Case Study of a High Wind Event Off the Coast of the Prince Olav Mountains, Antarctica

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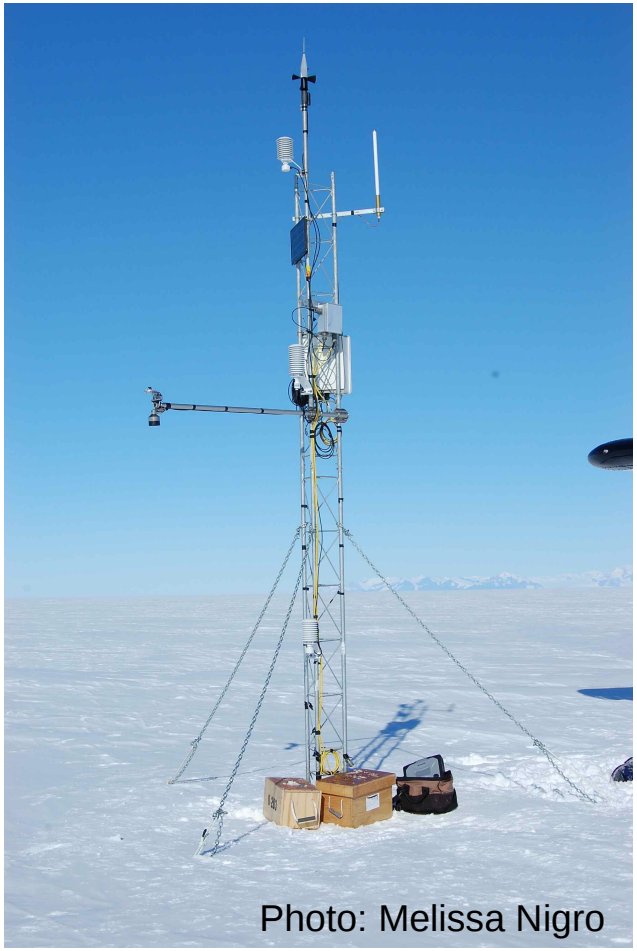
Photo: Melissa Nigro

