wave height (SW, 9.8m), and maximum wave height (SW, 13.7m) were recorded on Sept. 16th 1600KST. Approximately 5 hours later, the 'Geojaedo' buoy, which located on the East from 'NARI' best track, recorded the highest significant wave height (SW, 4.9m) and maximum wave height (SW, 7.8m).

그림 4.8 2007년 11호 태풍 나리(Nari) 경로도

Geomundo Buoy (22103)



[BUOY 자료] 22103 거문도 / 2007.09.17, 10:00

시간	바람상태				기압		수온		수심		해면상태	
	방향	속도	속도	속도	기압	기압	표면	표면	10m	10m	상태	방향
	(도)	(m/s)	(knot)	(knot)	(hPa)	(hPa)	(도C)	(도C)	(도C)	(도C)	(m)	(도)
170104	25	ENE	0.2	0.1	1002.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170105	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170106	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170107	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170108	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170109	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170110	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170111	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170112	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170113	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170114	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170115	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170116	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170117	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170118	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170119	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170120	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170121	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170122	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170123	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170124	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170125	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170126	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170127	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170128	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170129	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170130	30	E	1.4	0.6	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0

Typhoon NARI 2007-11

그림 4.9 거문도 브이 관측 바람 상태 및 해면 상태 (2007.9.16,00KST~2007.9.17,10KST)

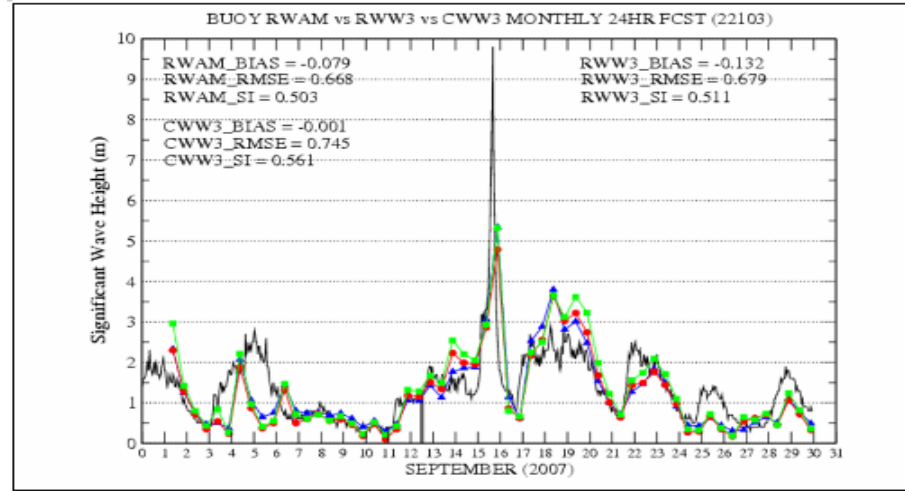
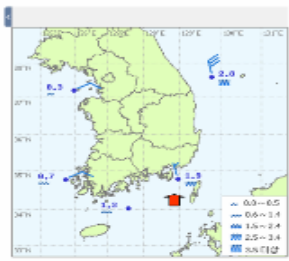


그림 4.11 거문도 브이(22103) 관측 유의파고(검은실선)와 ReWAM(파란 삼각형), ReWW3(붉은 원형), CoWW3(녹색원형) 24시간 예상 유의파고 시계열

Geojaedo Buoy (22104)



