BMKG

EXTREME WAVE CAUSED BY T.C CEMPAKA AND DAHLIA CONFIRMED IN IOP BENGKULU 2017

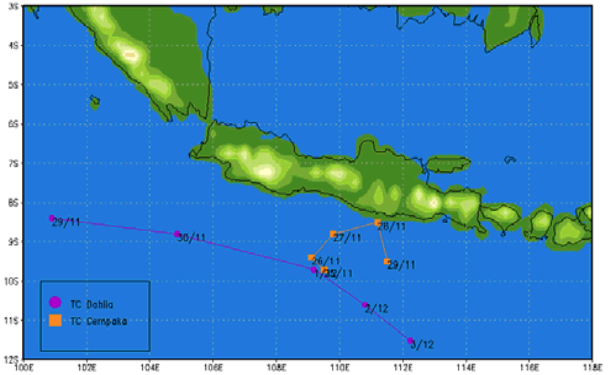
M. Najib Habibie, R. Kurniawan, H. Harsa, W. Fitria
Indonesia Agency of Meteorology Climatology and Geophysics

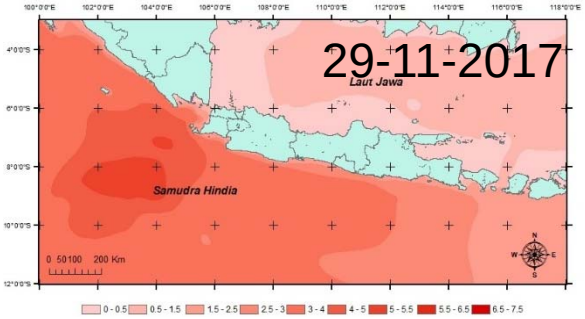
BMKG

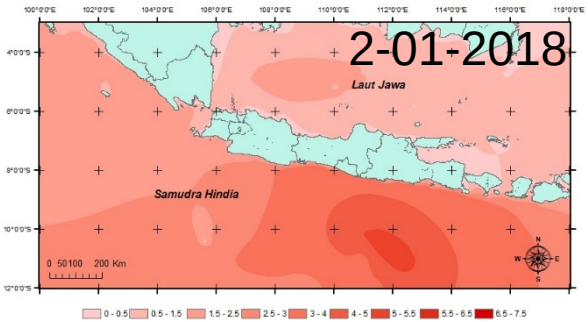
TC CEMPAKA AND DAHLIA

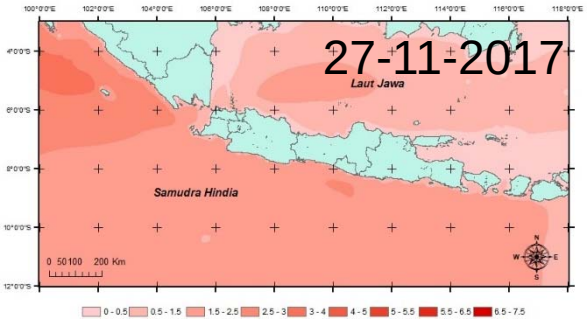
- *Tropical cyclone is a rare event in Indonesia, because most of Indonesia area is in low latitude.*
- *In 26 November until 2-Des-2017, tropical cyclone Cempaka and Dahlia was struct in Southern coast of Java.*
- *TC Cempaka develop from tropical depression in 26- 27 November and mature in 28-29 and decay in 30 November. TC Dahlia occured from 29 -11-2017 to 2-12-2017*
- *Tropical cyclones have strong influences on numerous meteorological parameters.*
- *In this paper we analyze significant wave height*