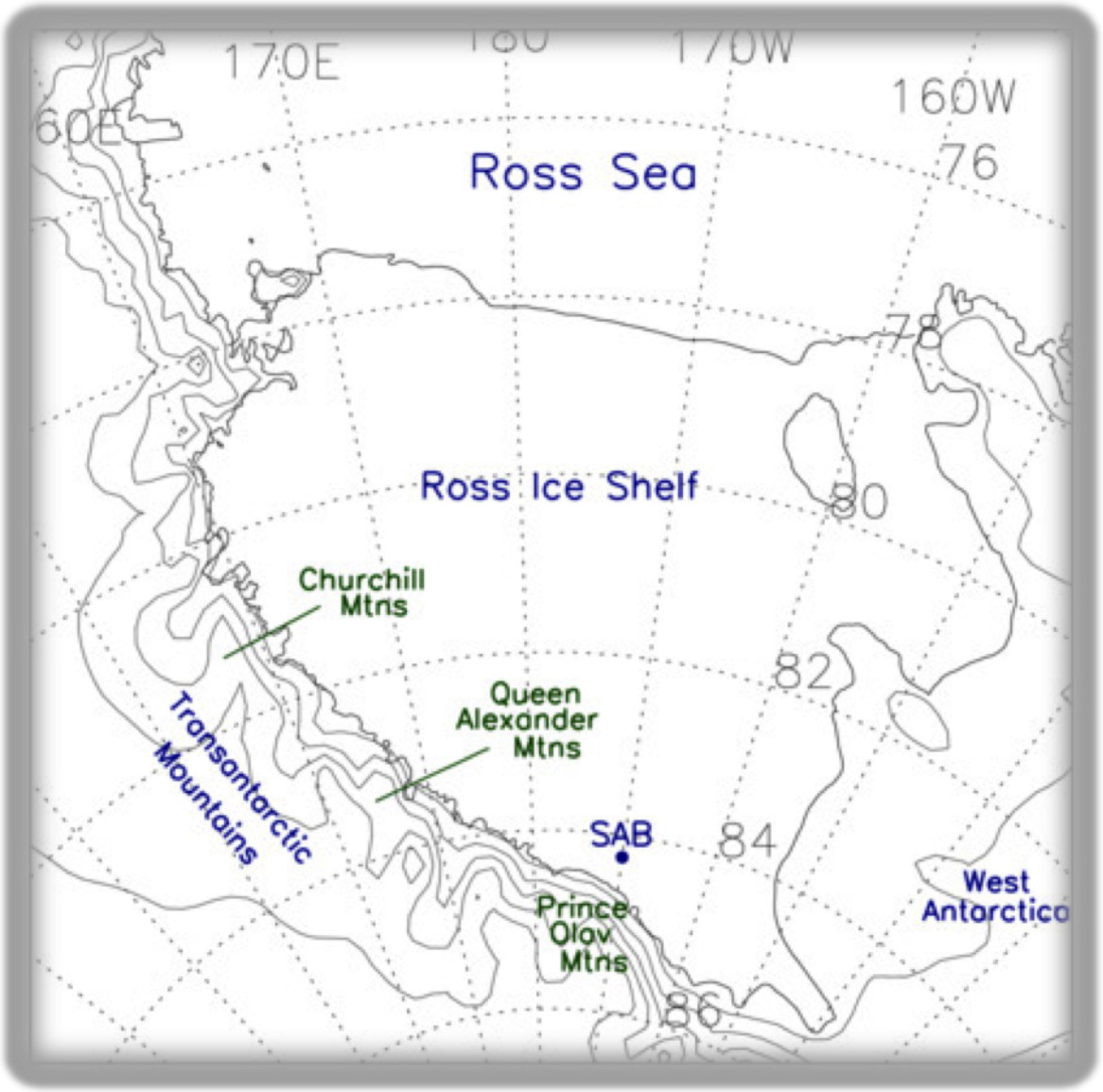
Outline

- Motivation: Local jets over the RIS
- Sabrina AWS: High Wind Event
- Tip Jet: What is this?
- Conclusion



Sabrina AWS

Geography


170E
180
170W
160W
60E
Ross Sea
76
78
Ross Ice Shelf
80
Churchill
Mtns
82
Queen
Alexander
Mtns
Transantarctic
Mountains
SAB
84
West
Antarctica
Prince
Olav
Mtns
86

