

# Case Study of GEM-LAM over Southern Baffin Island

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# Outline

- Motivation
- Model Description
- Storm Event
- Model Evaluation
- Summary

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# Motivation

- Storms are extremely important to human life, the economy, and the environment, particularly in the Canadian Arctic due to their activities on the land.
- Up to date, there has been no coordinated and integrated research program in Canada focused on severe Arctic storms and their related hazards.
- In order to better understand these, we will focus on the storms that occur in the southern Baffin Island region.
- To make progress on this critical issue, we carried out a modelling study on storms in this region as well as observations.

# Objective

- To evaluate GEM-LAM simulations during a high wind event in Iqaluit, NU



# Model Descriptions

- *Global*

*E*

*nvironmental Multiscale Model(GEM)*

- *GEM Global (Uniform grid)*

- *GEM-REG (Variable grid)*

- *GEM-LAM (Uniform grid)*

- *Hor*

*iz*

*ontal resolution of GEM-LAM is 2.5km*

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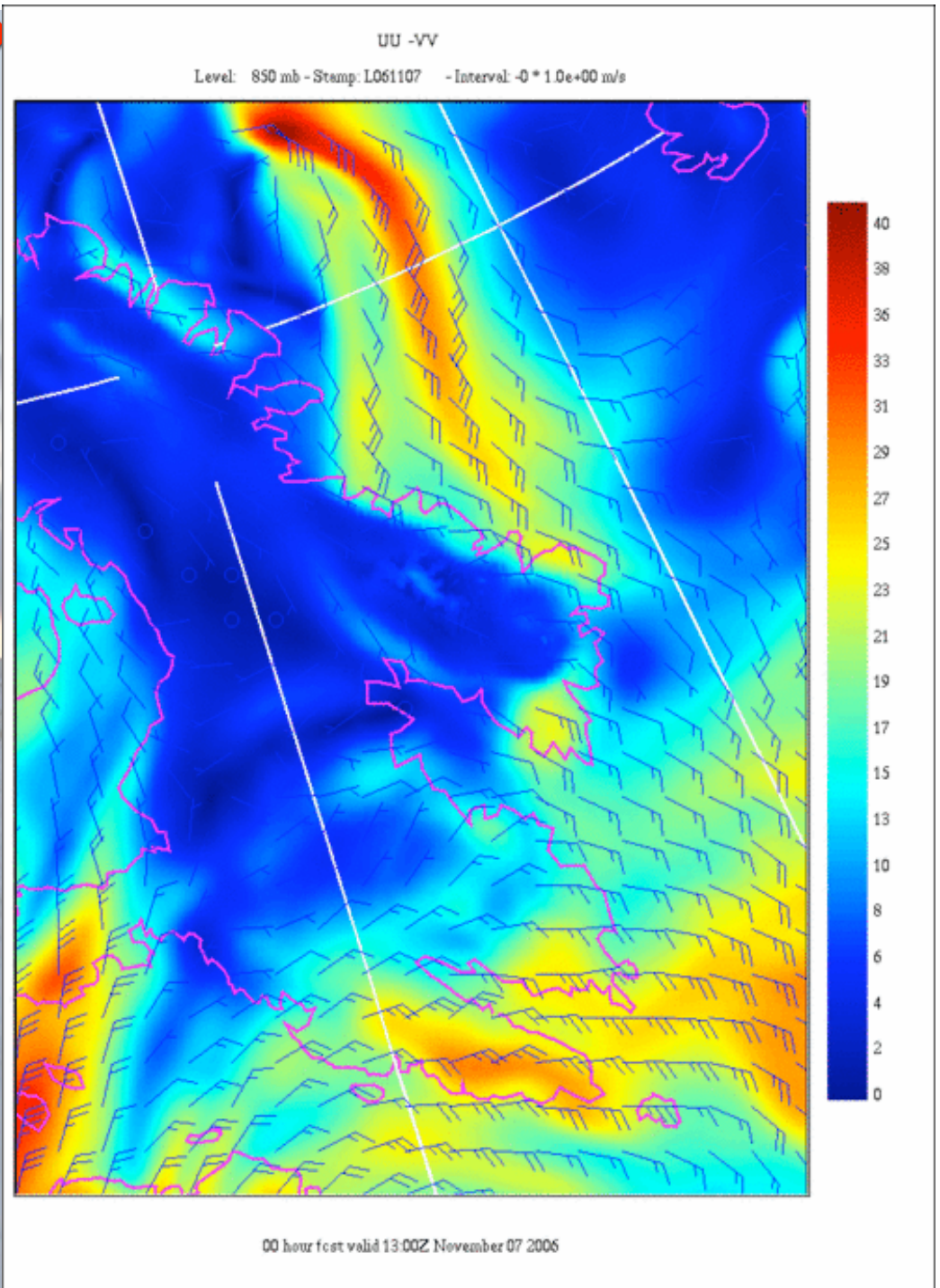
- *Non-hydrostatic with 58 vertical sigma-*