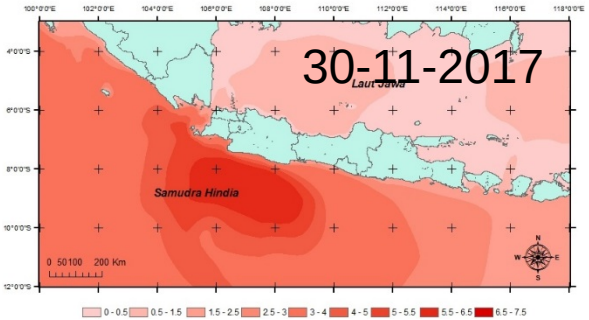
SIGNIFICANT WAVE HEIGHT OVER TC CEMPAKA AND DAHLIA

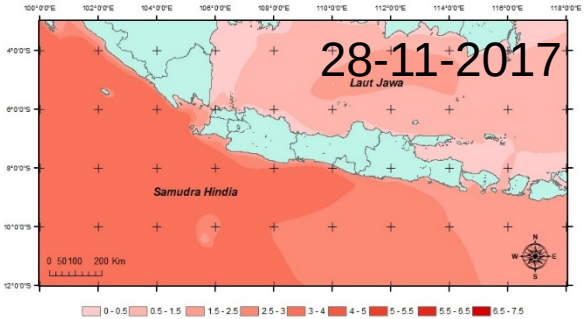


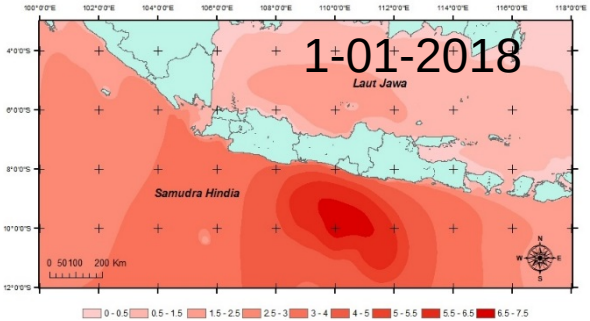






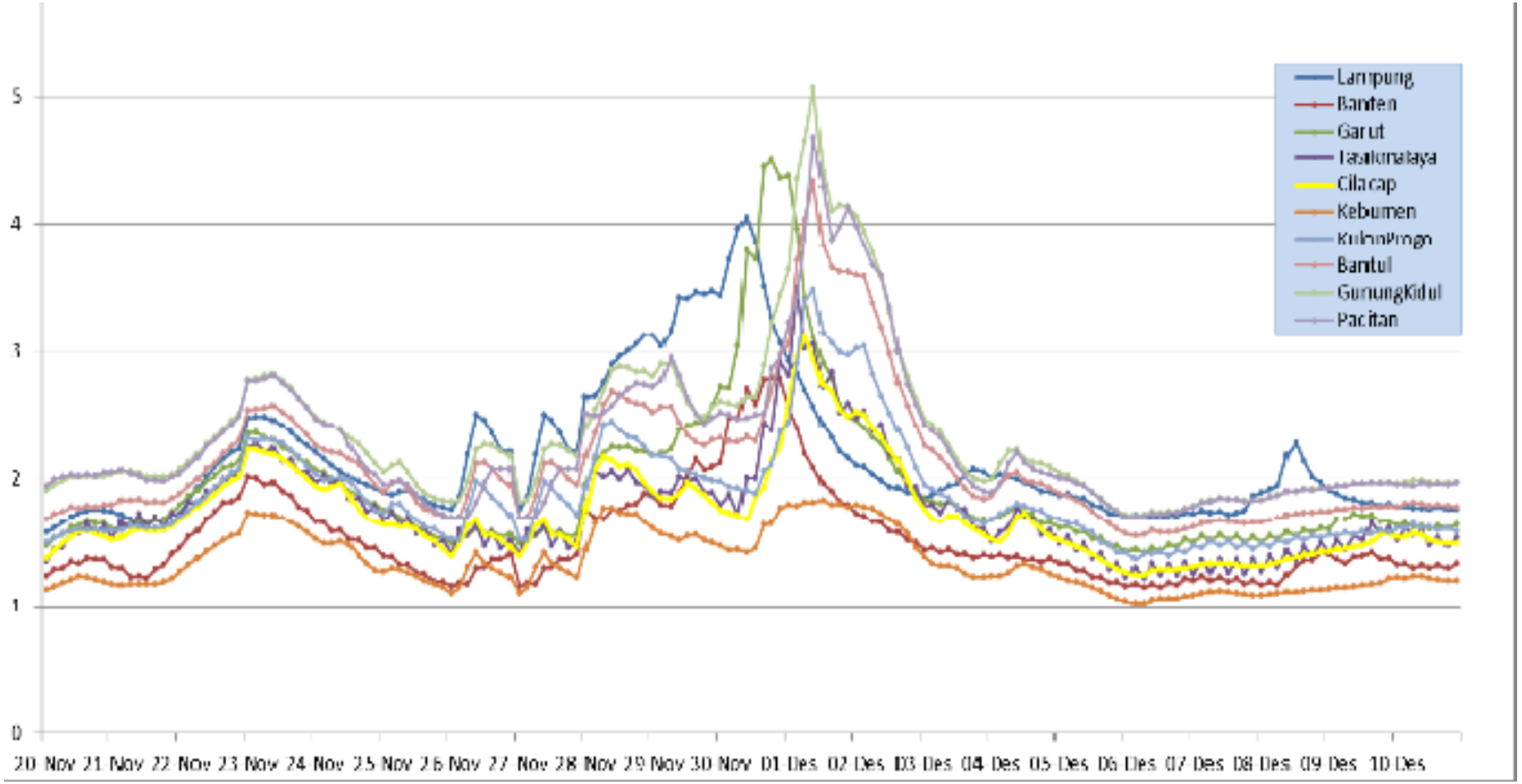




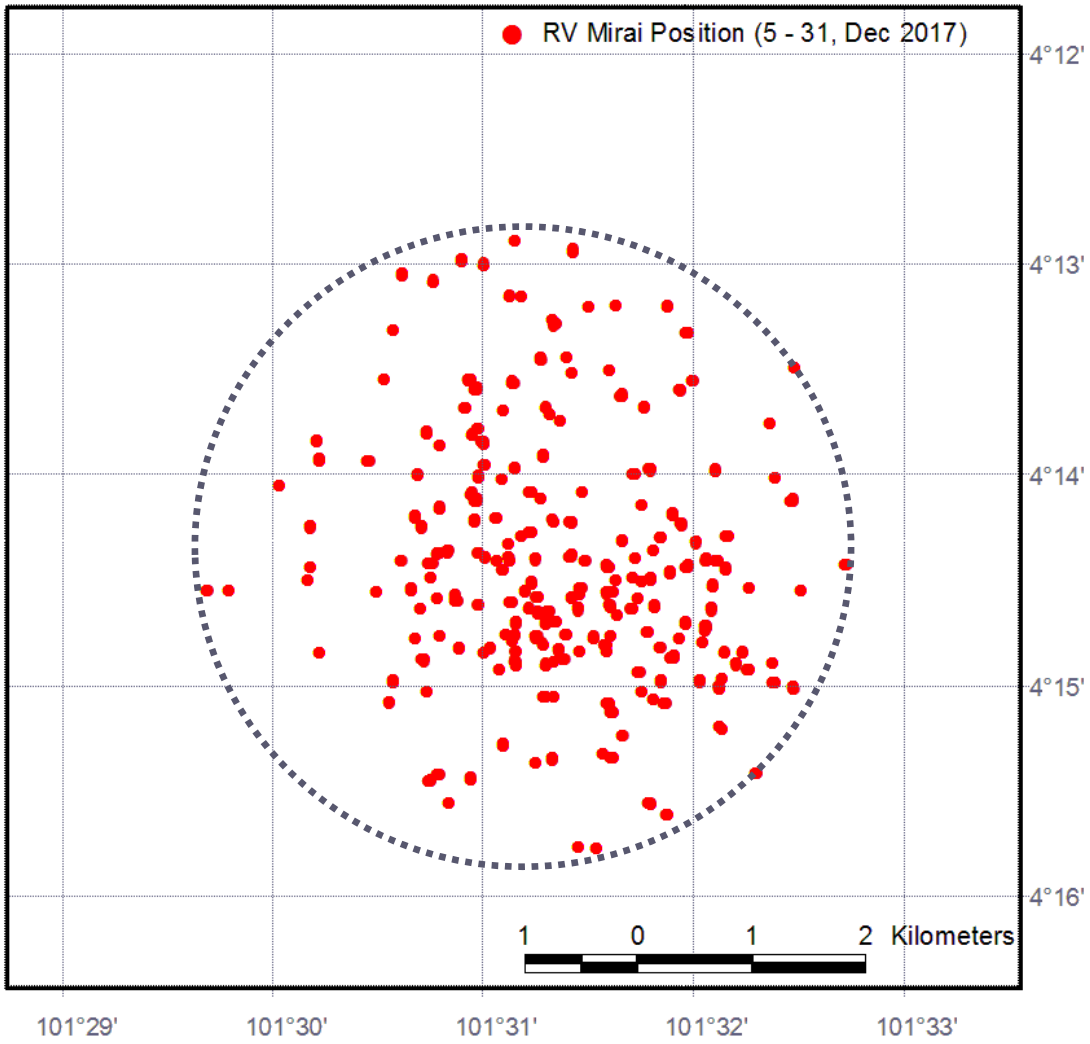


waves formed by tropical cyclones also play a significant role on extreme wave (Godoi et al., 2016)

