MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT
VIETNAM INSTITUTE OF METEOROLOGY HYDROLOGY AND CLIMATE CHANGE

THE INFLUENCE OF SEA SURFACE TEMPERATURE ON INTENSITY AND TRACK OF TROPICAL CYCLONE OVER VIETNAM EAST SEA

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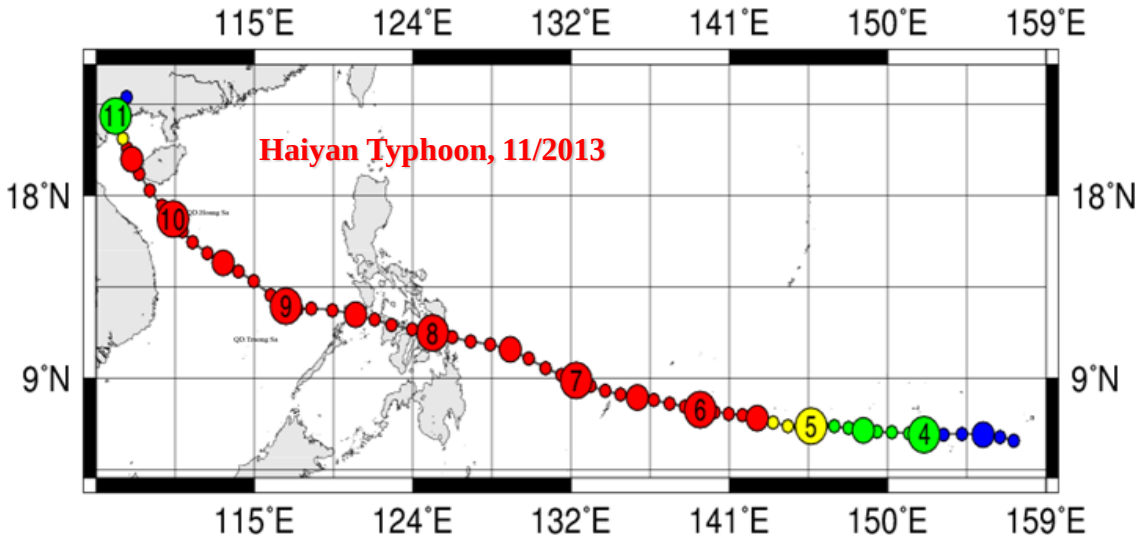
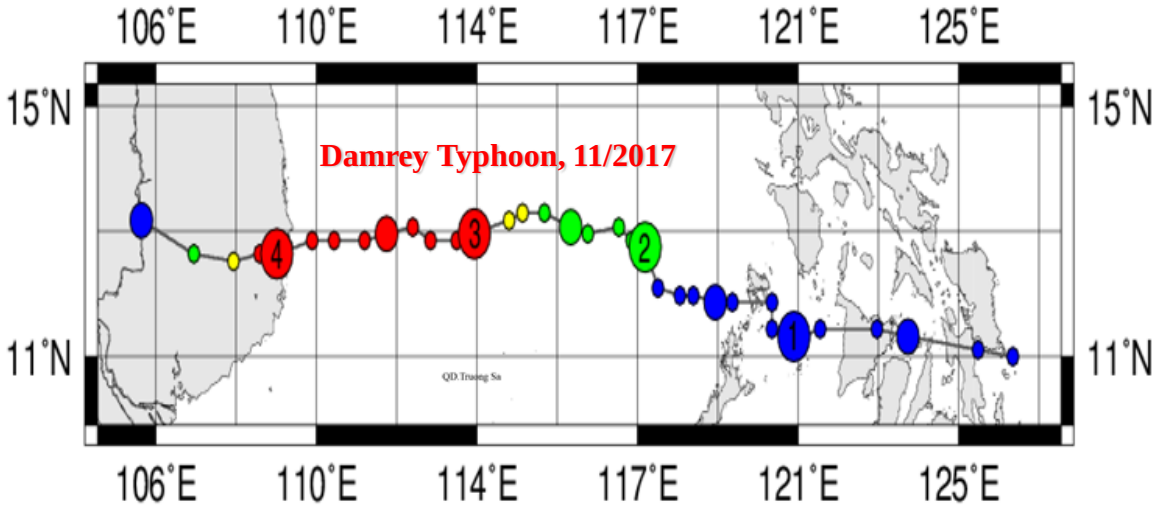
I. INTRODUCTION





(Source: http://agora.ex.nii.ac.jp/digital-typhoon/)

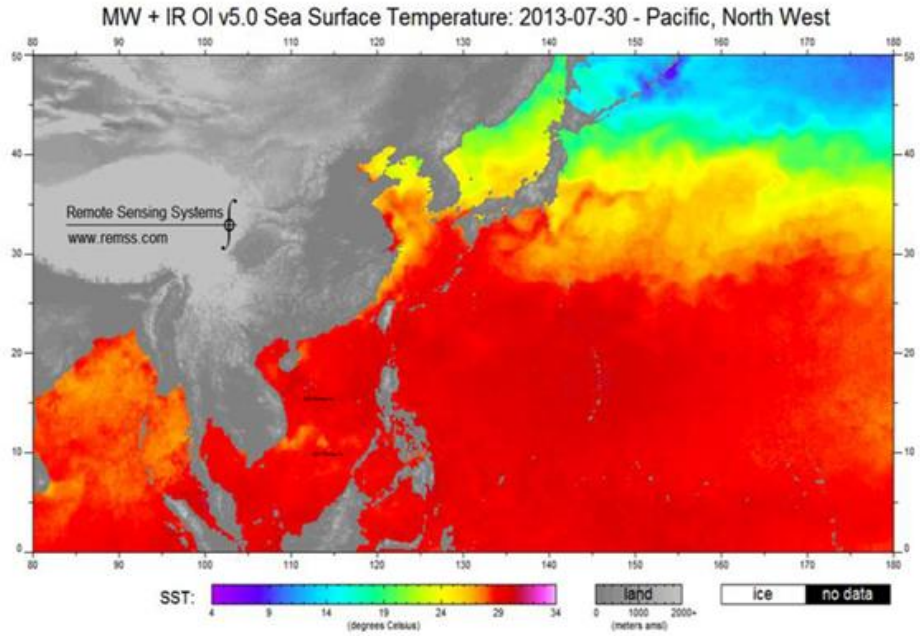
(Source : http://vietnamnet.vn/)

(Source : https://vnexpress.net/)