Motivation

Ross Ice Shelf Local jets

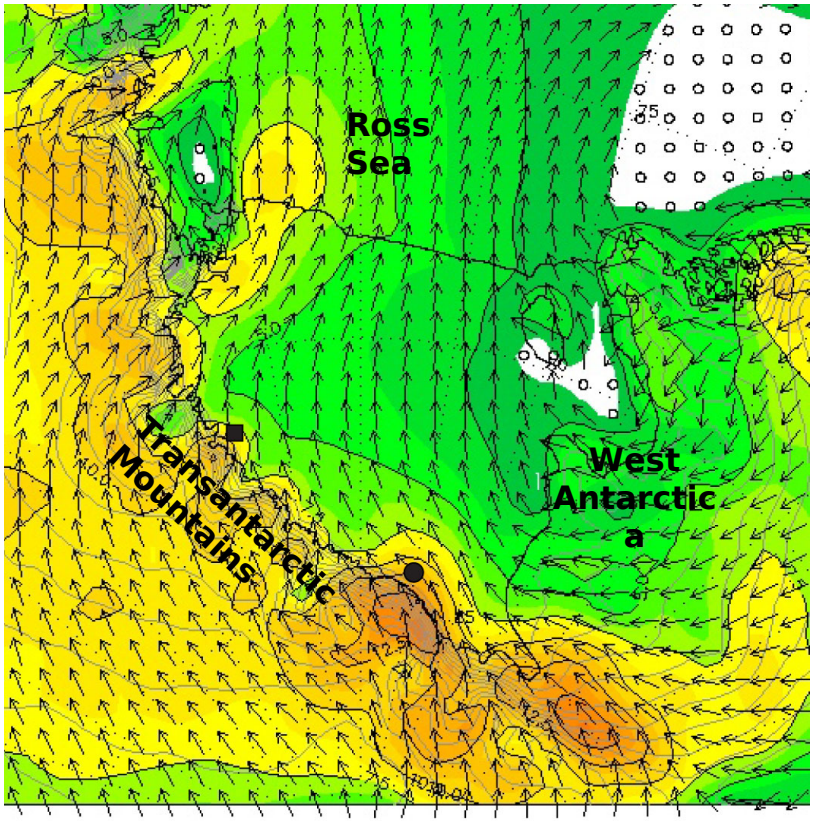
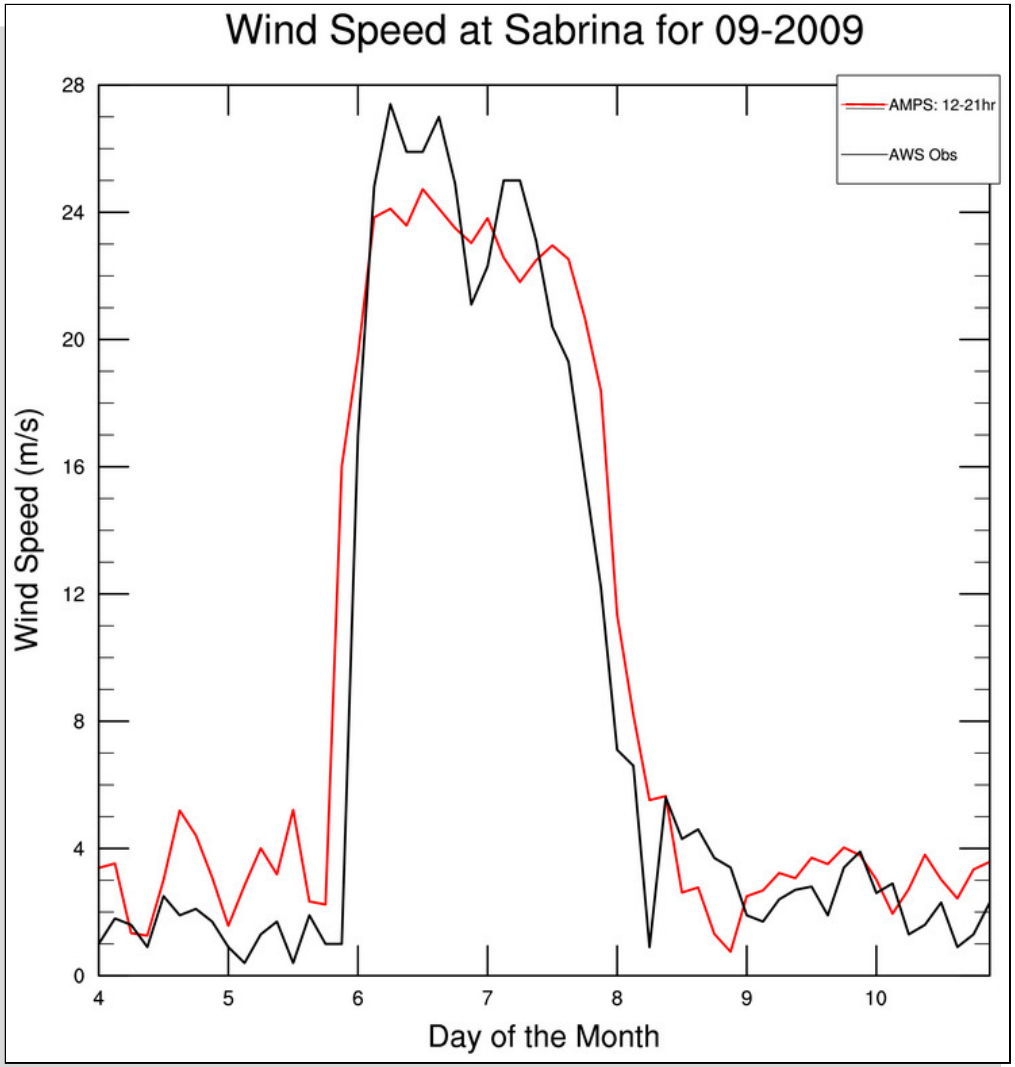