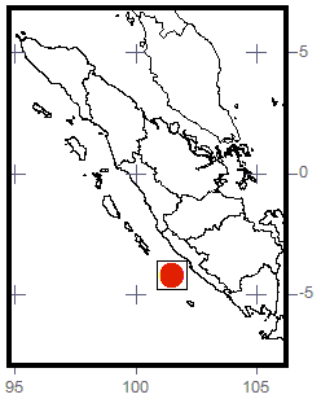
POINT ANALYZE



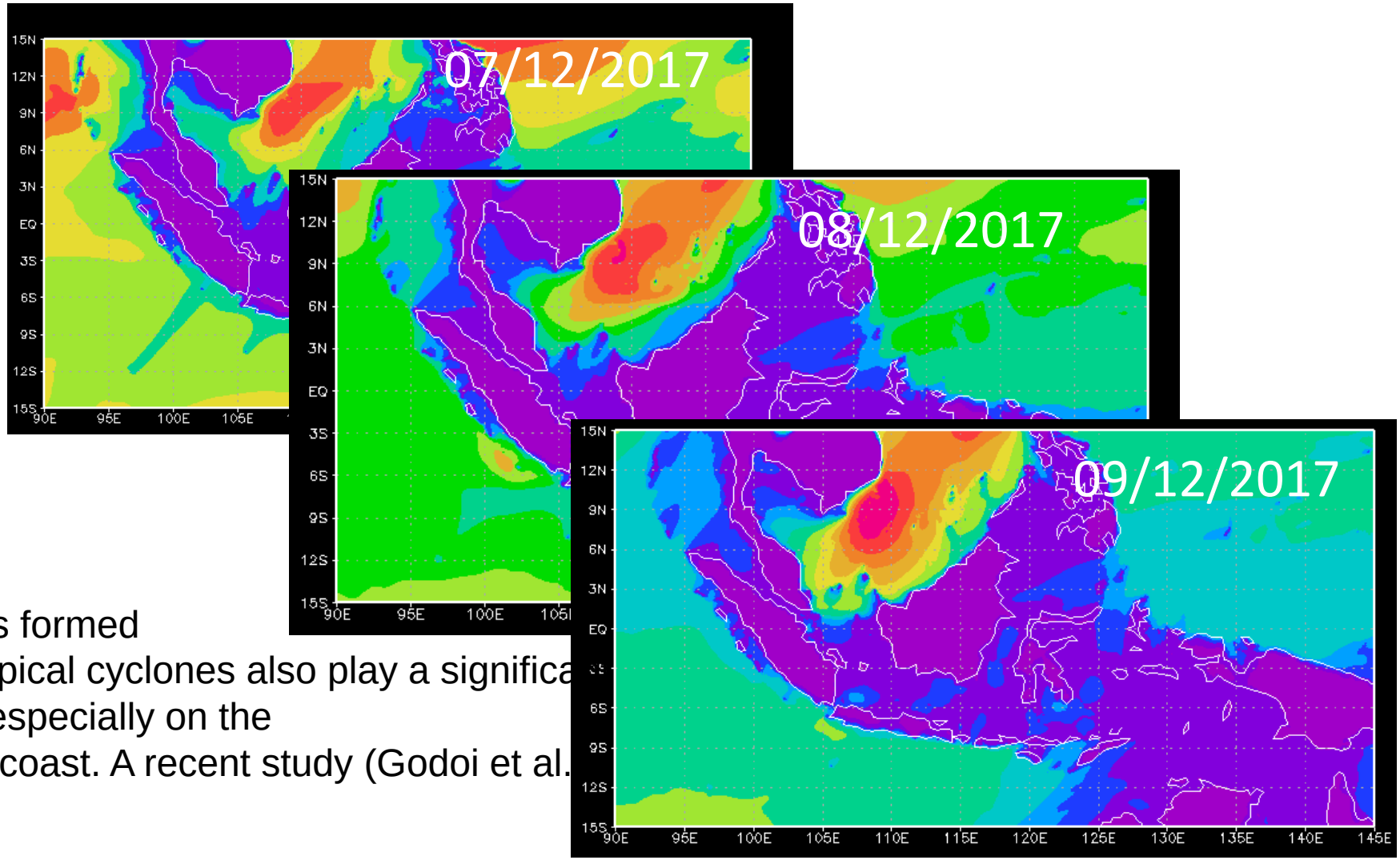
Position of RV Mirai 1708 on 5-31, Dec 2017



RV Mirai position
Arround 04°14'S, 101°31'E



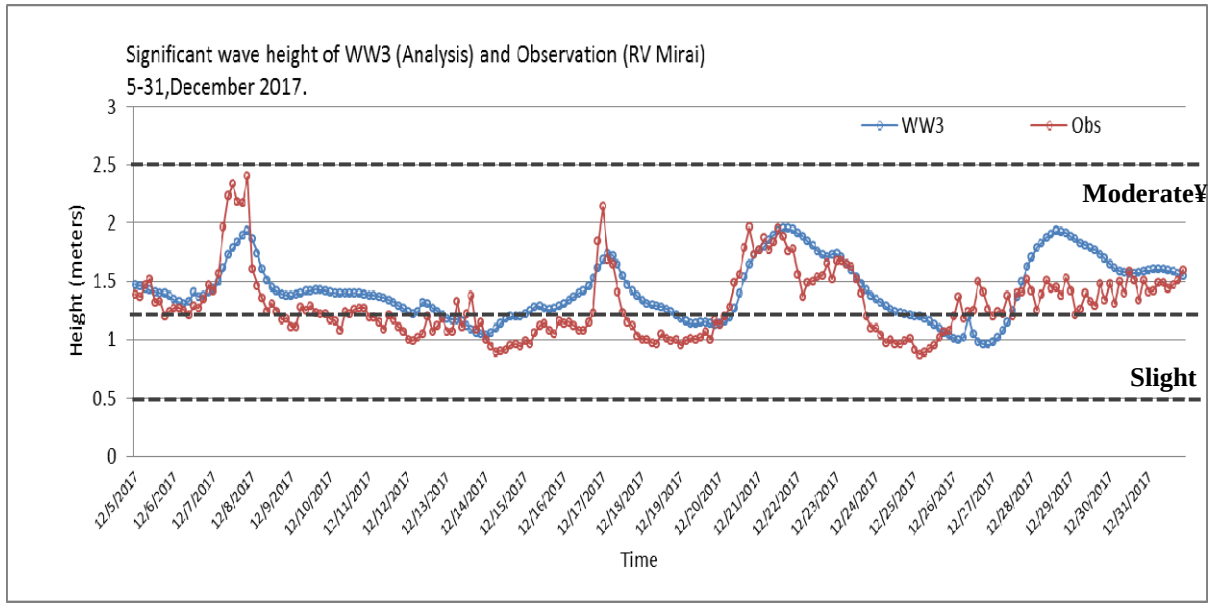
SWH FORCASTE FROM WW3 MODEL



waves formed
by tropical cyclones also play a significa
role, especially on the
north coast. A recent study (Godoi et al.
2016)