II. DATA, EXPERIMENTAL DESIGN AND METHODOLOGY

1. Data

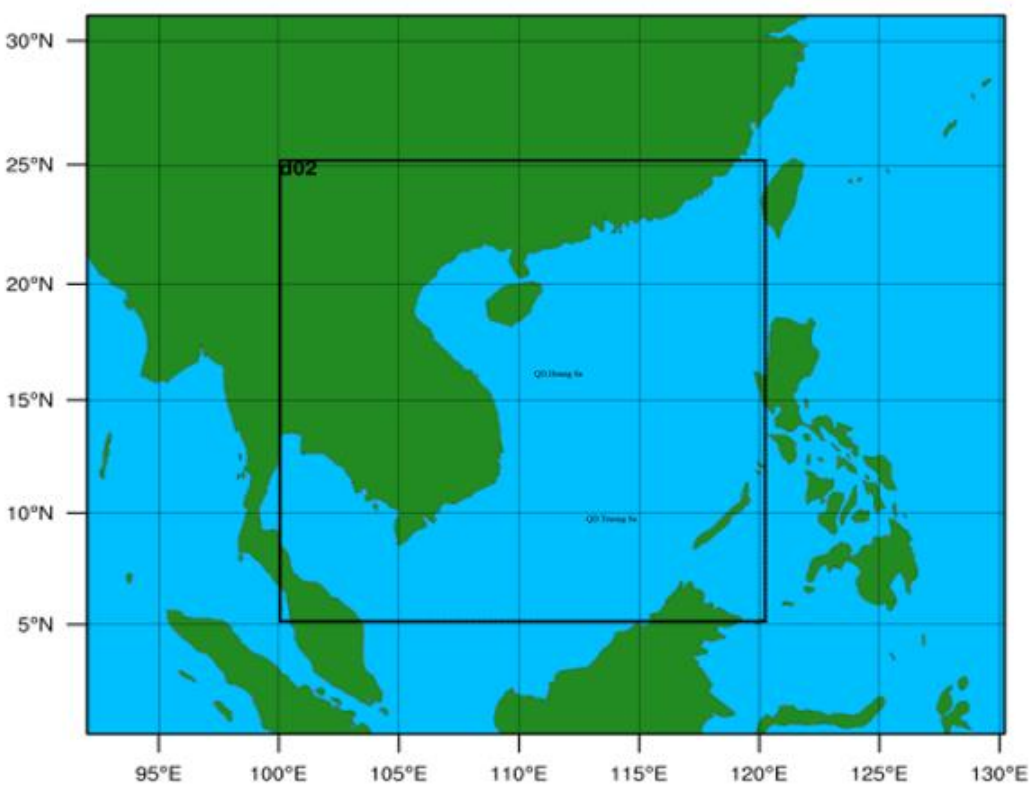
- The daily optimally interpolated SST data (MW_IR OI) were taken from RESS (Remote Sensing Systems). It is available at website: http://www. remss.com/.
- The GFS analysis data of National Centers for Environmental Prediction available at horizontal grid spacing of 0.5° x 0.5° and temporal resolution of 6 h. This data is provided at website: ftp://nomads.ncdc.noaa.gov/ GFS/ analysis_only/.
- Tropical cyclone best track data from IBTrACS (International Best Track Archive for Climate Stewardship). This data is available in the website: https://www.ncdc. noaa.gov/ibtracs/.



(*Source: http://www.remss.com/*)

II. DATA, EXPERIMENTAL DESIGN AND METHODOLOGY

2. Experimental design



Vertical Levels	32 terrain-following hydrostatic pressure coordinate	
Horizontal Grid Spacing	D01	D02
	27 km	9km
Domain	0 - 31°N; 92 - 130°E	5 - 25°N; 100 - 120°E
Radiation (SW/LW)	RRTMG (Iacono, 2008).	
cumulus parameterization	Kain-Fritsch 2 (KF2) (Kain, 2004)	
Microphysics	Thompson (Thompson, 2004)	
PBL	YSU (Hong, 2006)	
Surface Layer	Revised MM5 Monin-Obukhov scheme (Jimenez, 2012)	
Land surface Model	The multi-layer Noah land surface model (Chen and Dudhia 2001)	

The WRF model domains for tropical cyclone simulation

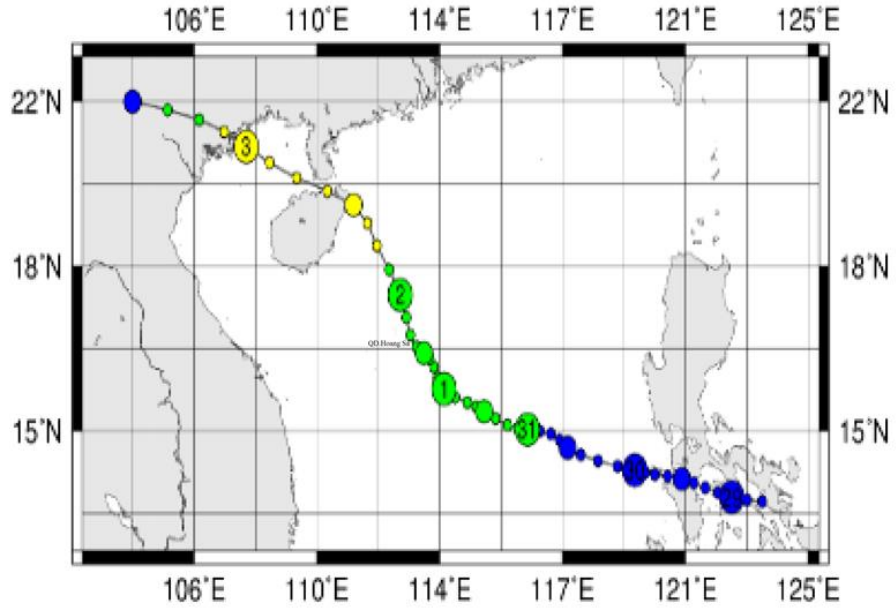
II. DATA, EXPERIMENTAL DESIGN AND METHODOLOGY

3. Methodology

- For Jebi tropical cyclone, two experiments: (1) SST is provided from GFS analysis (GFS case); (2) SST is used the daily optimally interpolated MW_IR OI SST data (SSTVT case). In both of cases, SST is kept unchanged during the 72 hr simulation.
- For Nalgae typhoon, three experiments: (1) SST from GFS analysis is provided for the initial condition and kept unchanged during the 72 hr simulation (GFS case); SST is used the MW_IR OI SST data for the initial condition and kept unchanged during the 72 hr simulation (SSTVT case); (3) the MW_IR OI SST data is updated every 24 hr for the initial and boundary conditions (SSTUP case).

