

# A Numerical Simulation Study of Strong Wind Event at Jangbogo Station, Antarctica



Hataek Kwon, Shin-Woo Kim, Sang-Jong Park, Solji Lee, Seong-Joong Kim, Taejin Choi and Baek-Min Kim\*  
Korea Polar Research Institute, Incheon, Korea, e-mail: h.kwon@kopri.re.kr/dixon409@gmail.com

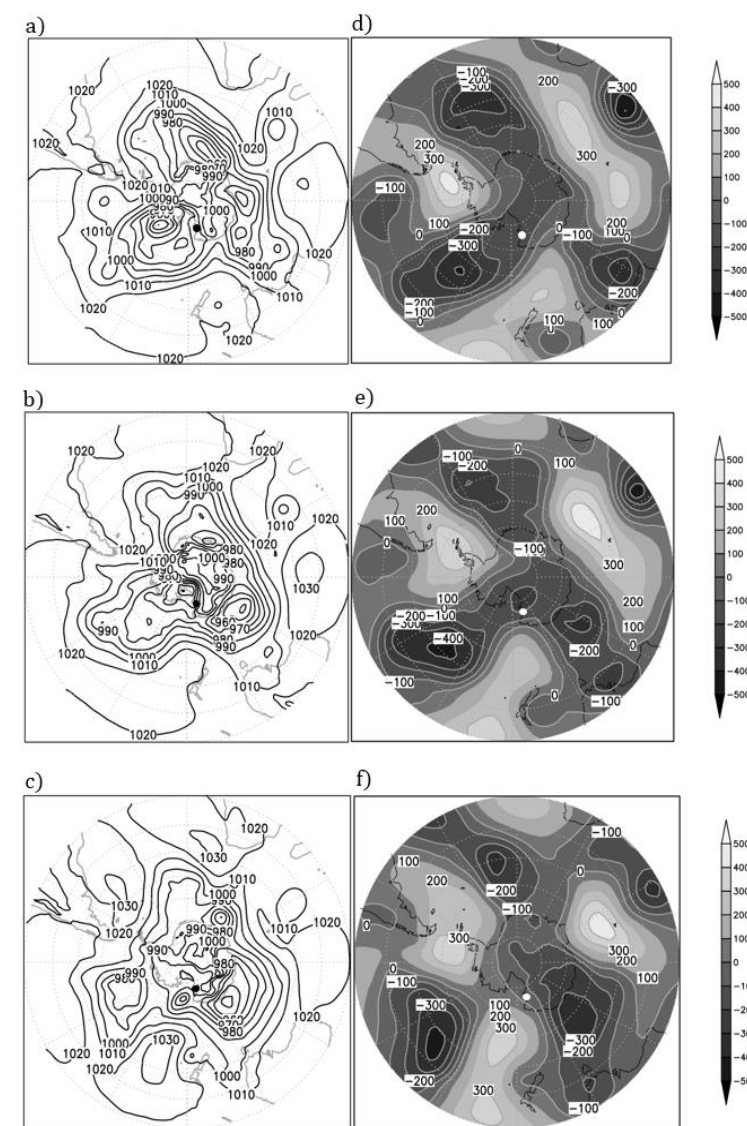
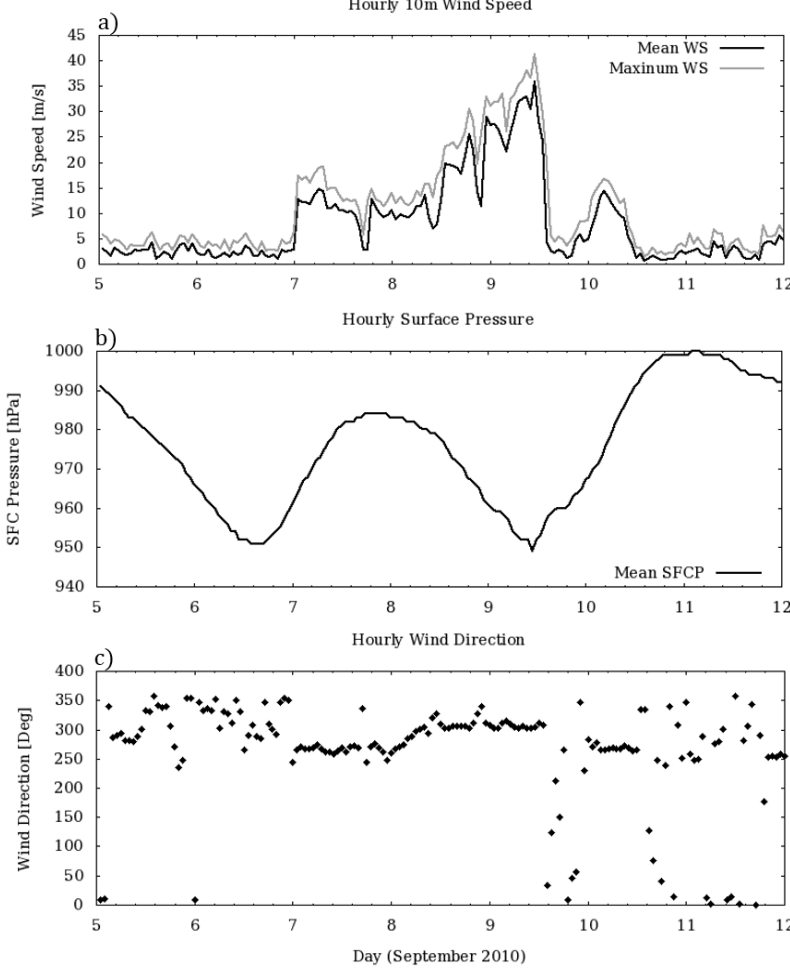
## ABSTRACT