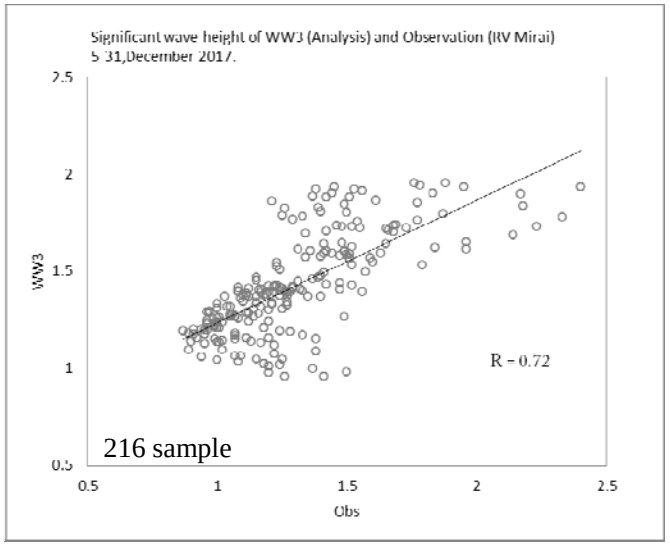
RESULT AND ANALYSIS SKILL OF BMKG WAVE FORECAST (WAVEWATCH-3) USING OBSERVATION DATA (R/V MIRAI 1708)

SWH Time series of WAVEWATCH-3 model (Analysis) and Observation R/V Mirai 1709



Douglas Sea Scale

0.5 - 1.25	Slight
1.25 - 2.5	Moderate

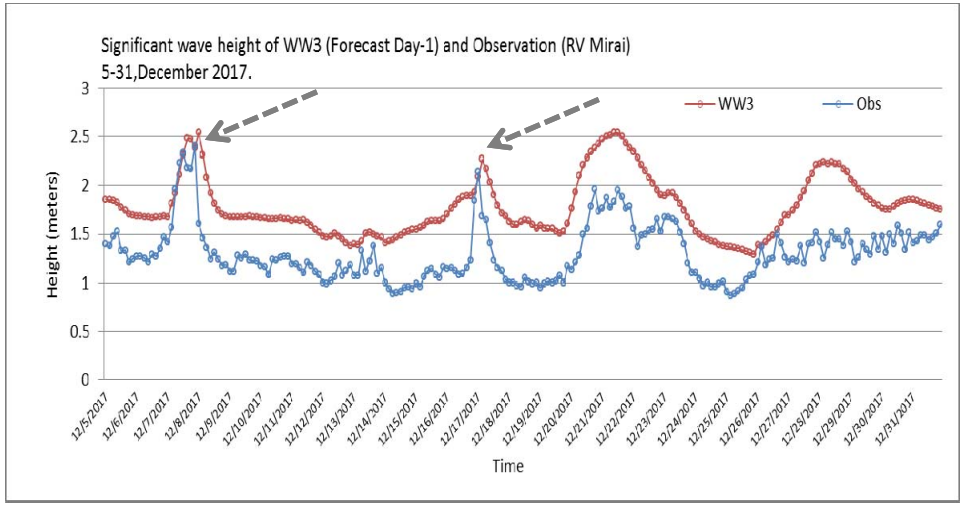


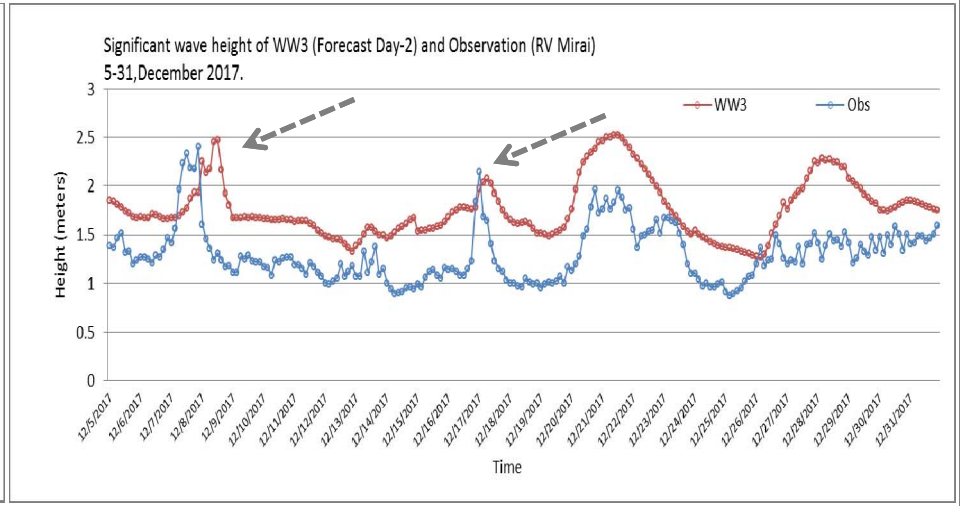
Regression Stat	WW3 analysis vs obs data 2015 (MR1504). Dedi, 2015	WW3 analysis vs Altimetry data. Andri, 2015	WW3 analysis vs obs data 2017 (MR1708)
Correlation	0.789	0.88	**0.72**
RMSE	0.267	0.016	**0.24**
TS			**70%**
RE			**16,3%**

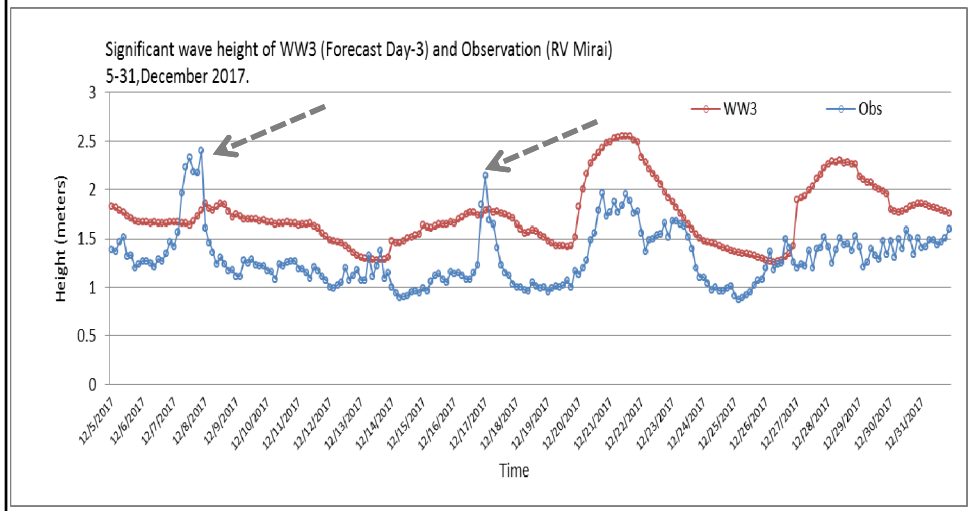
How about the forecast?