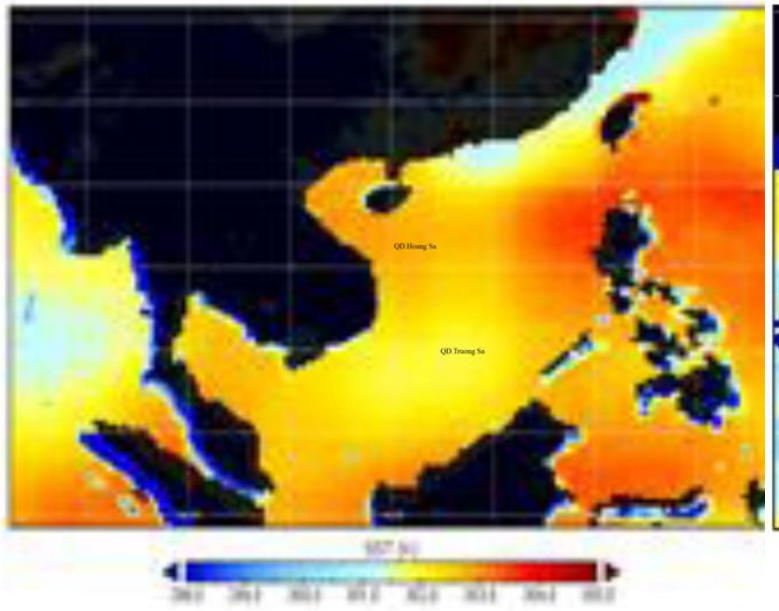
III. RESULTS AND DISCUSSION

1. Simulated Jebi tropical cyclone (2013)

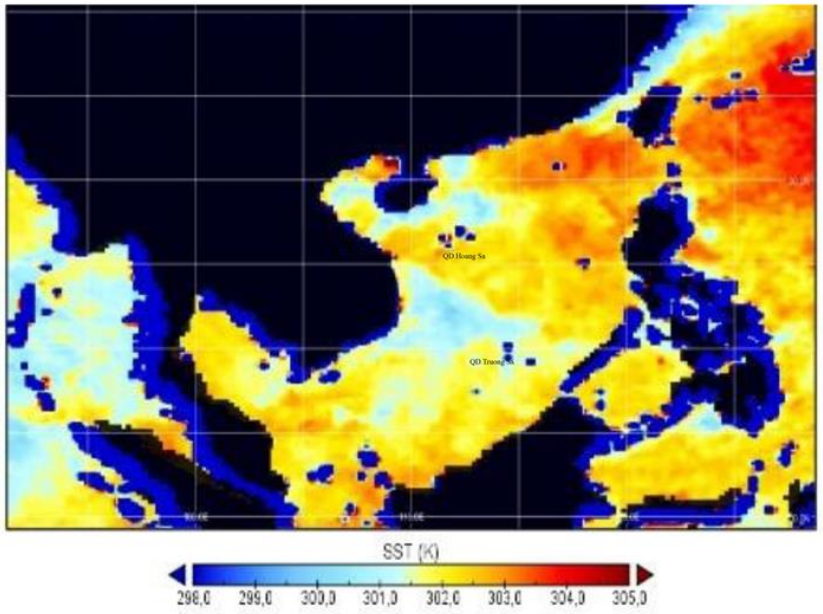


(Source: http://agora.ex.nii.ac.jp/digital-typhoon/)

Best track of Jebi tropical cyclone



SST from GFS valid for 30/07/2013



SST from RESS valid for 30/07/2013

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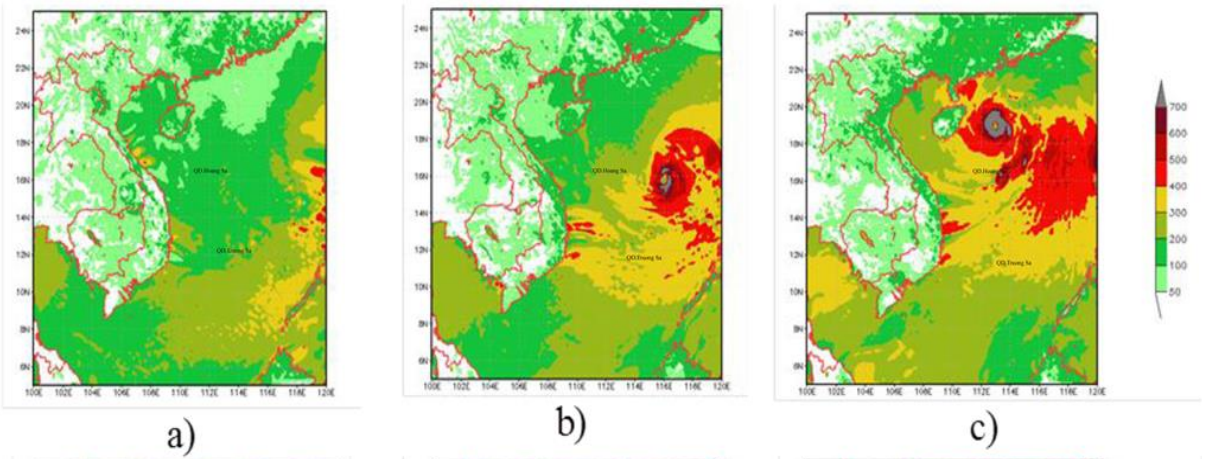
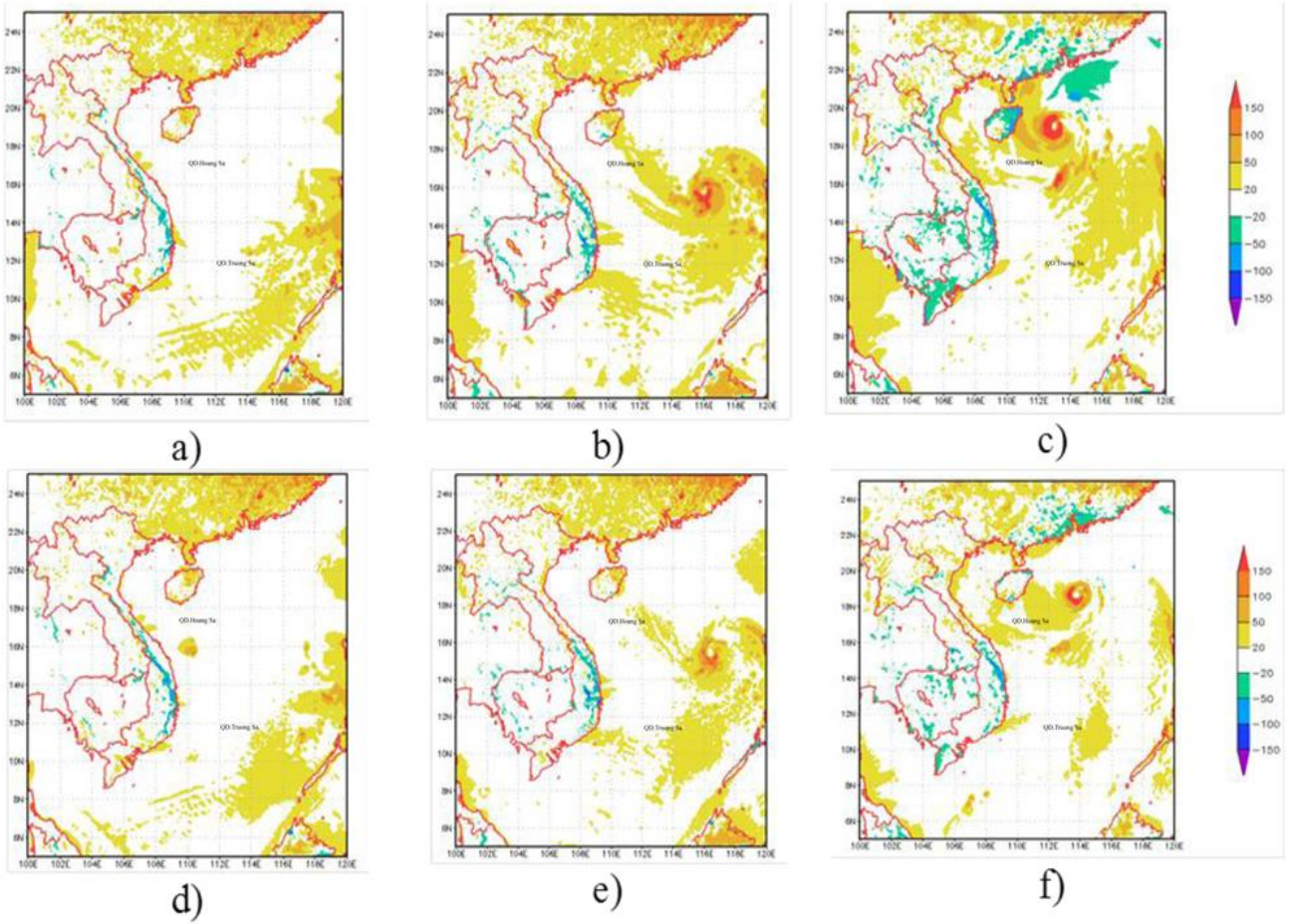