*pres*

*sure hybrid coordinate levels up to 10 hPa*

# Storm Event

2100Z, Nov. 7 to 0600Z  
Nov. 8, 2006, a cyclone  
propagated from southwest  
to northeast over the S.  
Baffin region, with warm air  
advection ahead of the  
system and a sudden wind  
shift in Iqaluit as the system  
propagated



# Observational Data

- Hourly Metars from Iqaluit
- 3h radiosondes during the event

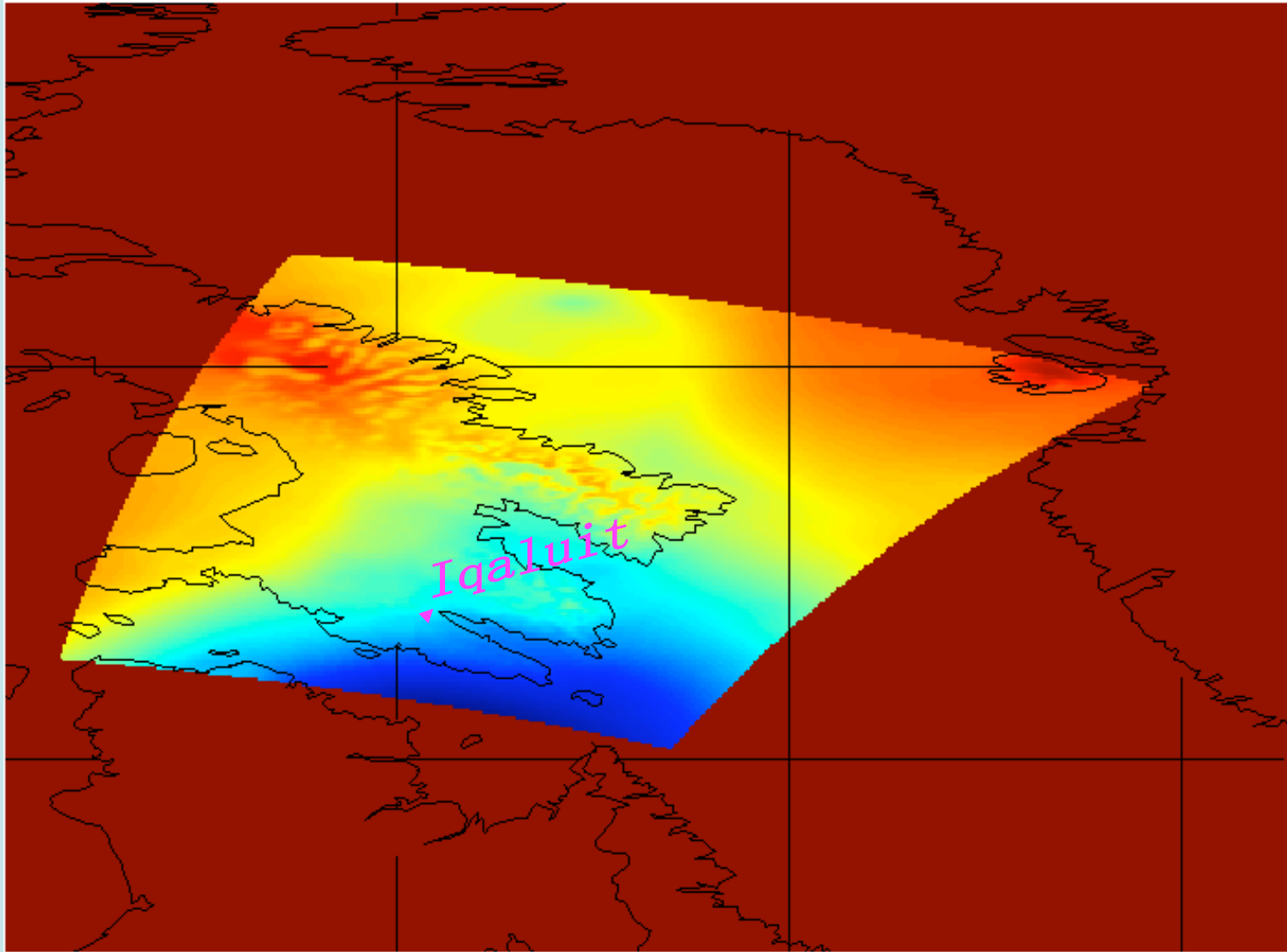


# Numerical Experiments

- **Three** model runs beginning Nov.7, 2006, 1300Z, and integrated 18 hours ahead.
- The lateral boundary conditions were provided by GEM-REG 15km run.
- **Previous** run : control run performed by R. Goodson using gengeo geophysical fields
- **New-CTRL** run : control run performed by Deacu/Zadra using Genesis geophysical fields
- **New-BELJ04** run : same as New-CTRL but using a distributed drag boundary layer scheme inspired by the parameterization of Beljaars et al.(2004).