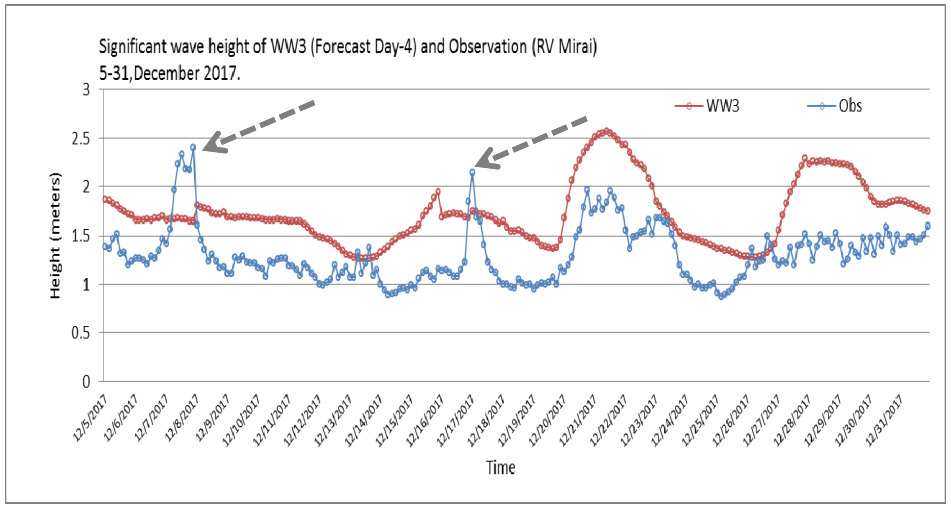
BMKG

SWH Time series of WW3 and Observation data (R/V Mirai 1708)



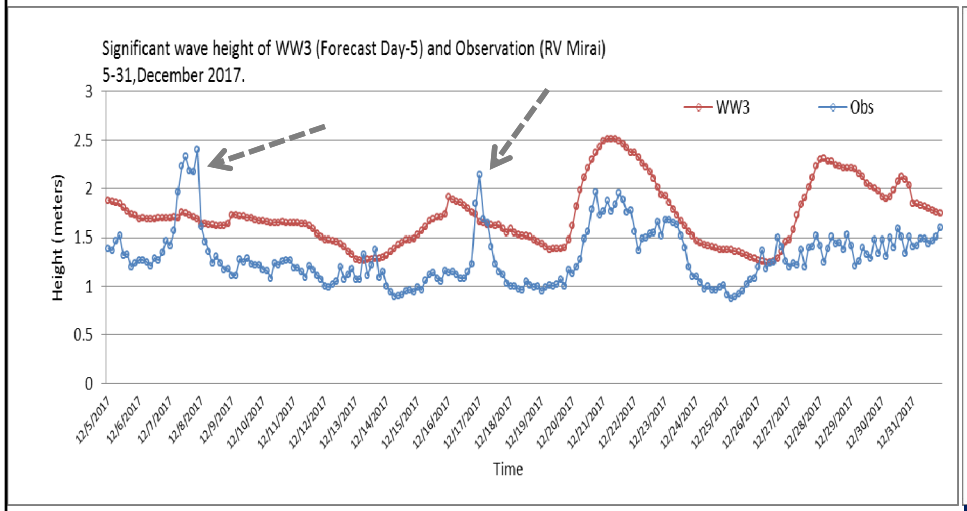


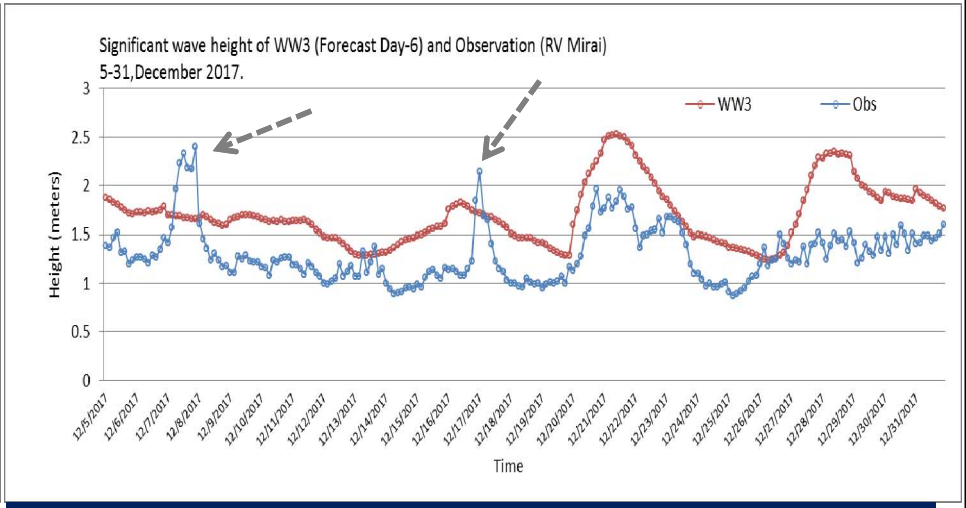


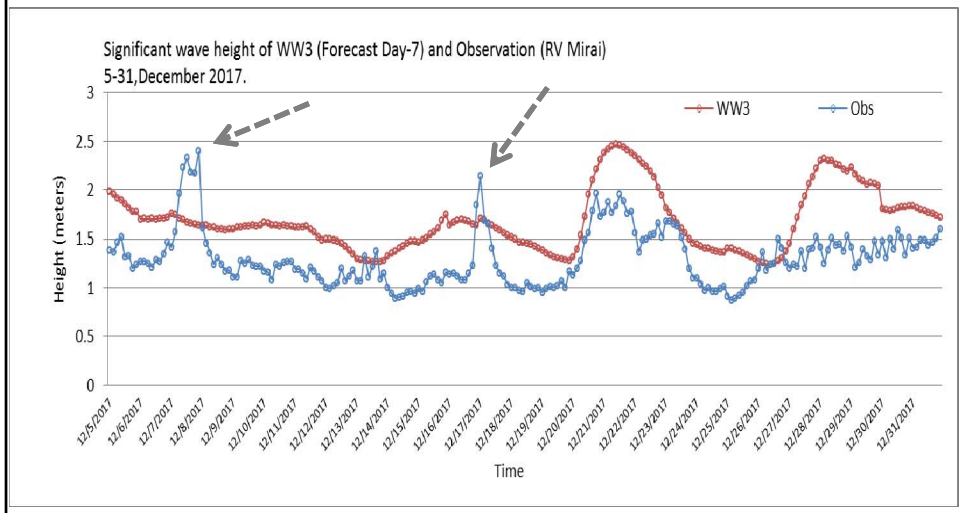


BMKG

SWH Time series of WW3 and Observation data (R/V Mirai 1708)