The simulated latent heat flux (Wm^{-2}) after 24 hr (a, d), 48 hr (b, e) and 72 hr (c, f) from 00 Z on July 30, 2013 for: GFS (a,b,c) case and SSTVT (d, e, f) case



The simulated sensible heat flux (Wm^{-2}) after 24 hr (a, d), 48 hr (b, e) and 72 hr (c, f) from 00 Z on July 30, 2013 for: GFS (a,b,c) and SSTVT (d, e, f) cases

III. RESULTS AND DISCUSSION

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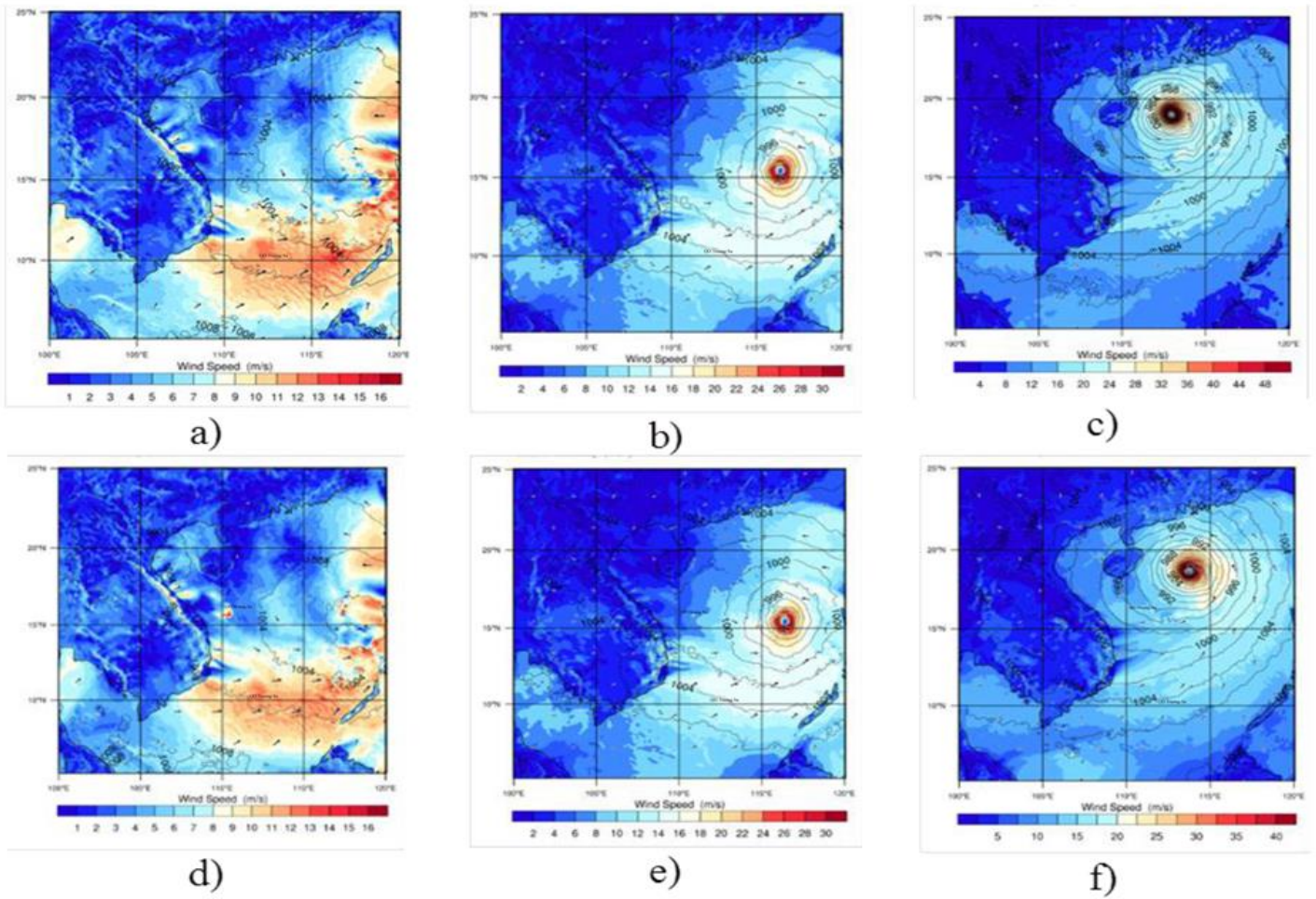

The simulated sea level pressure and the wind velocity at 10 m after 24 hr (a, d), 48 hr (b, e) and 72 hr (c, f) from 00 Z on July 30, 2013 for: GFS (a, b, c) and SSTVT (d, e, f) cases