Jangbogo station (74°37'S, 164°12'E) is located in Terra Nova Bay over the Antarctica, which is often affected by individual storms moving along nearby storm tracks. Strong wind is one of the extreme weather events at Jangbogo station caused by passage of the strong mesoscale cyclone. In this study, two strong wind events at Jangbogo station are simulated by using recent version of Polar Weather Research and Forecasting model (Polar WRF) with a high horizontal resolution of 3 km. Then, simulation results are validated against near-surface meteorological observations and Era-Interim reanalysis data at Jangbogo station. Two high wind events with an hourly mean wind speed of ~30 m/s on 20, August and 9, September 2010 are selected for the Polar WRF simulation. Verifying model results from 3km grid resolution simulation against AMOS observation showed that high skill in simulating high wind speed on 9, September 2010 case, but bad skill in simulation high wind speed on 20, August 2010. It is found that the complex topography around the Jangbogo station is one of main factor to reduce the forecast skill of strong wind events at Jangbogo station.

## Strong Wind Cases

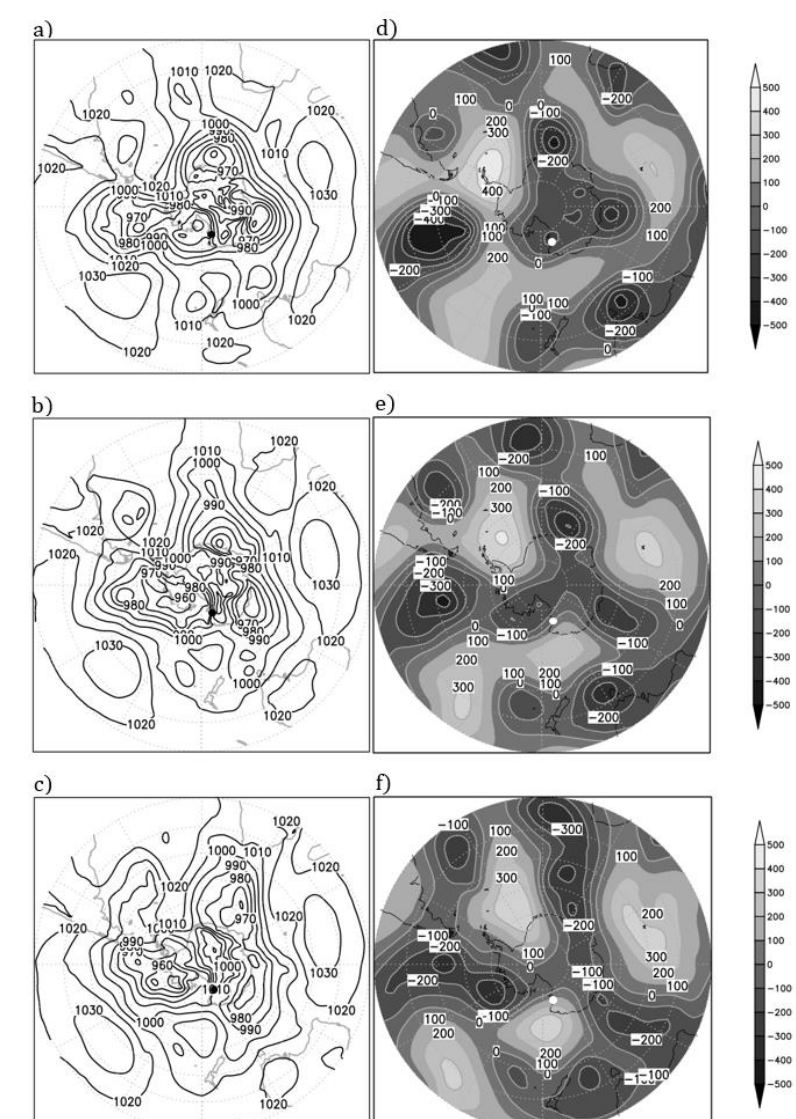
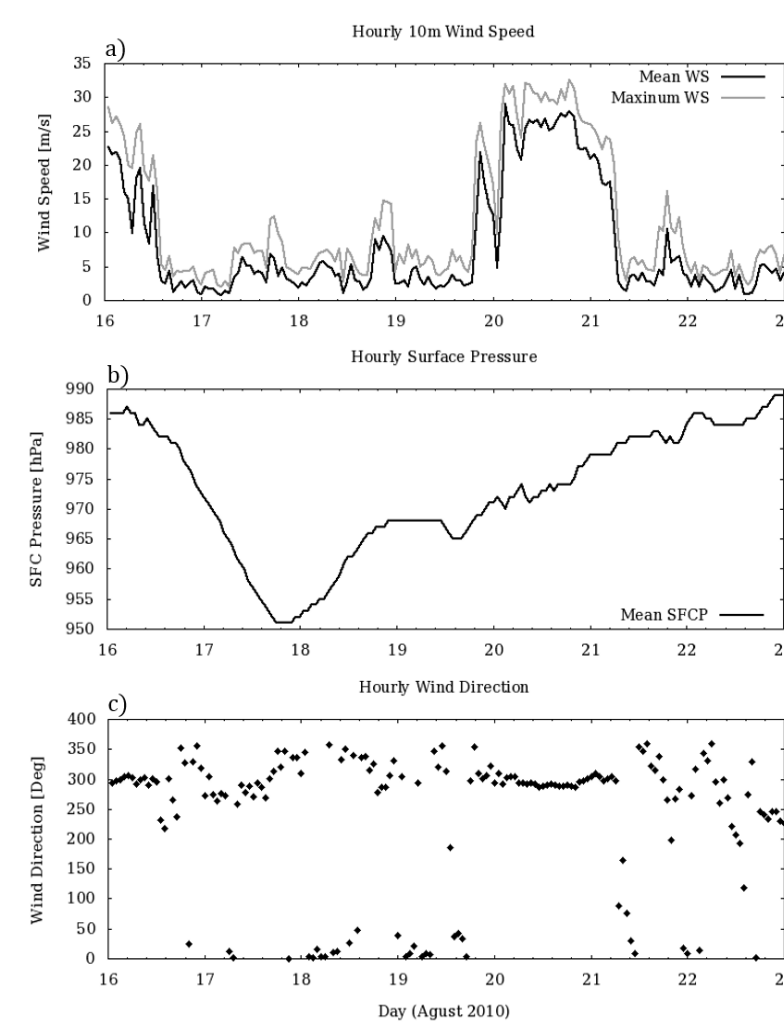
### CASE 1: 9 September, 2010