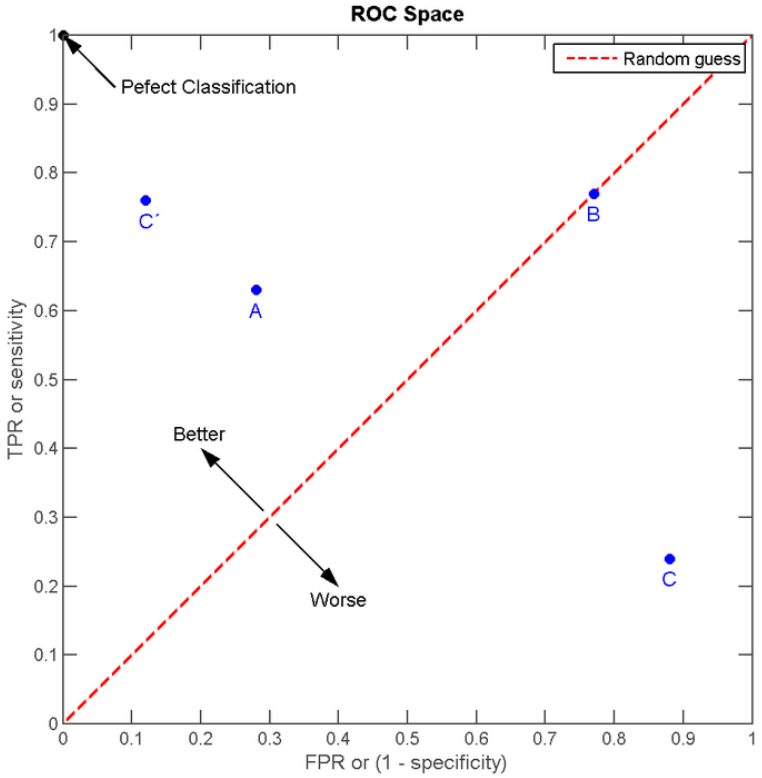






THE TIME SERIES SHOWS THAT THE FORECAST GIVEN BY THE WW3 MODEL UNTIL 2 DAYS AHEAD PROVIDED GOOD FORECAST SKILLS EVEN FOR THE EXTREME CONDITIONS, BUT THE FORECAST SKILL STARTING FROM 3 DAYS AHEAD BEGUN TO DETERIORATE UNTIL THE 7 DAYS FORECAST.

ROC Curve (Receiver Operating Charactheristic)



Contingency Table

		(O) Observed		
		Yes	No	Total
(F) Forecast	Yes	hits	False alarm	Forecast Yes
	No	Misses	Correct Negatives	Forecast No
	Total	Observed yes	Observed No	Total

The ROC curve is one of the visualization methods used for classifying quality. It shows the dependency between the HR (Hit Rate) and the FAR (False Alarm Rate).

Hit Rate:
HR=hits/hits+misses

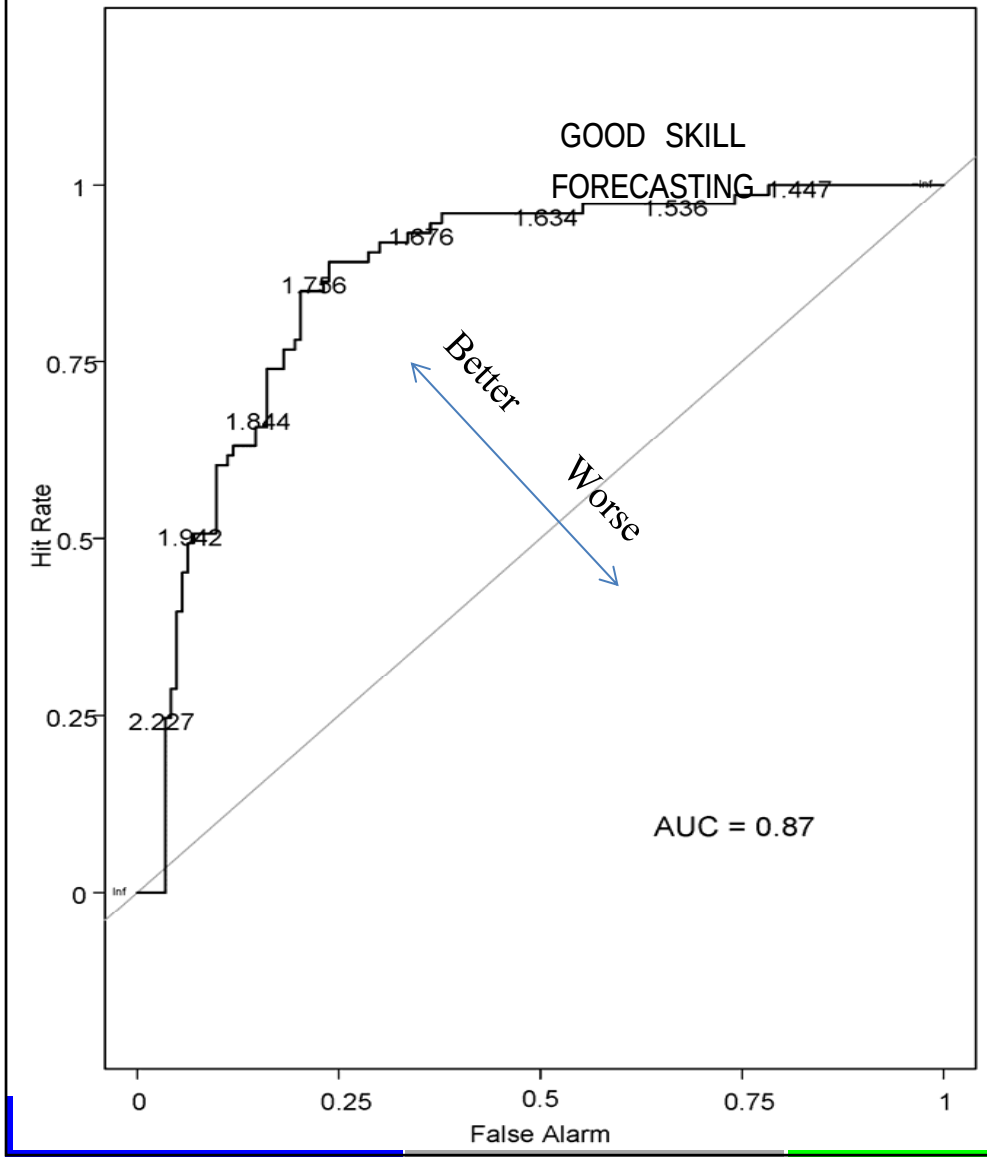
False Alarm Rate:
FAR=false alarm/correct negative+false alarm

Tresholds categories were based on **Douglas scale.** The categorical method used for analyzing which wave categories were successfully predicted.