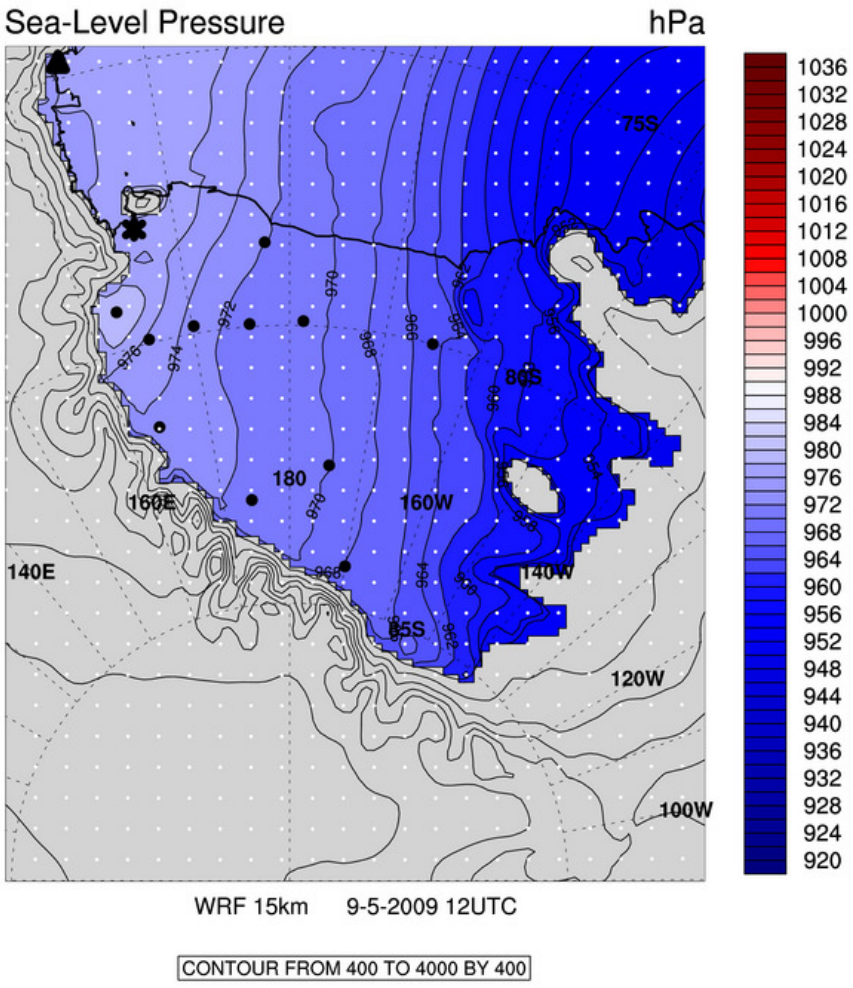
Figure courtesy of Mark Seefeldt

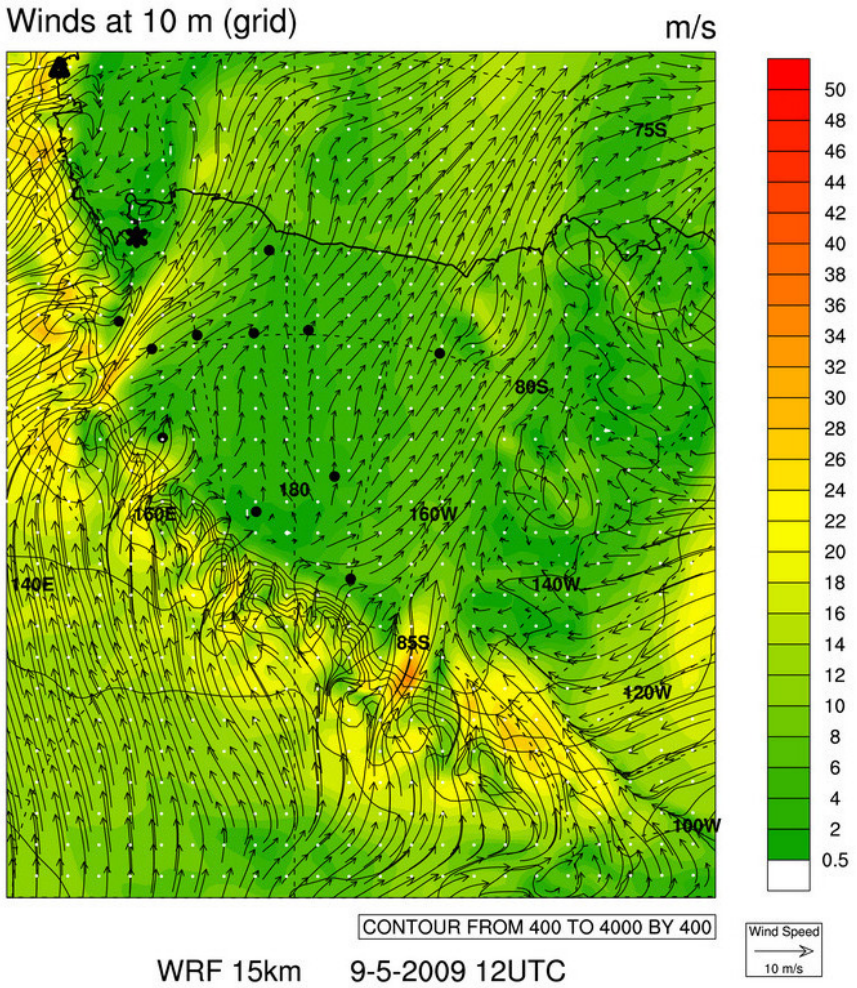
Mean annual wind speeds for the lowest sigma level (approximately 11-13 m AGL) from the AMPS 30 km archive for 2001 - 2005. Contour lines are in intervals of 2.5 m s-1.