[BUOY 자료] 22104 거제도 / 2007.09.17, 10:00

시간	바람상태				기압		수온		수심		해면상태	
	방향	속도	속도	속도	기압	기압	표면	표면	10m	10m	상태	방향
	(도)	(m/s)	(knot)	(knot)	(hPa)	(hPa)	(도C)	(도C)	(도C)	(도C)	(m)	(도)
170104	344	WSW	3.7	0.3	1012.0	1012.0	28.0	28.0	28.0	28.0	1.0	1.0
170105	240	WSW	2.9	0.4	1011.0	1011.0	28.0	28.0	28.0	28.0	1.0	1.0
170106	240	WSW	4.1	0.6	1010.0	1010.0	28.0	28.0	28.0	28.0	1.0	1.0
170107	240	WSW	5.3	0.8	1009.0	1009.0	28.0	28.0	28.0	28.0	1.0	1.0
170108	236	WSW	7.1	1.2	1008.0	1008.0	28.0	28.0	28.0	28.0	1.0	1.0
170109	240	WSW	8.6	1.4	1007.0	1007.0	28.0	28.0	28.0	28.0	1.0	1.0
170110	231	SW	13.0	2.5	1006.0	1006.0	28.0	28.0	28.0	28.0	1.0	1.0
170111	236	SW	11.7	2.2	1005.0	1005.0	28.0	28.0	28.0	28.0	1.0	1.0
170112	201	SW	11.8	2.2	1004.0	1004.0	28.0	28.0	28.0	28.0	1.0	1.0
170113	201	SW	11.2	2.1	1003.0	1003.0	28.0	28.0	28.0	28.0	1.0	1.0
170114	201	SW	10.1	1.9	1002.0	1002.0	28.0	28.0	28.0	28.0	1.0	1.0
170115	201	SW	11.2	2.1	1001.0	1001.0	28.0	28.0	28.0	28.0	1.0	1.0
170116	201	SW	11.2	2.1	1000.0	1000.0	28.0	28.0	28.0	28.0	1.0	1.0
170117	201	SW	11.2	2.1	999.0	999.0	28.0	28.0	28.0	28.0	1.0	1.0
170118	201	SW	11.2	2.1	998.0	998.0	28.0	28.0	28.0	28.0	1.0	1.0
170119	201	SW	11.2	2.1	997.0	997.0	28.0	28.0	28.0	28.0	1.0	1.0
170120	201	SW	11.2	2.1	996.0	996.0	28.0	28.0	28.0	28.0	1.0	1.0
170121	201	SW	11.2	2.1	995.0	995.0	28.0	28.0	28.0	28.0	1.0	1.0
170122	201	SW	11.2	2.1	994.0	994.0	28.0	28.0	28.0	28.0	1.0	1.0
170123	201	SW	11.2	2.1	993.0	993.0	28.0	28.0	28.0	28.0	1.0	1.0
170124	201	SW	11.2	2.1	992.0	992.0	28.0	28.0	28.0	28.0	1.0	1.0
170125	201	SW	11.2	2.1	991.0	991.0	28.0	28.0	28.0	28.0	1.0	1.0
170126	201	SW	11.2	2.1	990.0	990.0	28.0	28.0	28.0	28.0	1.0	1.0
170127	201	SW	11.2	2.1	989.0	989.0	28.0	28.0	28.0	28.0	1.0	1.0
170128	201	SW	11.2	2.1	988.0	988.0	28.0	28.0	28.0	28.0	1.0	1.0
170129	201	SW	11.2	2.1	987.0	987.0	28.0	28.0	28.0	28.0	1.0	1.0
170130	201	SW	11.2	2.1	986.0	986.0	28.0	28.0	28.0	28.0	1.0	1.0

Typhoon NARI 2007-11

그림 4.10 거제도 브이 관측 바람 상태 및 해면 상태 (2007.9.16,00KST~2007.9.17,10KST)

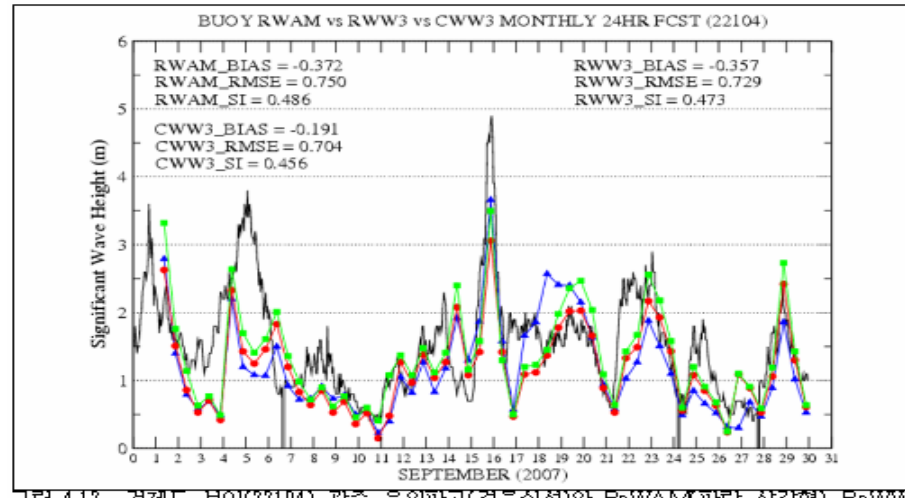


그림 4.12 거제도 브이(22104) 관측 유의파고(검은실선)와 ReWAM(파란 삼각형), ReWW3(붉은 원형), CoWW3(녹색원형) 24시간 예상 유의파고 시계열

Time series and monthly validation statistics of September 2007 are shown for two buoy's observed significant wave wave height (black line) against model's 24 hour forecast. The underestimation in spectral wave prediction for NARI case is clear. This discrepancy is mainly caused by underestimated sea surface wind forecast