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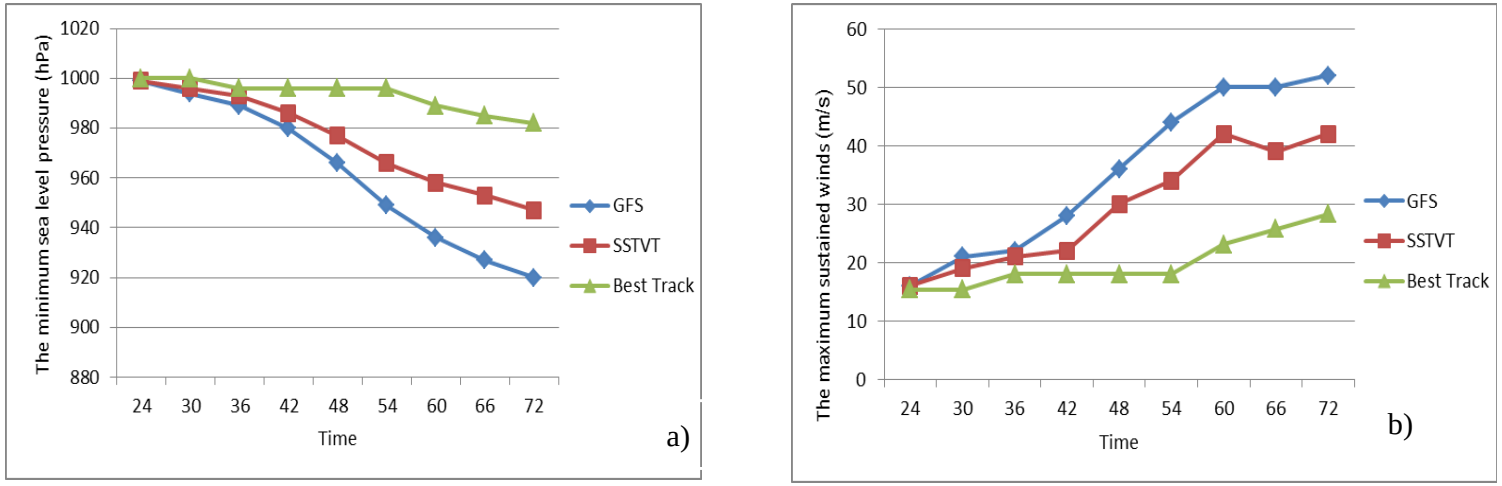

The time series of intensity: a) Pmin; b) Vmax for Jebi tropical cyclone simulated from 00 Z on July 30, 2013 by GFS and SSTVT cases and observed by IBTrACS (Best Track)

III. RESULTS AND DISCUSSION

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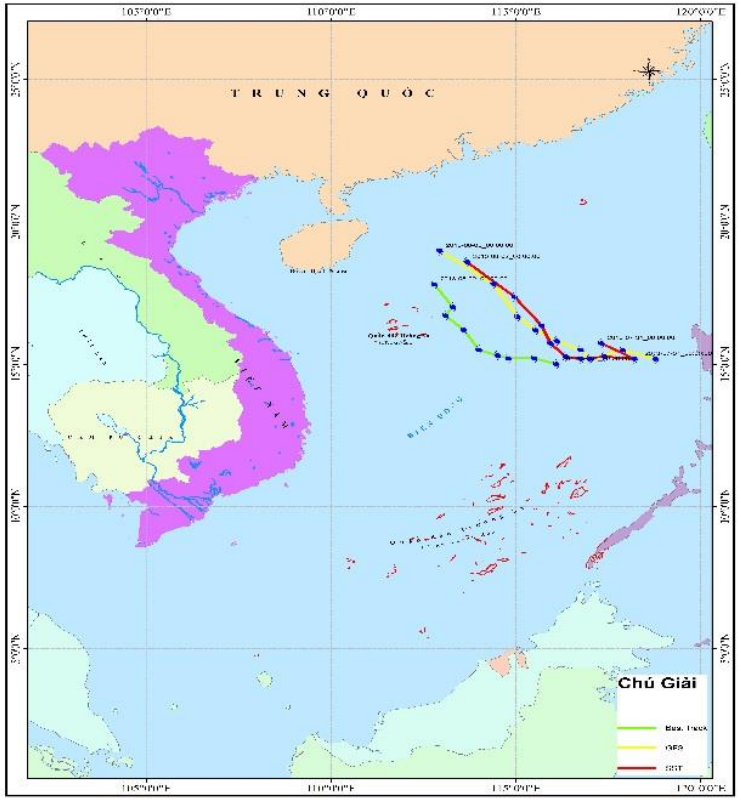


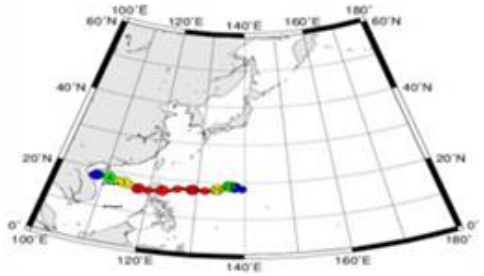
The simulated tracks for Jebi tropical cyclone from 00 Z on July 30, 2013 by GFS and SSTVT and the observed IBTrACS best track

The distance errors (PE) for Jebi tropical cyclone simulated from 00 Z on July 30, 2013 by SSTVT and GFS

Forecast period (hour)	PE_GFS (km)	PE_ SSTVT (km)
24	278.6	262.3
30	234.2	271.5
36	227.5	271.1
42	230.3	252.5
48	247.2	277.8
54	220.9	274.7
60	197.4	260.5
66	202.2	251.9
72	142.8	167.4