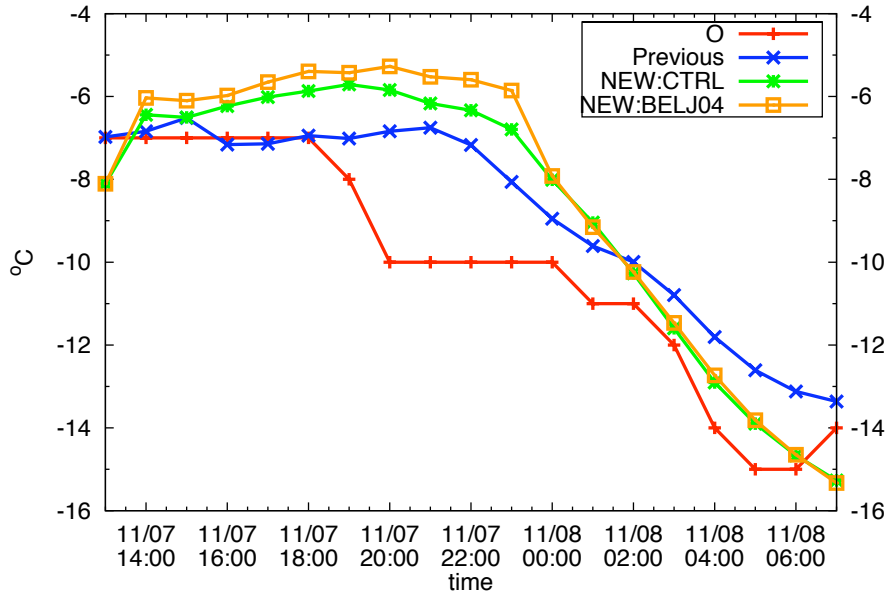


# GEM-LAM Domain

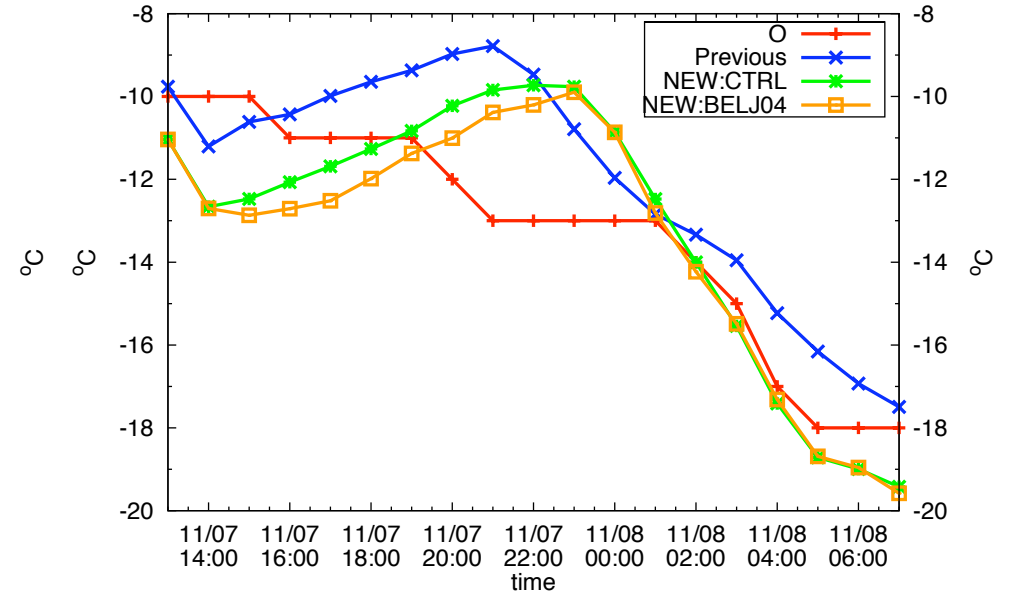


# Time Series Surface fields

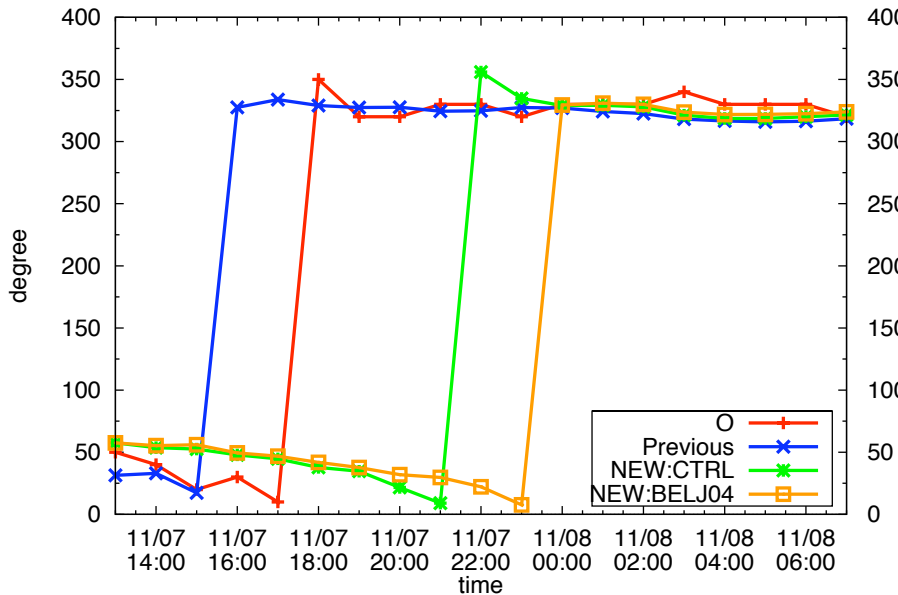