FWFE4A 00UTC 16 SEP 2007

3hr Spectra Forecast Chart for Buoy_22103

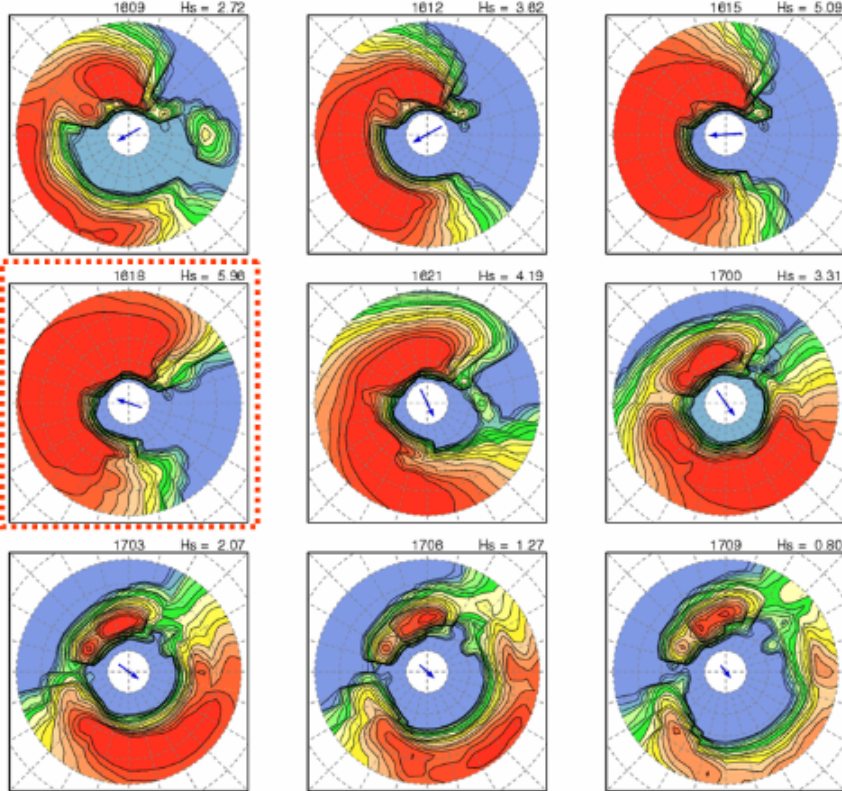
Coastal Wave Watch III (CWW3)
Korea Meteorological Administration

VALID : 09KST 16 SEP 2007 - 09KST 17 SEP 2007

Sea Surface Wind Vector, Significant Wave Height(m)

Normalized Spectrum Energy(m²/Hz/rad)

0.05Hz(inner circle) - 0.25Hz(outer circle)



FWFE4B 00UTC 16 SEP 2007

3hr Sea Surface Wind and Waveheight Forecast Chart

Coastal Wave Watch III (CWW3) - RGS1
Korea Meteorological Administration

VALID : 21KST 16 SEP 2007 - 06KST 17 SEP 2007

Wind (kts)

Wave Height (0.5 m)