- Maximum of 10 min instantaneous wind speed: 41.19 m/s



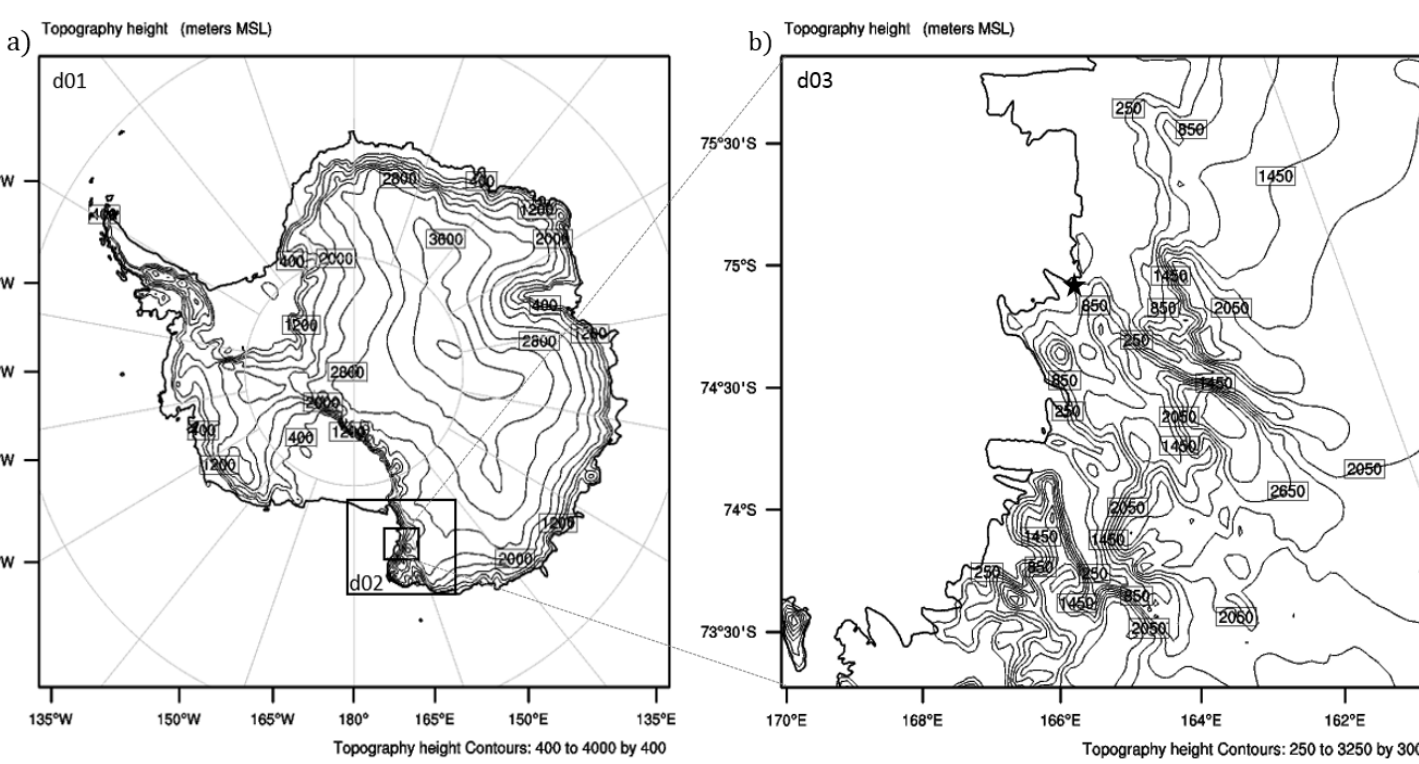
### CASE 2: 20 August, 2010

- Maximum daily mean wind speed: 23.92 m/s



## POLAR WRF CONFIGURATION

- Model domain with terrain height (solid line) for (a) 27km grid and (b) 3km grid.