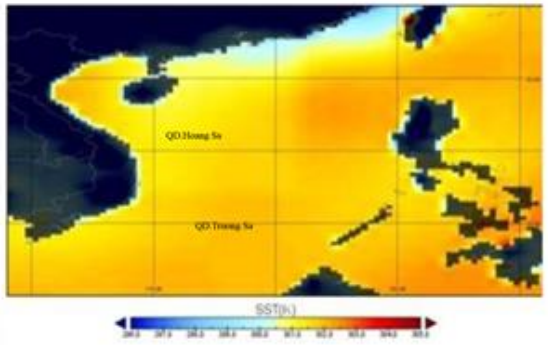
III. RESULTS AND DISCUSSION

2. Simulated Nalgae typhoon (2011)

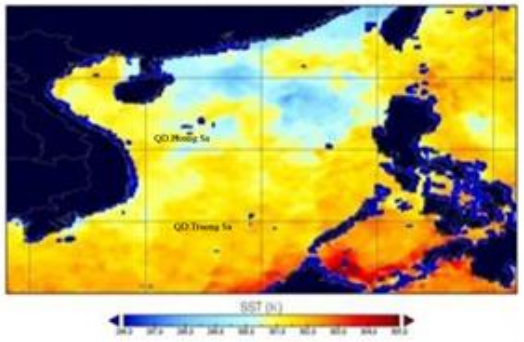


(Source: http://agora.ex. *nii.ac.jp/digital-typhoon/)*

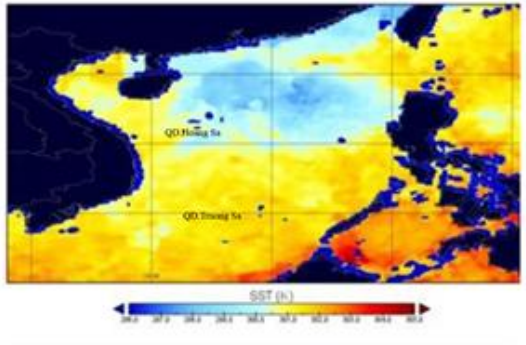
Best track of Nalgae typhoon



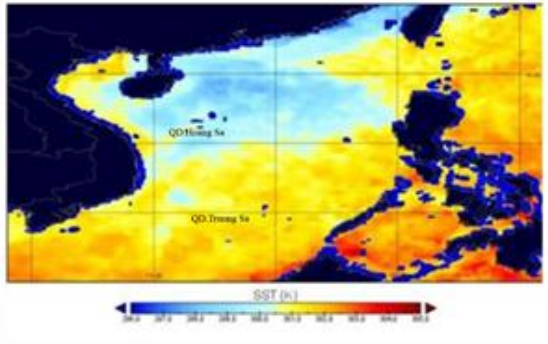
SST from GFS valid for October 2, 2011



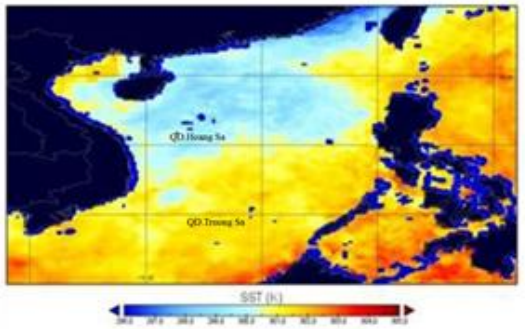
SST from RESS valid for October 2, 2011



SST from RESS valid for October 3, 2011



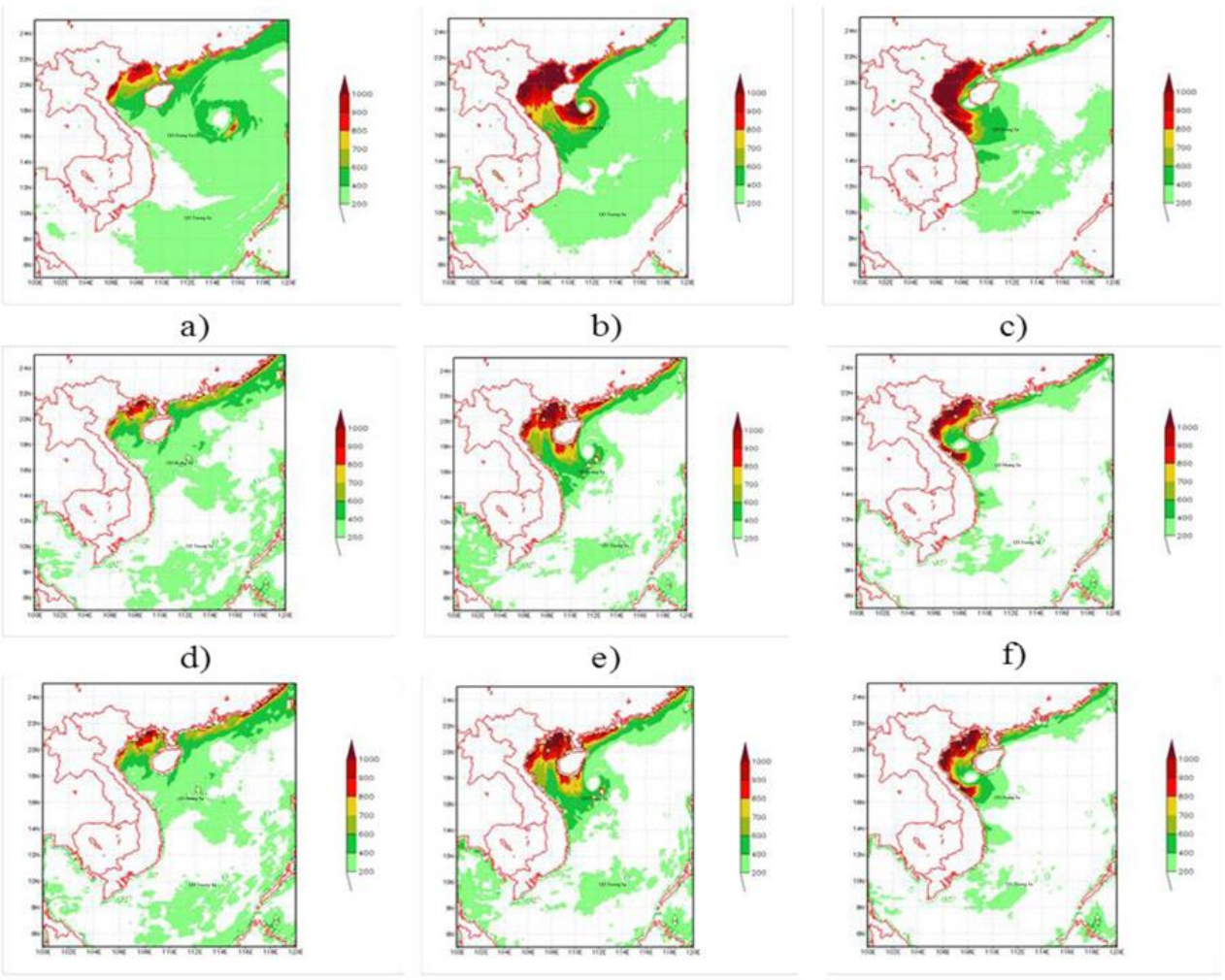
SST from RESS valid for October 4, 2011



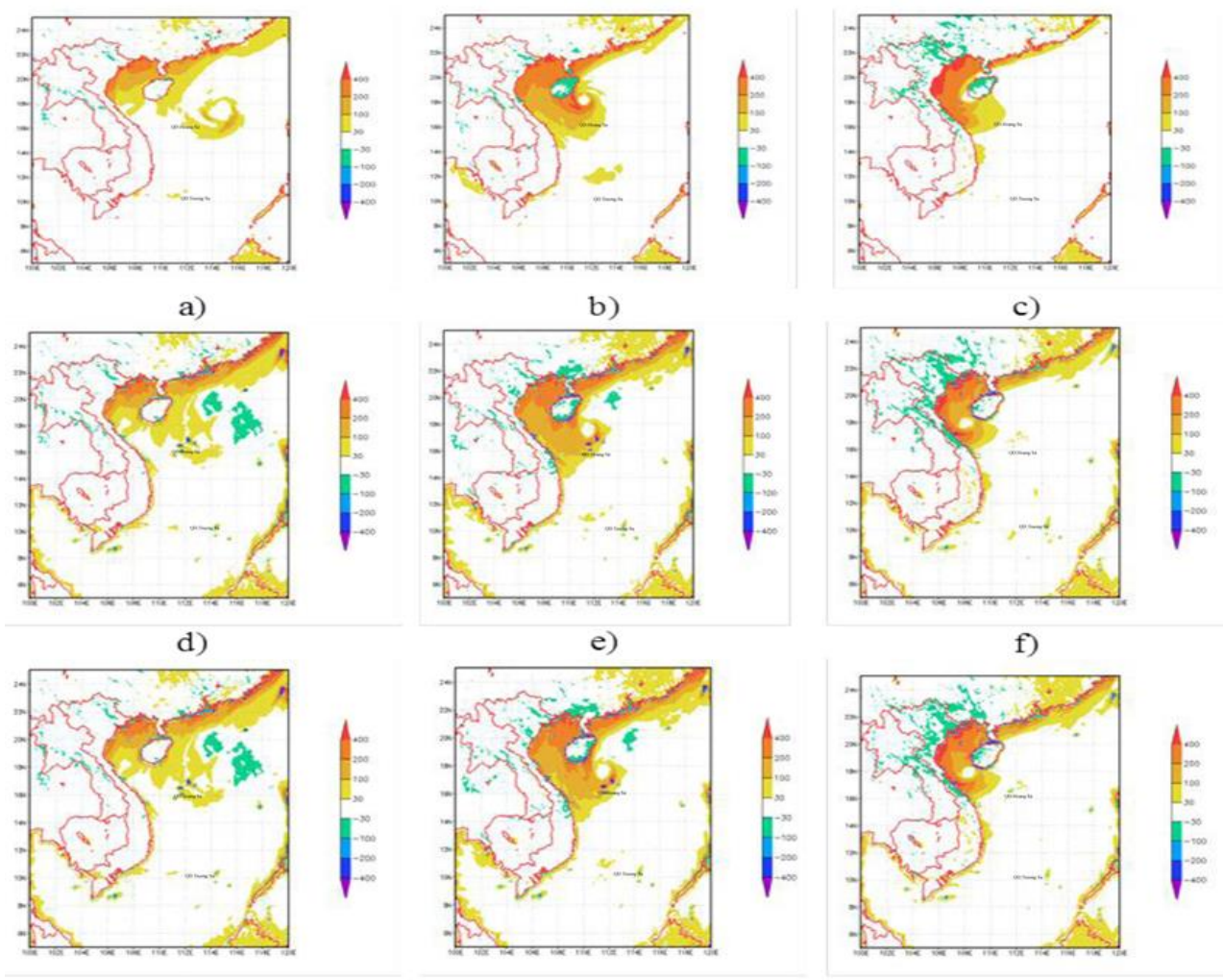