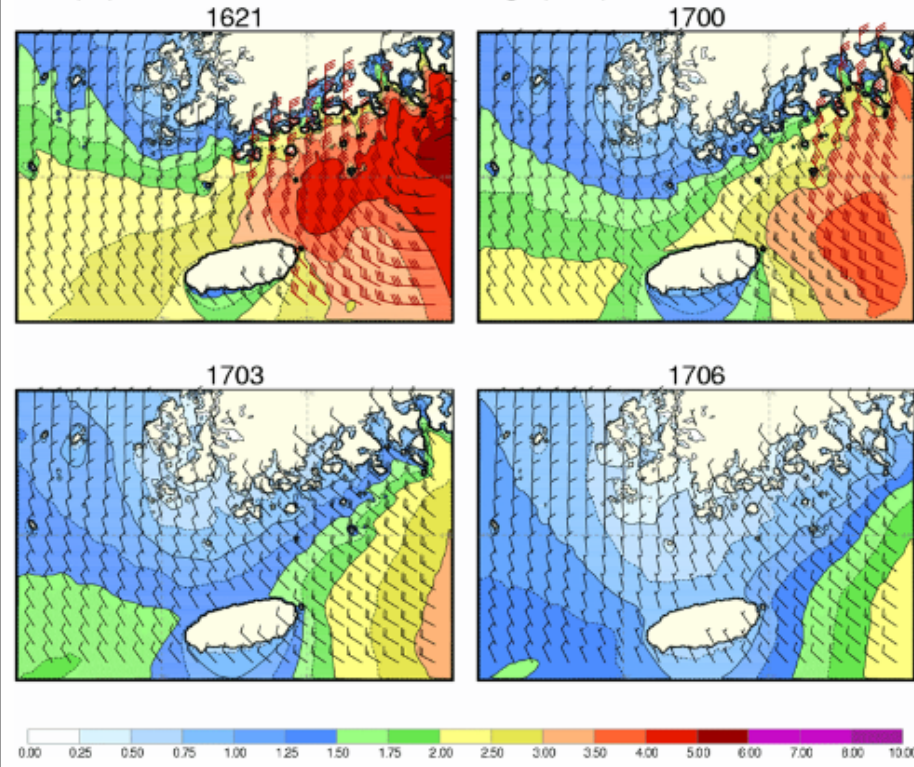


그림 4.14 CoWW3-RGS1 모델의 3시간 간격 해상풍 및 유의파고 예상도

그림 4.13 거문도 브이 지점 CoWW3-RGS1 모델 3시간 간격 스펙트럼 에너지 예상도

The point wave model spectra derived from KMA's operational Coastal Wave Prediction System(CoWW3) corresponding to Geomundo buoy location are shown. The concentric circles representing frequencies linearly increasing from 0.05 Hz (20 sec; inner circle) to 0.25 Hz (4 sec; outer circle) in 0.05 Hz interval. The isopleths of wave energy are in normalized units of m²/Hz/rad in the direction to which waves are traveling. The northward moving long wave (with period over 10 sec) is persistent, while the short wave rotate counterclockwise following the typhoon's wind fields.

FWFE4A 00UTC 16 SEP 2007

3hr Spectra Forecast Chart for Buoy_22104

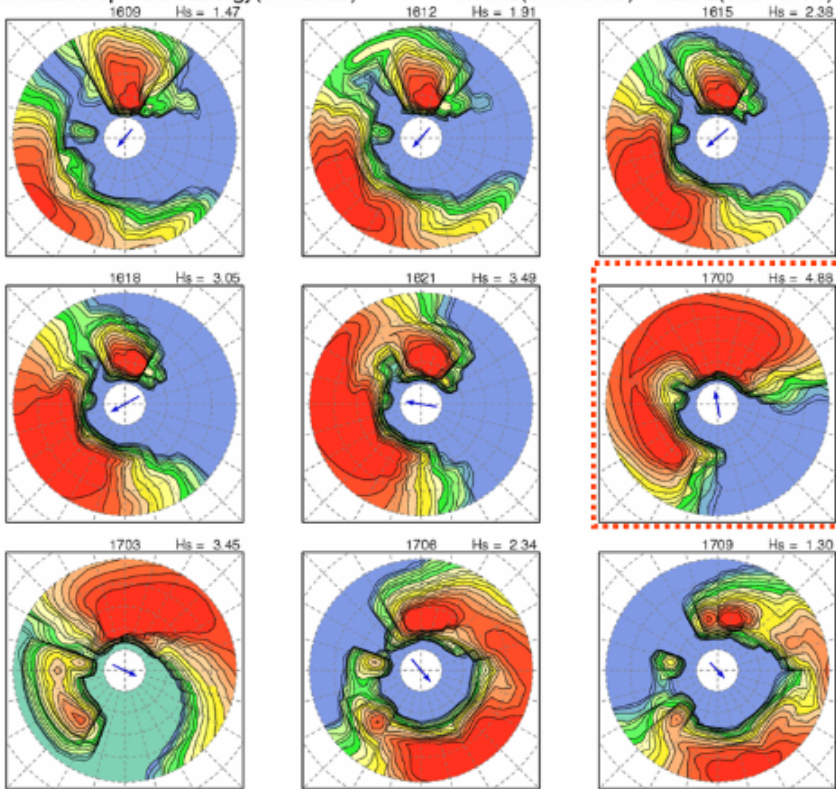
Coastal Wave Watch III (CWW3)
Korea Meteorological Administration

VALID : 09KST 16 SEP 2007 - 09KST 17 SEP 2007

Sea Surface Wind Vector, Significant Wave Height(m)

Normalized Spectrum Energy($m^2/Hz/rad$)

0.05Hz(inner circle) - 0.25Hz(outer circle)



FWFE4B 00UTC 16 SEP 2007

3hr Sea Surface Wind and Waveheight Forecast Chart

Coastal Wave Watch III (CWW3) - RGS2
Korea Meteorological Administration

VALID : 21KST 16 SEP 2007 - 06KST 17 SEP 2007

Wind (kts)

Wave Height (0.5 m)