### Summary of model configuration

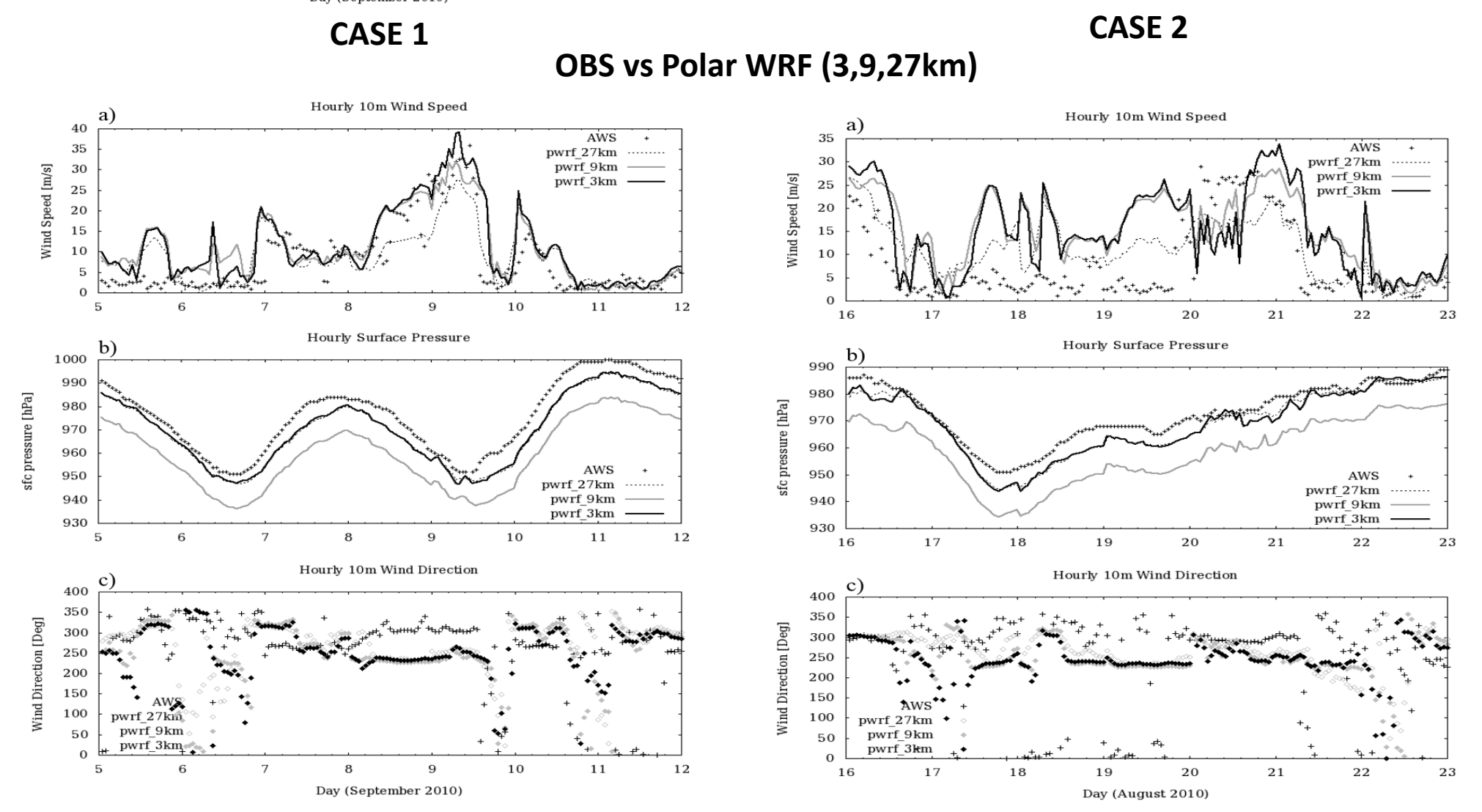
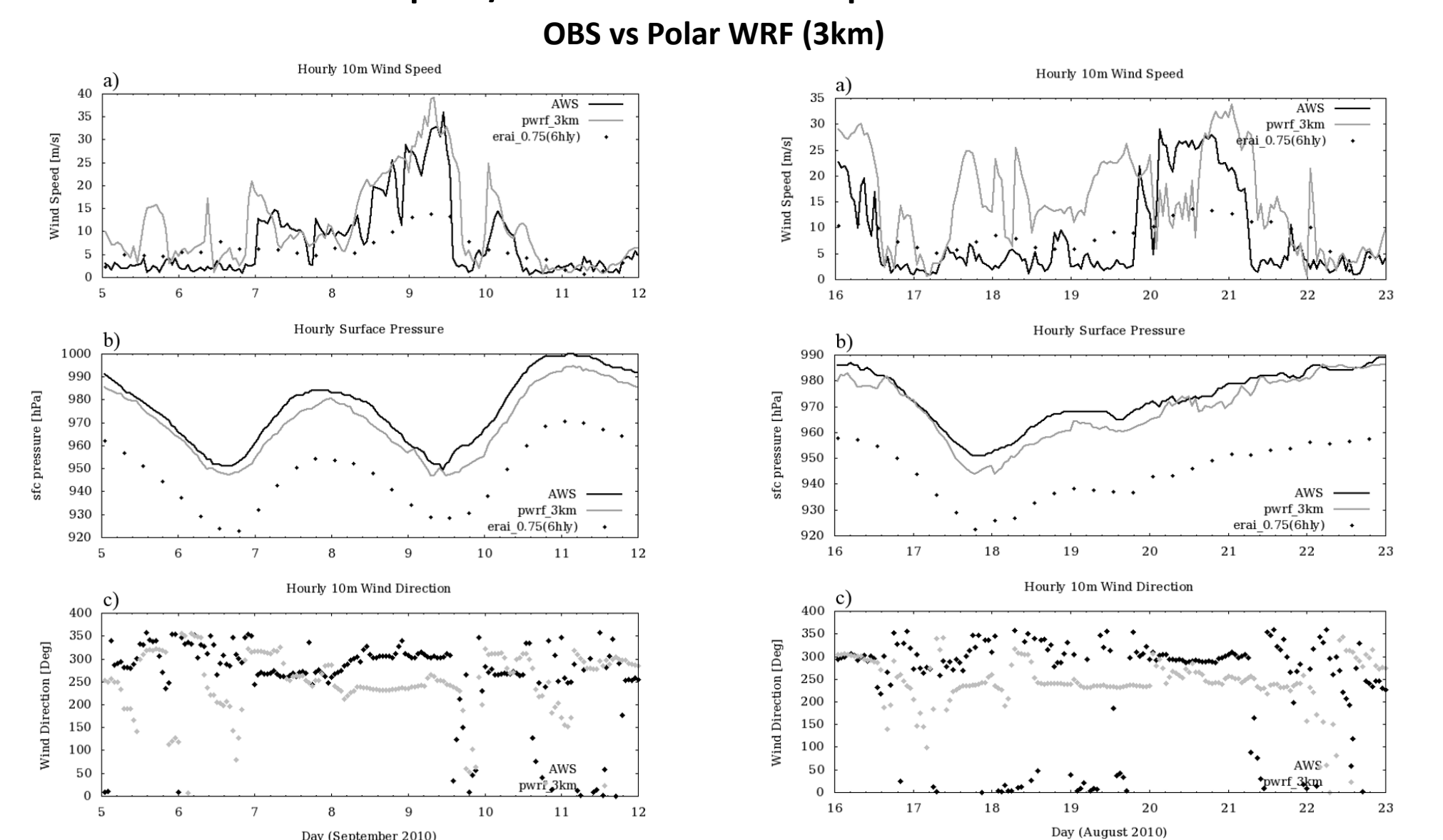
Domain	Domain 1	Domain 2	Domain 3
Horizontal grid	240 x 230	124 x 103	100 x 109
Resolution	27 km	9 km	3 km
Vertical layers	44 Layers (model top: 10 hPa)		
Geog data resolution	10m'	30s'	30s'
Initial, lateral boundary condition	ERA-interim (6-hour intervals with a spatial resolution of 0.75° x 0.75°)		
Time integration	48h forecast from global analysis (first 24 h used for model spin up)		
Base state temperature	273.16 K		
Relaxation zone	4 grid point (Default)		