Sabrina AWS: High Wind Event



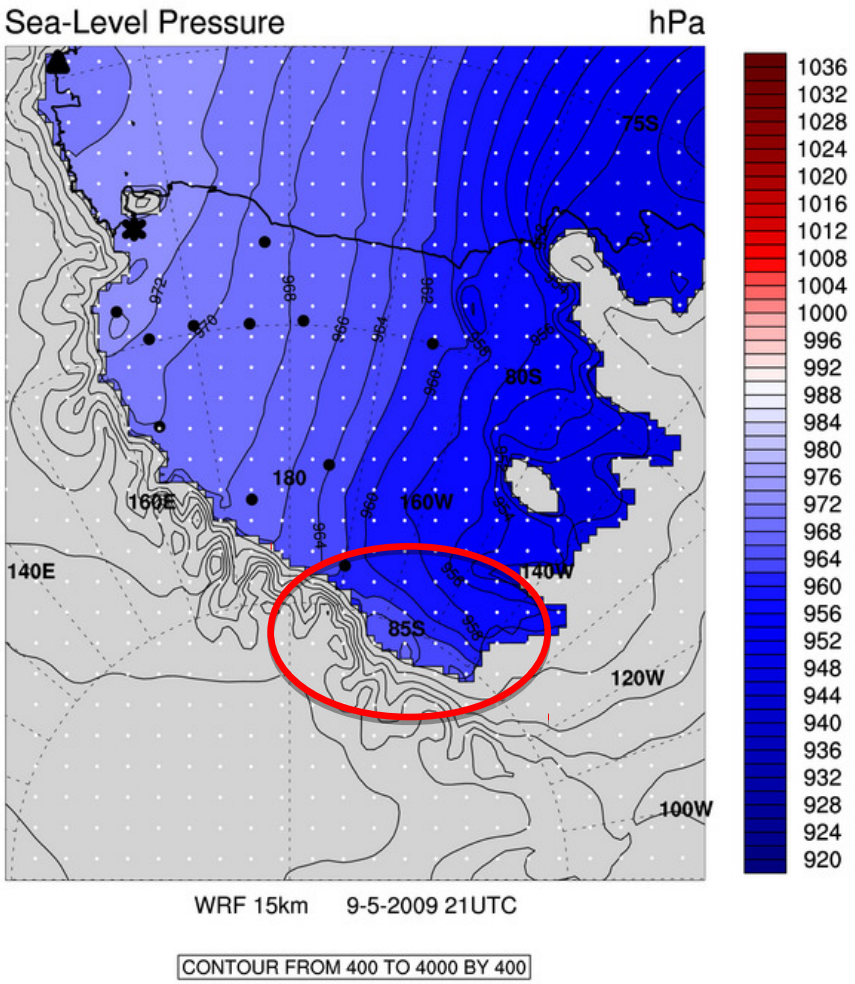
High Wind Event: 9-5-2009 12 UTC Initial State