SST from RESS valid for October 5, 2011

III. RESULTS AND DISCUSSION

2. Simulated Nalgae typhoon (2011)



The simulated latent heat flux (Wm^{-2}) after 24 hr (a, d, g), 48 hr (b, e, h) and 72 hr (c, f, i) from 00 Z on July 30, 2013 for: GFS (a,b,c) case; SSTVT (d, e, f) and SSTUP (g, h, i) case



The simulated sensible heat flux (Wm^{-2}) after 24 hr (a, d), 48 hr (b, e) and 72 hr (c, f) from 00 Z on July 30, 2013 for: GFS (a,b,c); SSTVT (d, e, f) and SSTUP (g, h, i) cases

III. RESULTS AND DISCUSSION

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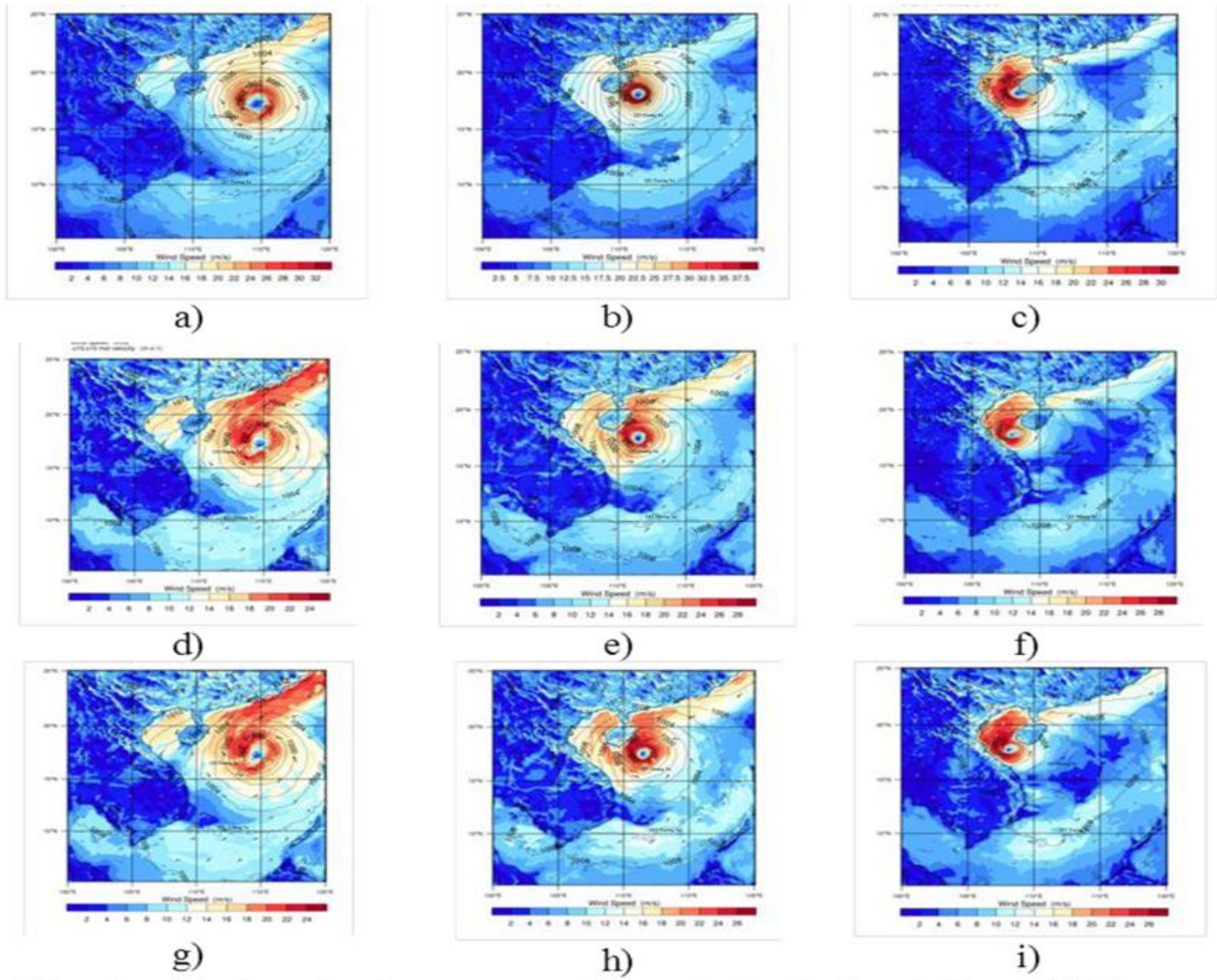