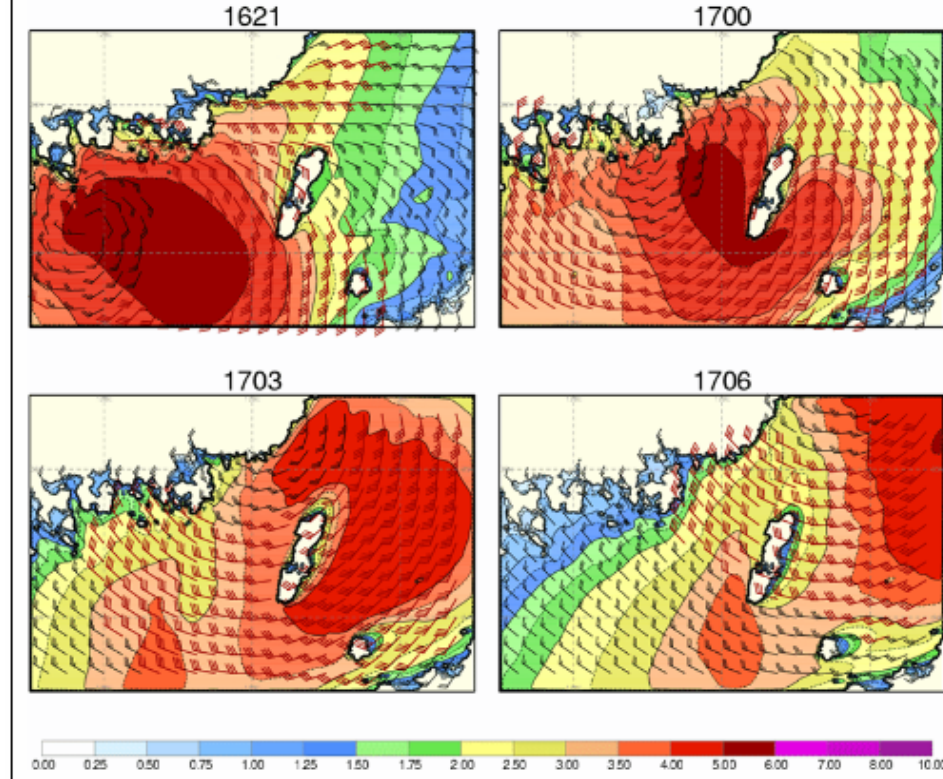
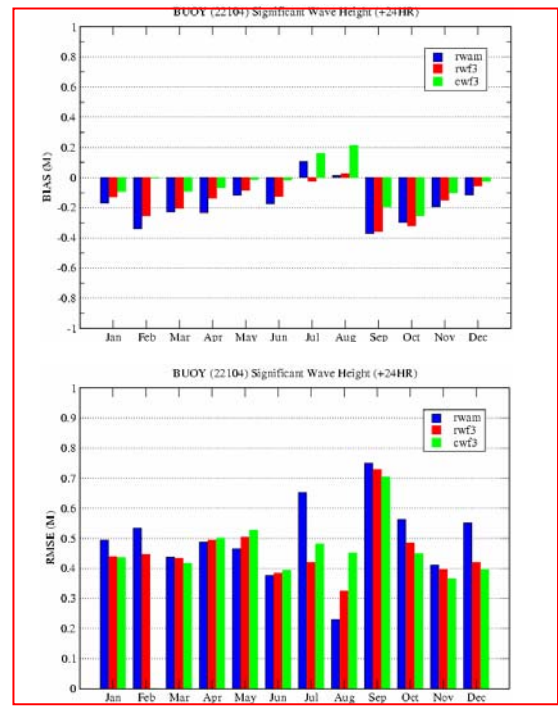
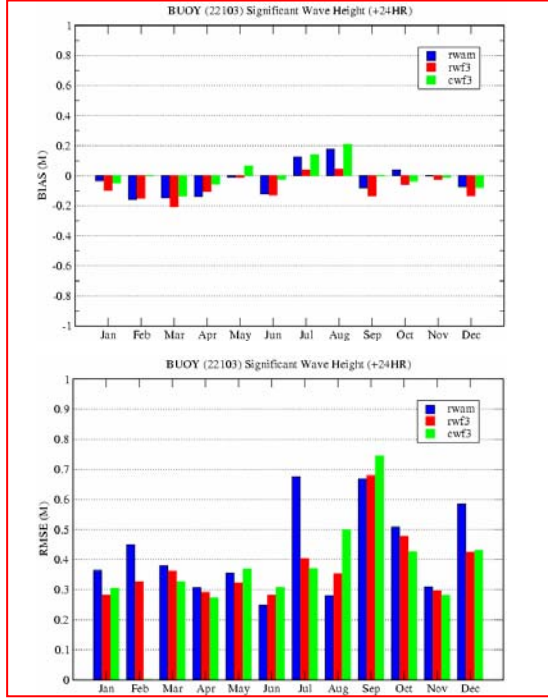
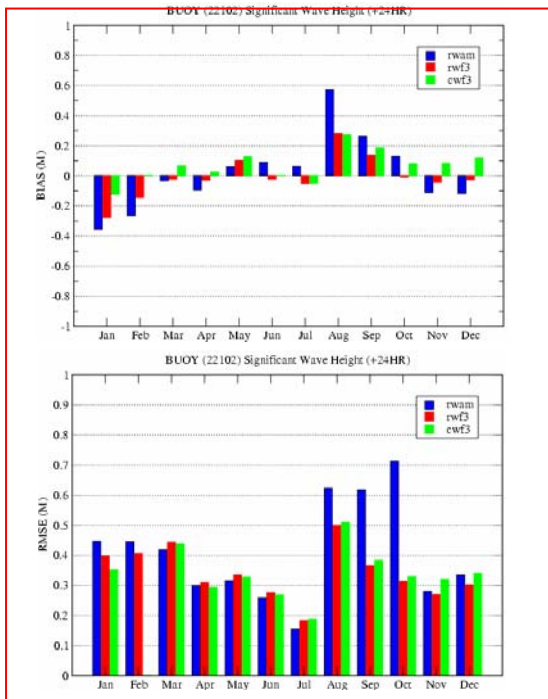