### TEMPERATURE



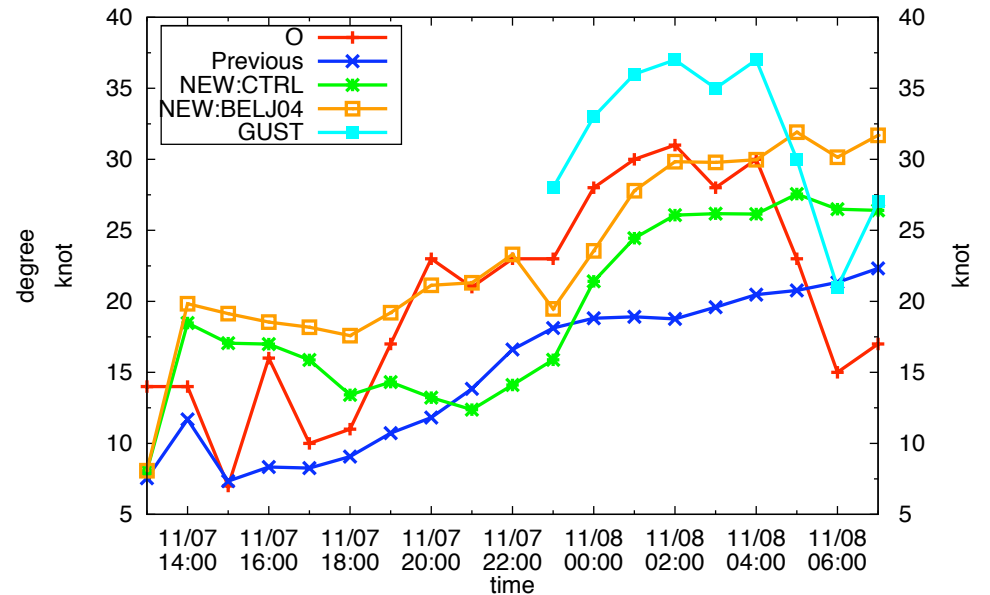
### DEW-POINT TEMPERATURE



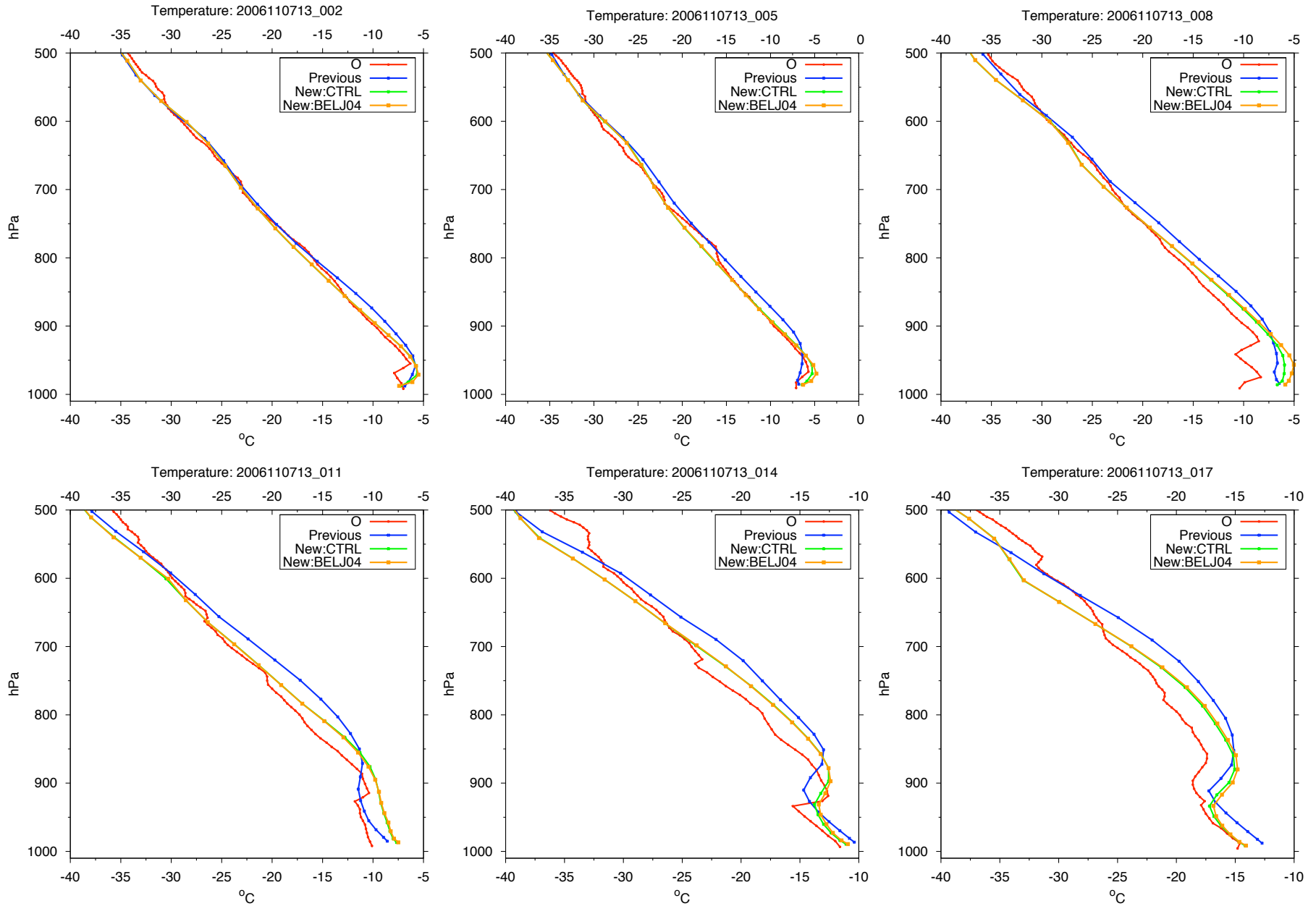