Douglas Sea Scale is a scale which measures the height of the sea waves. The scale is very simple to follow and is expressed in one of 10 levels.

Scale	Height	Desc
0	0	No wave
1	0 - 0.1	Calm
2	0.1 - 0.5	Smooth
3	0.5 - 1.25	Slight
4	1.25 - 2.5	Moderate
5	2.5 - 4	Rough
6	4 - 6	Very Rough
7	6 - 9	High
8	9 - 14	Very High
9	> 14	Phenomenal

BMKG



ROC Curve WW3 vs Observation Forecast day-1

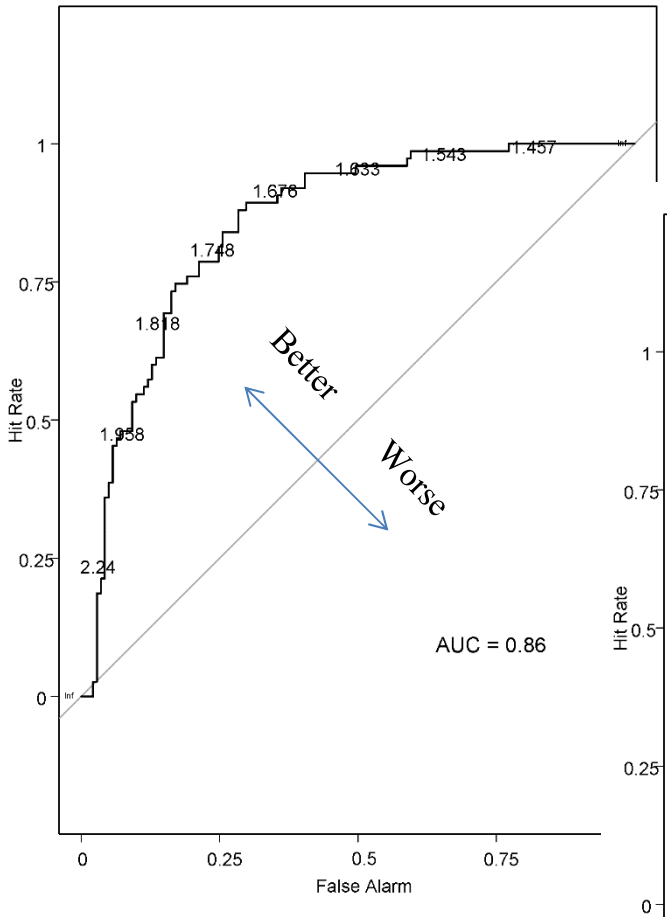
The ROC curve represents a skill forecast of a system wherein the hit rate and the false alarm rate are compared.

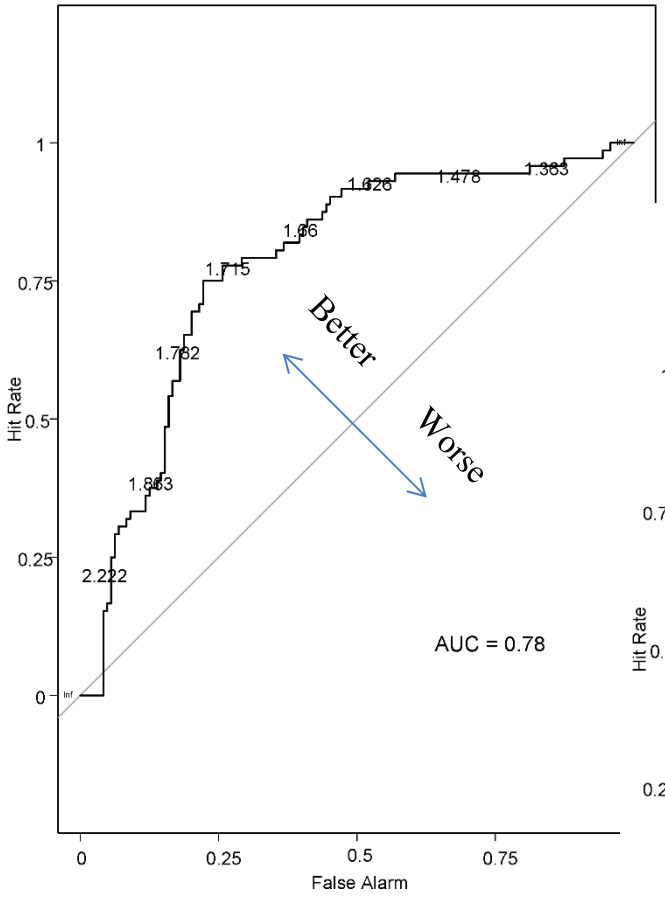
The 1 day forecast shows a good skill forecast information (above on the base line) whose AUC equals to 0.87.

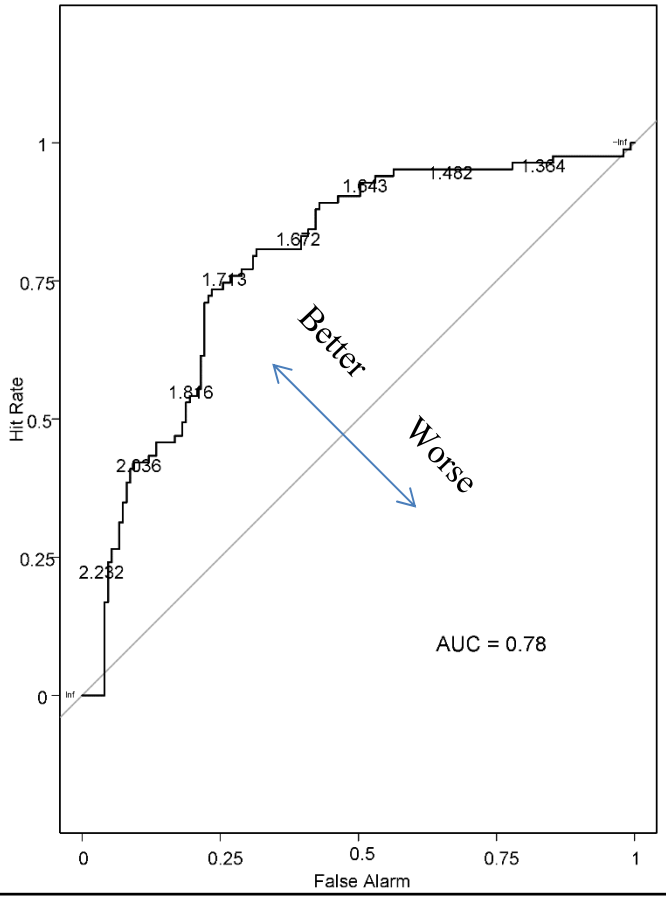
A rough guide for classifying the accuracy of a diagnostic test is given by the traditional academic point system:

.90-1 = excellent
.80-.90 = good
.70-.80 = fair
.60-.70 = poor
.50-.60 = fail

ROC Curve WW3 vs Observation Forecast day-2, 3, and 4.