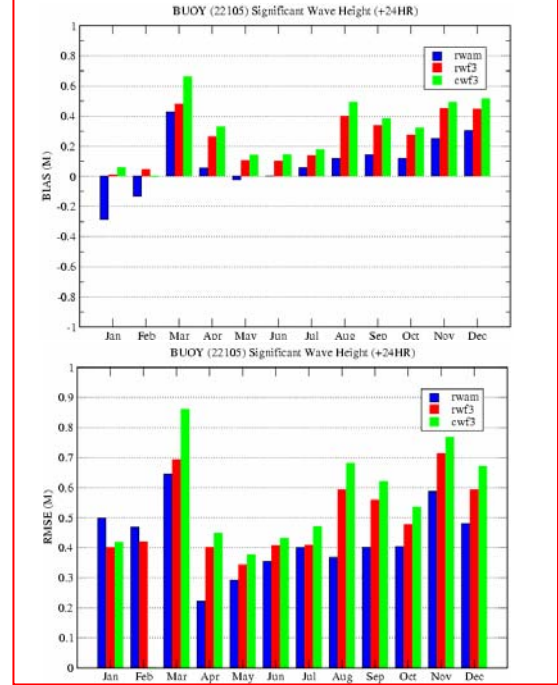
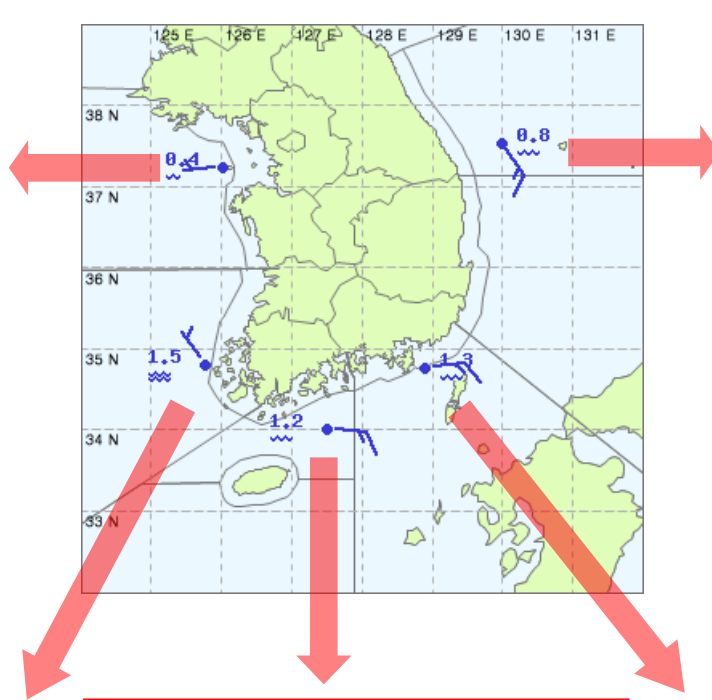
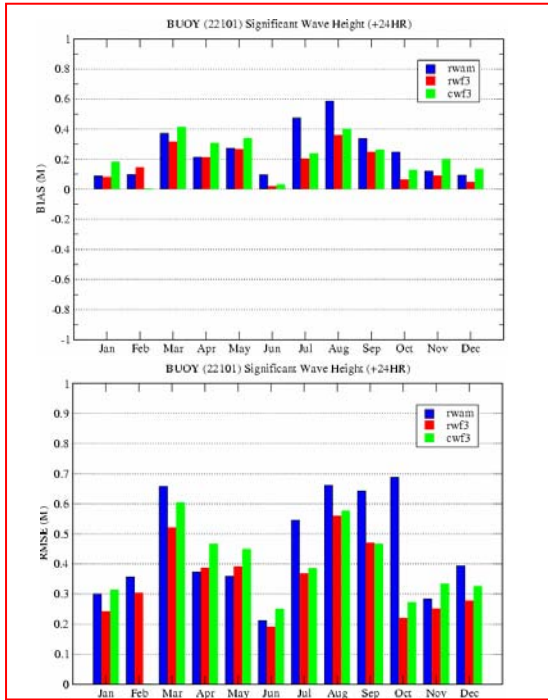