### WIND DIRECTION



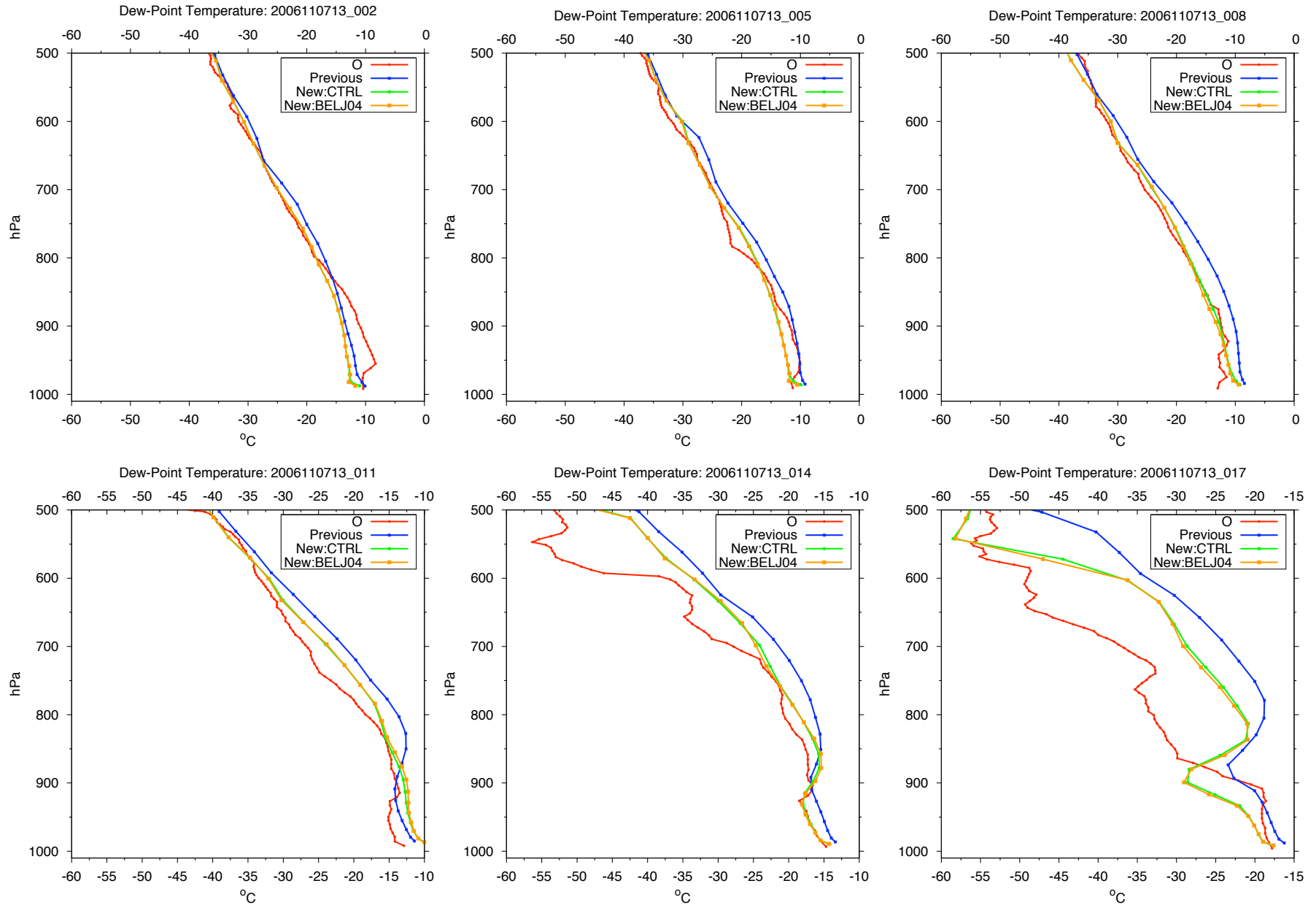
### WIND SPEED



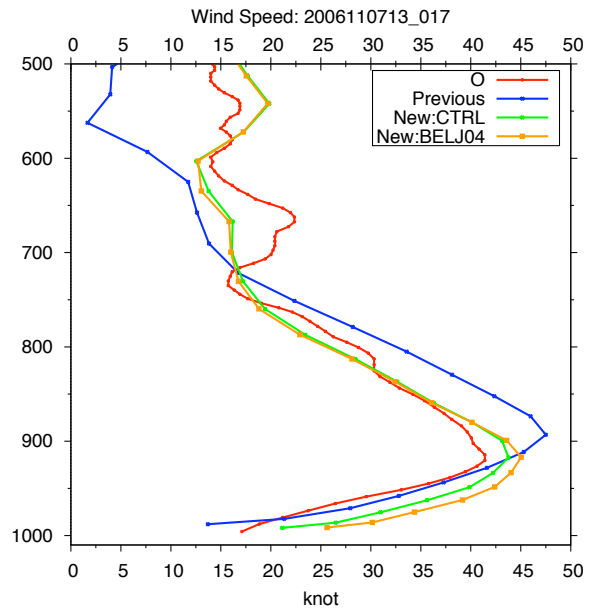
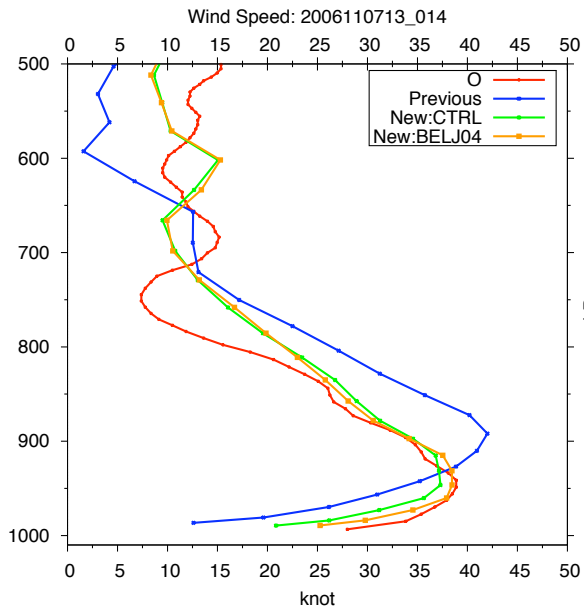