### Summary of used parameterization

	Domain1	Domain2	Domain3
Microphysics	WRF Single-Moment 5-class		
Longwave rad.	RRTMG scheme		
Shortwave rad.	RRTMG Shortwave		
Land surface	Noah Land Surface Model		
Surface layer	Molin-Obukhov		
PBL	Mellor Yamada-Janjic TKE		
Cumulus param.	Grell-Devenyi ensemble	×	×

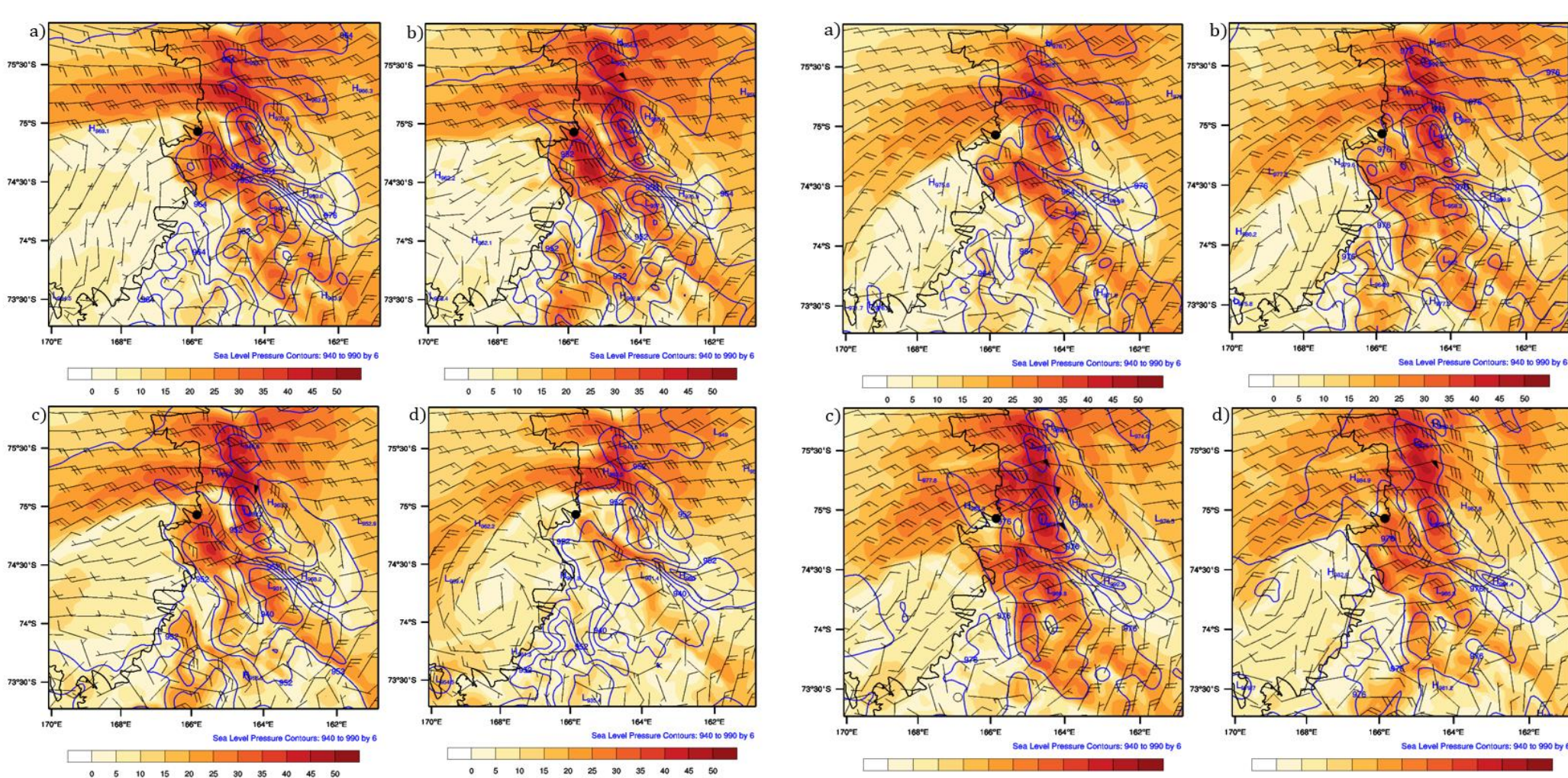
## SIMULATION RESULTS

- Time series of wind speed/direction and surface pressure