The simulated sea level pressure and the wind velocity at 10 m of Nalgae typhoon after 24 hr (a, d, g), 48 hr (b, e, h) and 72 hr (c, f, i) from 00 Z on October 2, 2011 for: GFS (a, b, c); SSTVT (d, e, f) and SSTUP (g, h, i) cases

III. RESULTS AND DISCUSSION

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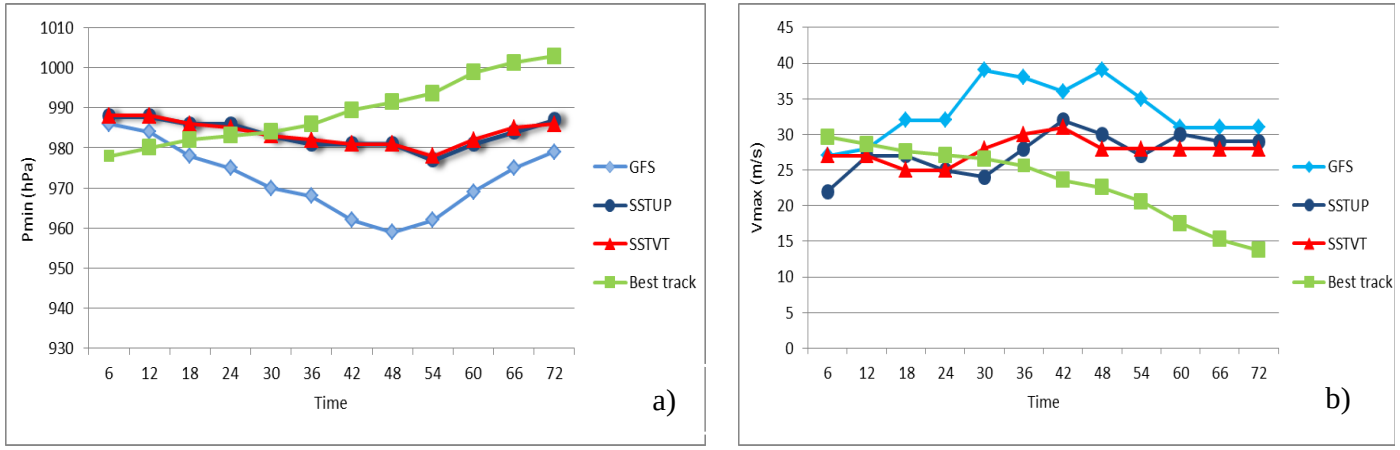

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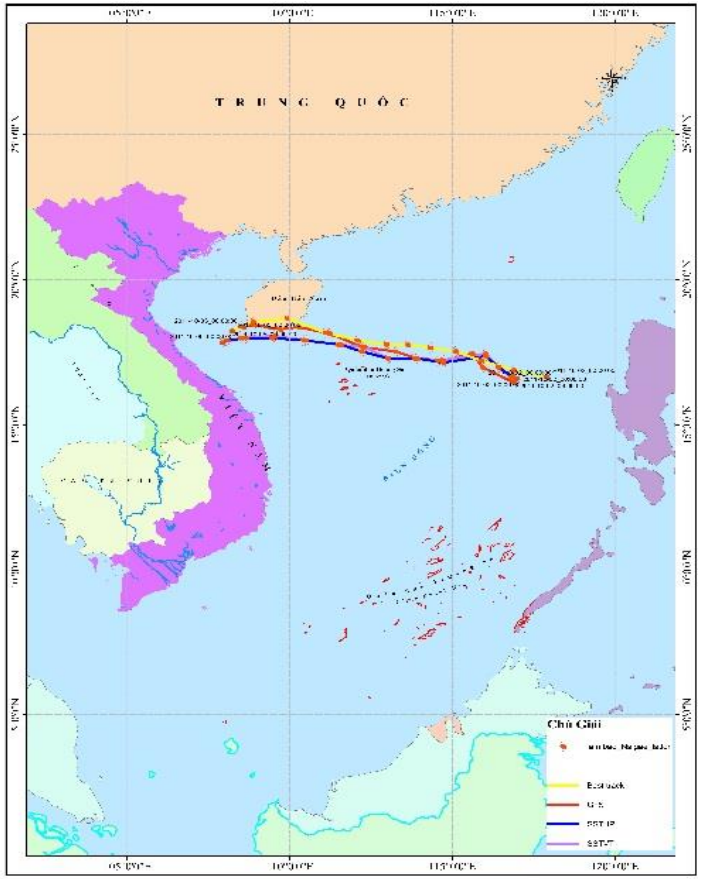

The simulated tracks for Nalgae typhoon from 00 Z on October 2, 2011 by GFS; SSTVT and SSTUP and the observed IBTrACS best track

The distance errors (PE) for Nalgae typhoon simulated from October 2, 2011 by GFS; SSTVT and SSTUP cases

Forecast period (hour)	PE_GFS (km)	PE_ SSTVT (km)	PE_ SSTUP (km)
06	49	32.7	24
12	27.2	63.3	63.3
18	54.8	98	99.3
24	64.1	54.7	70.2
30	61.7	57.9	61.7
36	40.7	53.6	53.6
42	29	33.9	45.6
48	15.1	61.5	67.5
54	47.5	102.9	98.2
60	89.9	87	85.9
66	41.7	44.5	47.2
72	40.1	54.6	38.5

IV. CONCLUSION

- The updating of SST from satellite data for both only initial condition case and initial and boundary conditions case significantly improve the simulated intensity of tropical cyclone due to improved simulation of latent heat and heat fluxs. However, the updating of SST for initial and boundary conditions case is not much not much difference when compared to only initial condition case.
- The simulated results also show the updating of SST from satellite data does not improve the simulated track of tropical cyclone. The further research is required for more reasonable explanations.

THANK YOU VERY MUCH