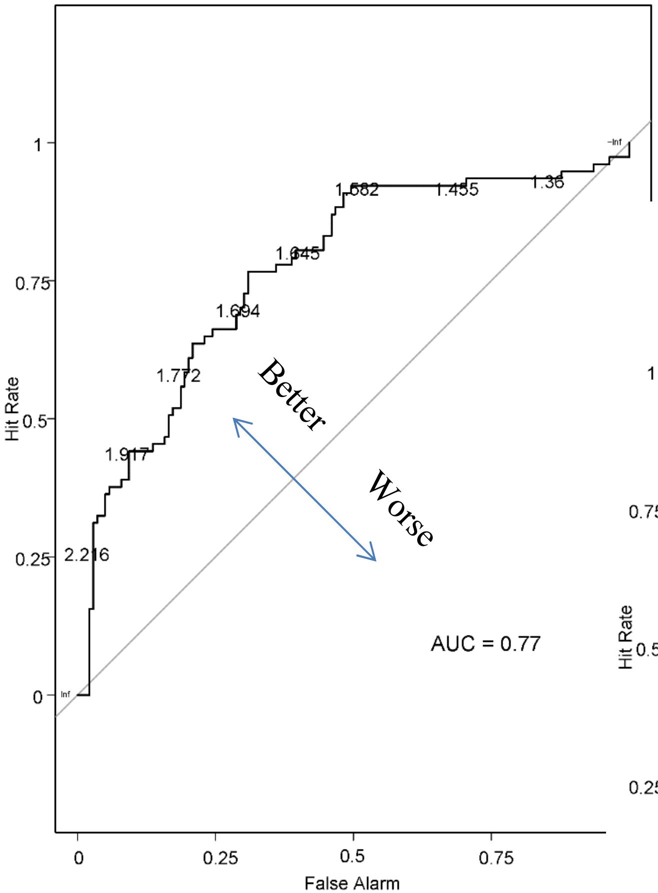


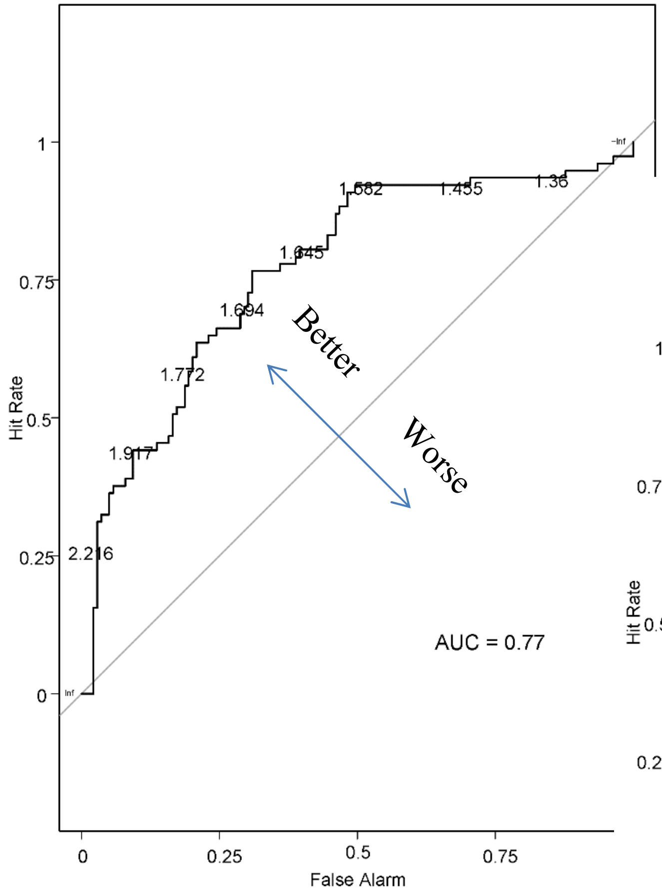
AUC=0.87 (FD-1), AUC=0.86 (FD-2), AUC=0.78 (FD-3),

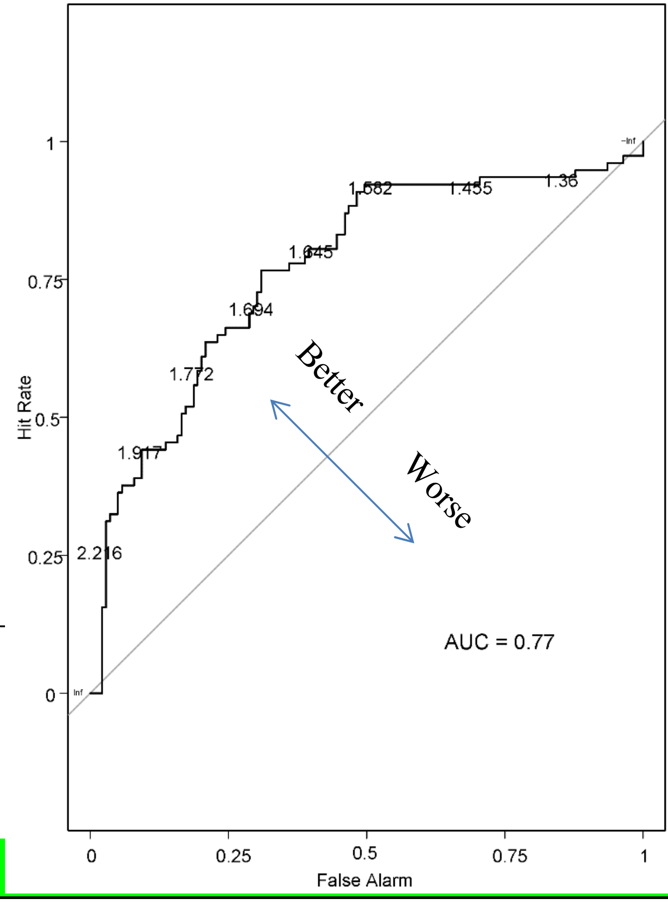
AUC=0.78 (FD-4)

Skill forecast results decrease

ROC Curve WW3 vs Observation Forecast day-5, 6, and 7.







AUC=0.77 (FD-5), AUC=0.77 (FD-6), AUC=0.77 (FD-7)

BMKG

CONCLUSION

- The model can simulated extreme wave
- Verification shows that the forecast model until 2 days provided good skills even for the extreme conditions
- ROC results presented skill forecast are decreases with increasing forecast time