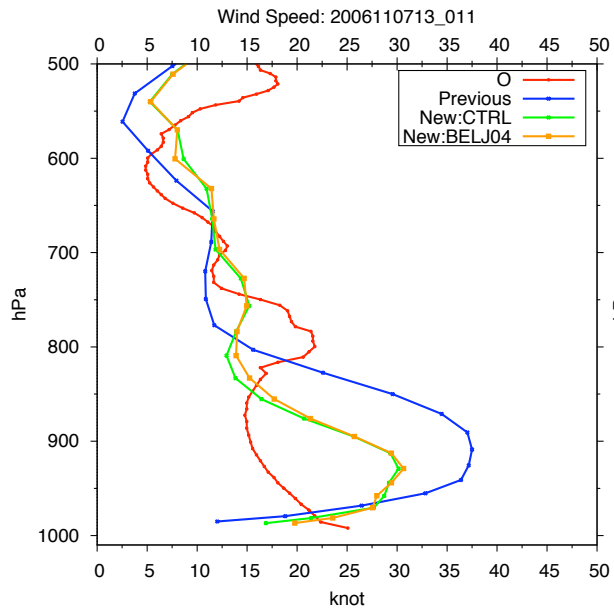
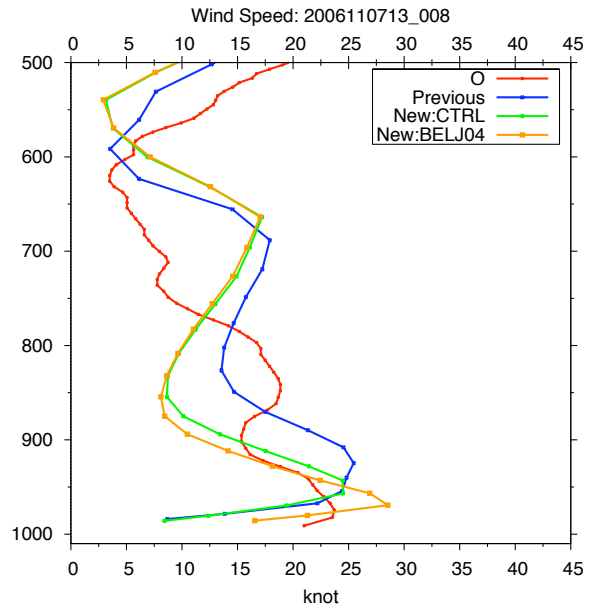
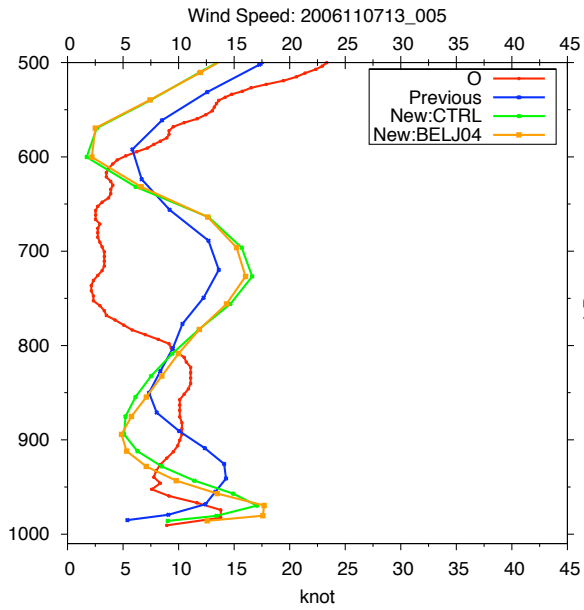
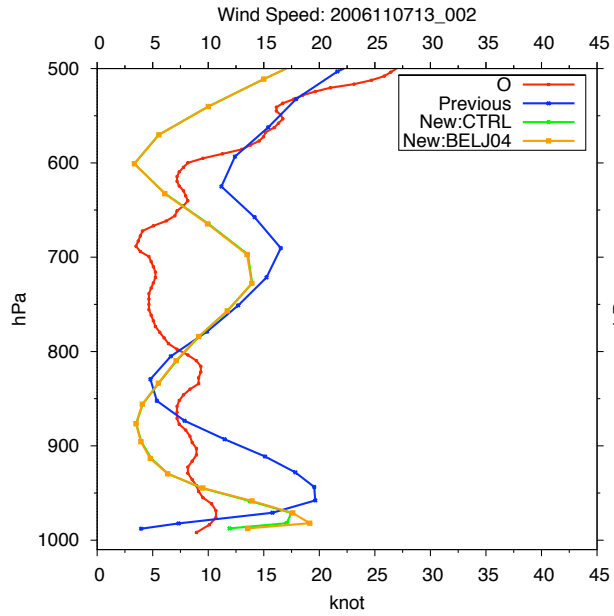
# Temperature