그림 4.15 거제도 브이 지점 CoWW3-RGS2 모델 3시간 간격 스펙트럼 에너지 예상도

그림 4.16 CoWW3-RGS1 모델의 3시간 간격 해상풍 및 유의파고 예상도

The point wave model spectra derived from KMA's operational Coastal Wave Prediction System(CoWW3) corresponding to Geojaedo buoy (right) location are shown. The concentric circles representing frequencies linearly increasing from 0.05 Hz (20 sec; inner circle) to 0.25 Hz (4 sec; outer circle) in 0.05 Hz interval. The isopleths of wave energy are in normalized units of $m^2/Hz/rad$ in the direction to which waves are traveling. The northward moving long wave (with period over 10 sec) is persistent, while the short wave rotate counterclockwise following the typhoon's wind fields.



- *Research plan for 2008-2009*

Objective: Sensitivity test of sea surface wind forecasts from the UM on the global, regional, and coastal operational ocean wind wave prediction at KMA

궐- Installation of an interface module for ingesting the sea surface wind forecasts from UM-global and UM-regional onto wave models

- Construction of parallel run frame for global and regional wave prediction system to conduct sensitivity test of sea surface wind forecasts from the UM-global and UM-regional

- *Outline plan for 2010-2012*

- Parallel run of GoWW3 with UM-global and ReWW3, CoWW3 with UM-regional sea surface wind and their performance evaluation

- Application of sea surface wind generated by the UM-based very high-resolution model to CoWW3

- The feasibility study on synchronous coupling between GoWW3 and UM-global and their impact assessment

- Trapped-Fetch Wave Model (Al MacAfee, MSC) application to tropical cyclone

● Two New Moored Buoy (Nomad-Type) at KMA

INFORMATION ON NON-DRIFTING BUOY(MOORED)

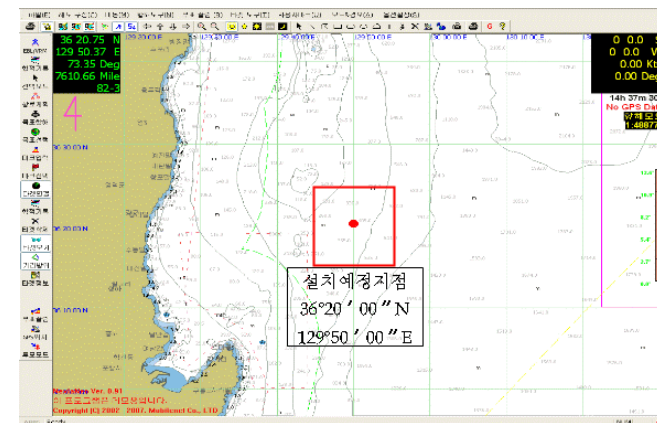
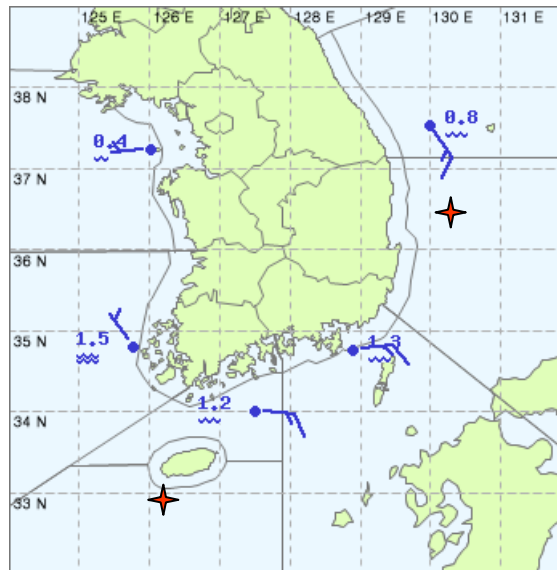
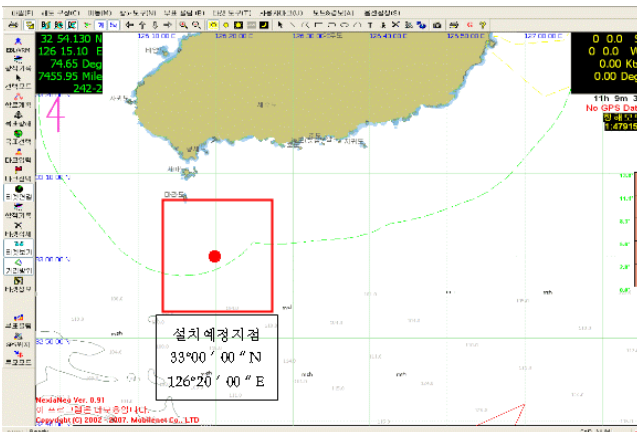
Country: Republic of KOREA