## SIMULATION RESULTS

- Sea-level pressure and wind speed

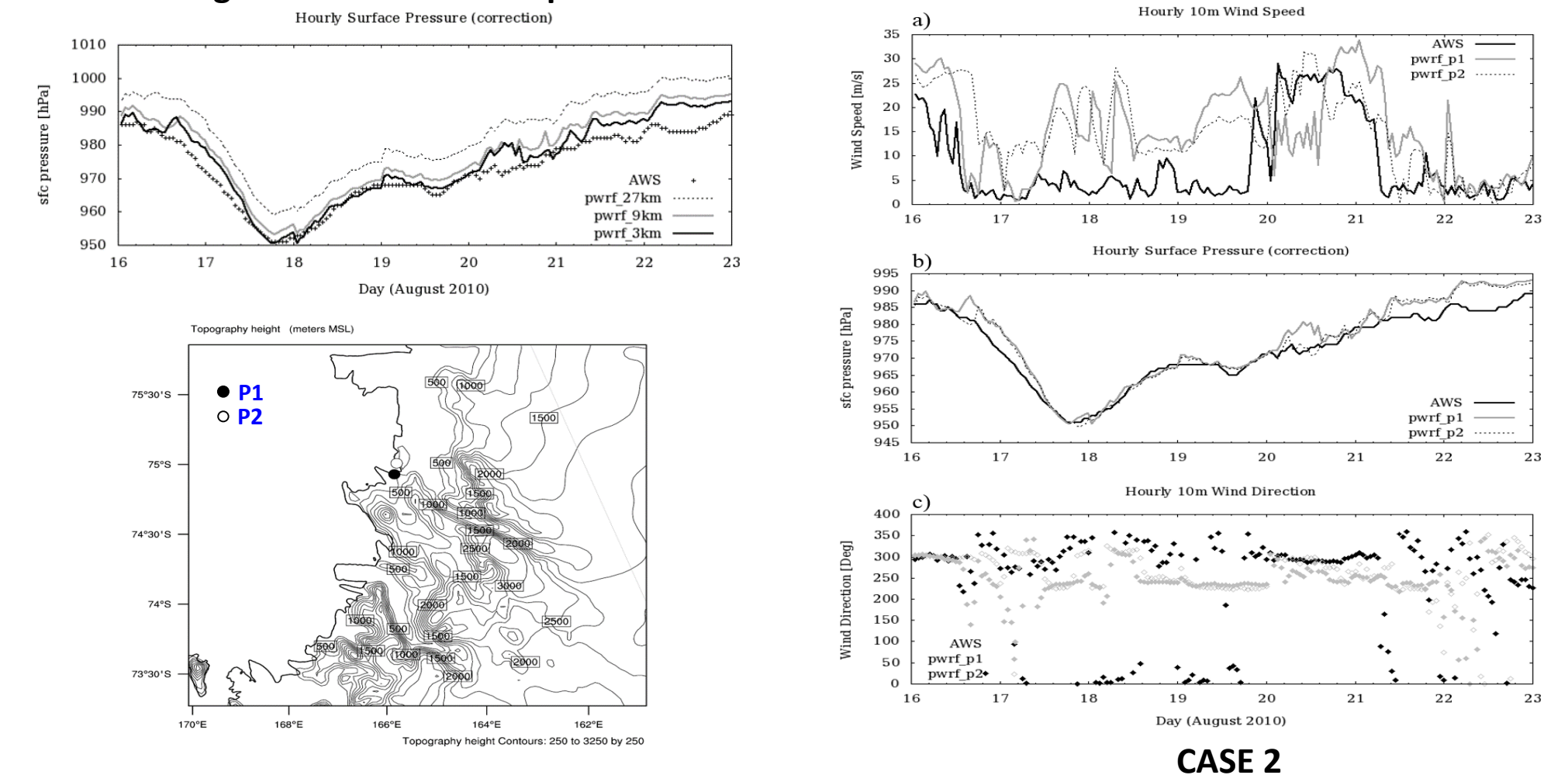


CASE 1

CASE 2

Sea-level pressure (blue contour, hPa) and wind speed (shading, m/s) at a) 0000, b) 0600, c) 1200, and d) 1800 UTC 09 September 2010 from Polar WRF simulation with 3 km grid resolution. Contour interval is 6 hPa. Black circle indicates Jangbogo Station.

### Height corrected surface pressure



CASE 2