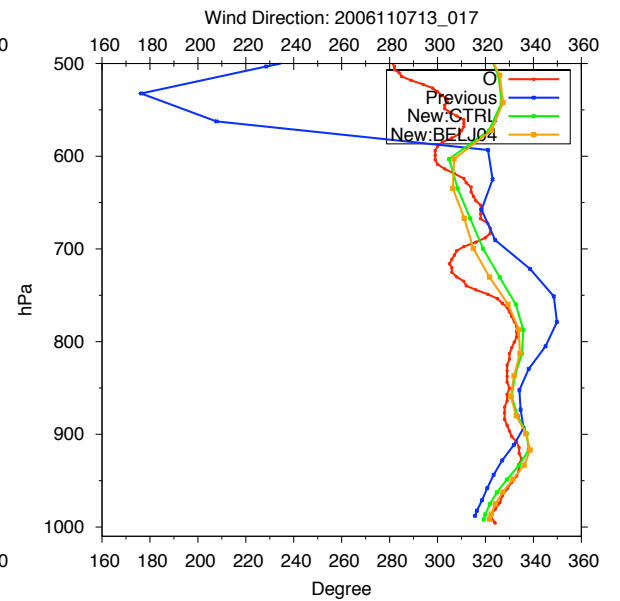
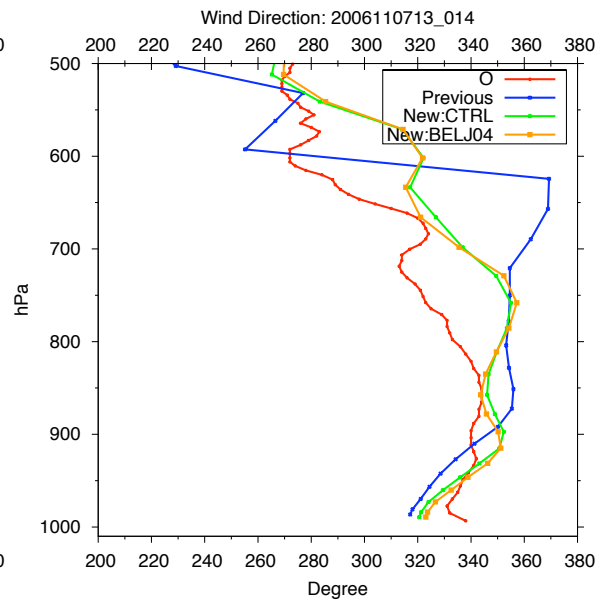
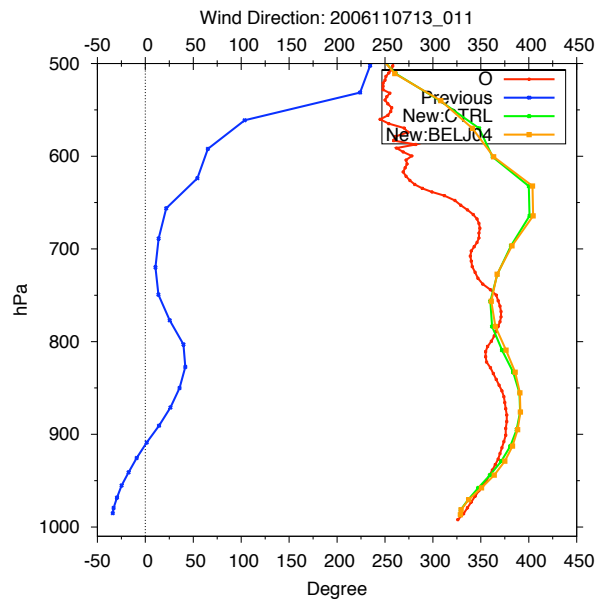
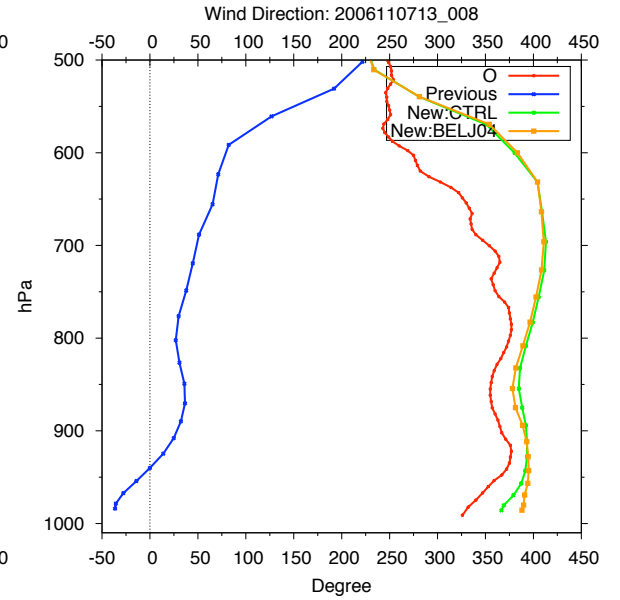
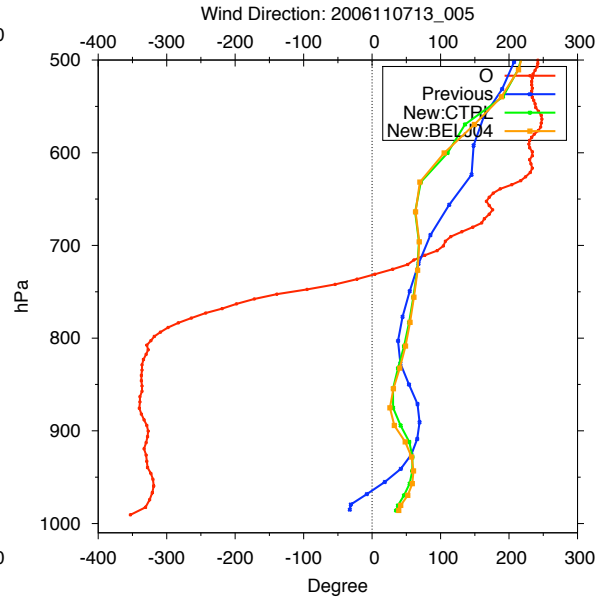
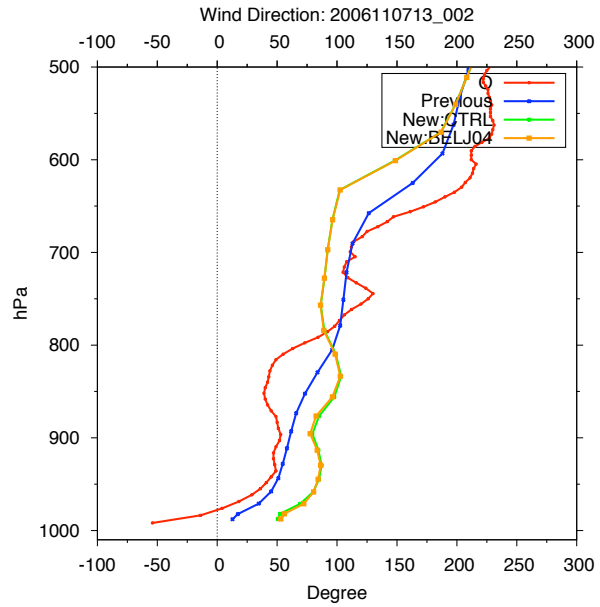
# Dew-Point temperature



# Wind Speed



# Wind Direction



# Summary

- The temperature and dew point of all experiments were simulated well both for time series surface data and vertical profile. The new experiments is better than previous run after 13 hours forecast. The previous run was always overestimate after 5 hour forecast.
- All modelled wind direction near the surface was reasonably close to observations except for the timing of the wind shift, the previous run was 2 hours earlier compared to observations, while new experiments were delayed 4 and 6 hours respectively.
- The simulated surface wind of previous run is always weaker than the observation; while that of new experiments were stronger and were close to the observations
- The predicted vertical profiles of wind direction by new experiments were improved and close to observation.
- For the vertical profile of wind speed, all experiments showed there was a peak value around 925mb all the time and is stronger than the observation. New experiments produced better results

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# Acknowledgments



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***Thank You***