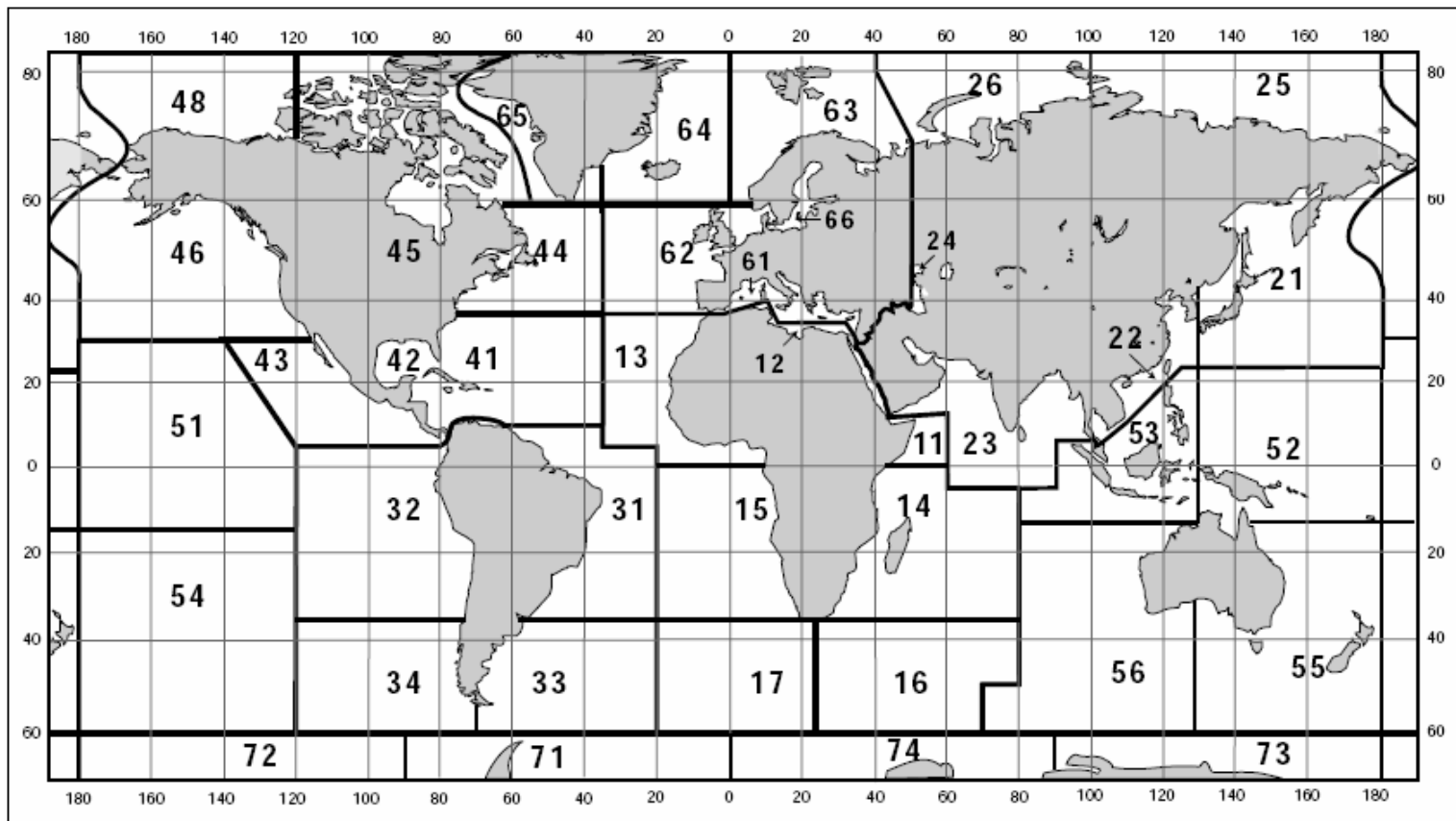
Date: July 15, 2008

IDENTIFIER		ODAS		LOCATION		VARIABLES MEASURED											Trans Means	CORRE FORM	Data Avail-ability	Status	COMMENTS		
WMO	OTHER (spec)	Type	Hull	POSITION	DATE	Air Temp	Air Press	Press Tend	Humi- dity	Wind (DD,FF)	Wave (PP,HH)	Wave Spectra	SST	S/Surf Temp	Salini- ty	Curr- ent						Others (spec)	
22108	Pohang	M	06 N	36° 20'N 129° 50'E	10/08	24	24		24	24	24		24						O		G	O	
22107	Jeju	M	06 N	33° 00'N 126° 20'E	10/08	24	24		24	24	24		24						O		G	O	

※ Operated by the Korea Meteorological Administration(KMA)

(Courtesy of T. Kim)





- 22001 - 22010 Japan
- 22011 - 22025 USA
- 22026 - 22040 USA
- 22041 - 22070 China
- 22071 - 22085 USA
- 22086 - 22100 USA
- 22101 - 22107 Republic of Korea
- 22108 - 22112 USA



53456 – 53463 Republic of Korea

※ DBCP23-Doc-9-3-secretariats-report