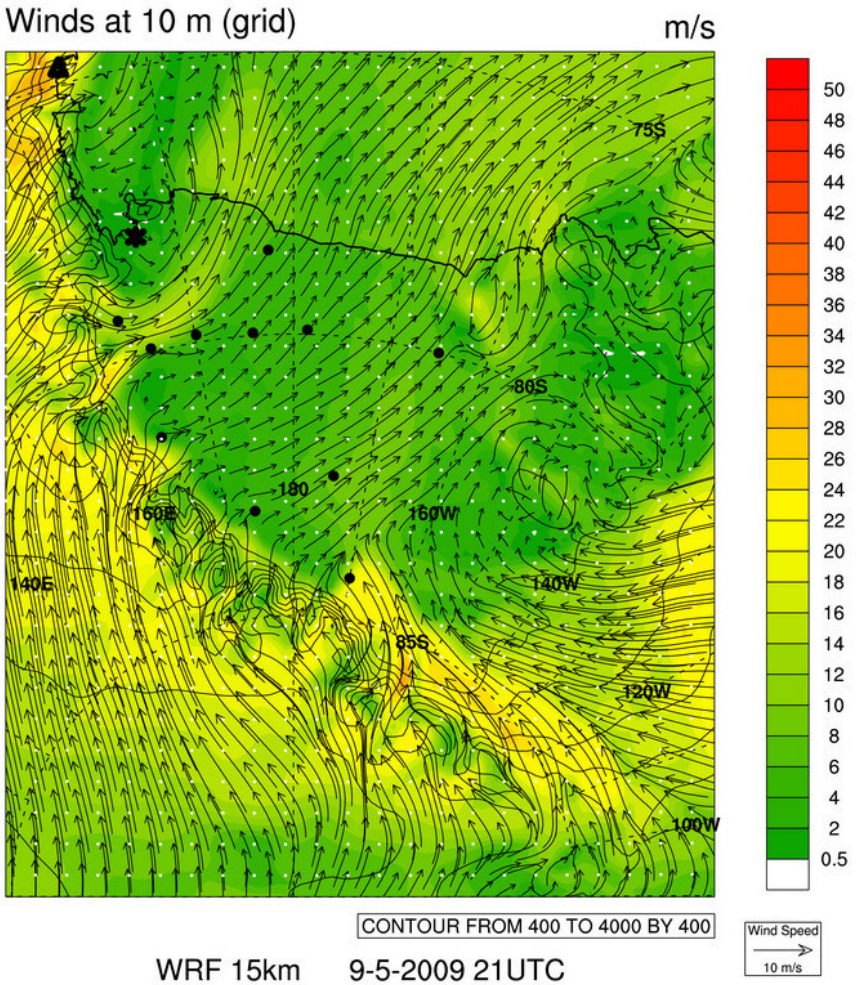




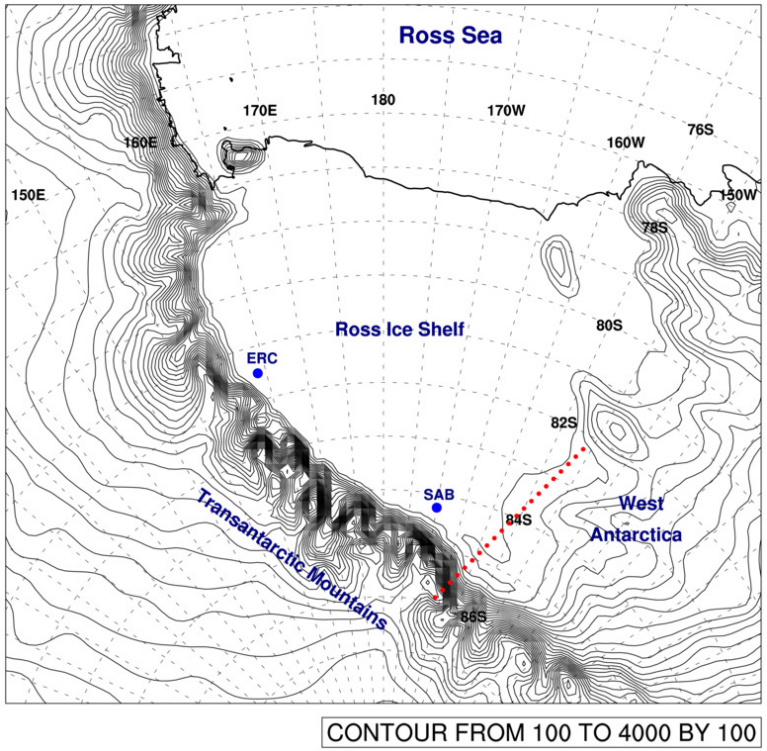
High Wind Event: 9-5-2009 21 UTC

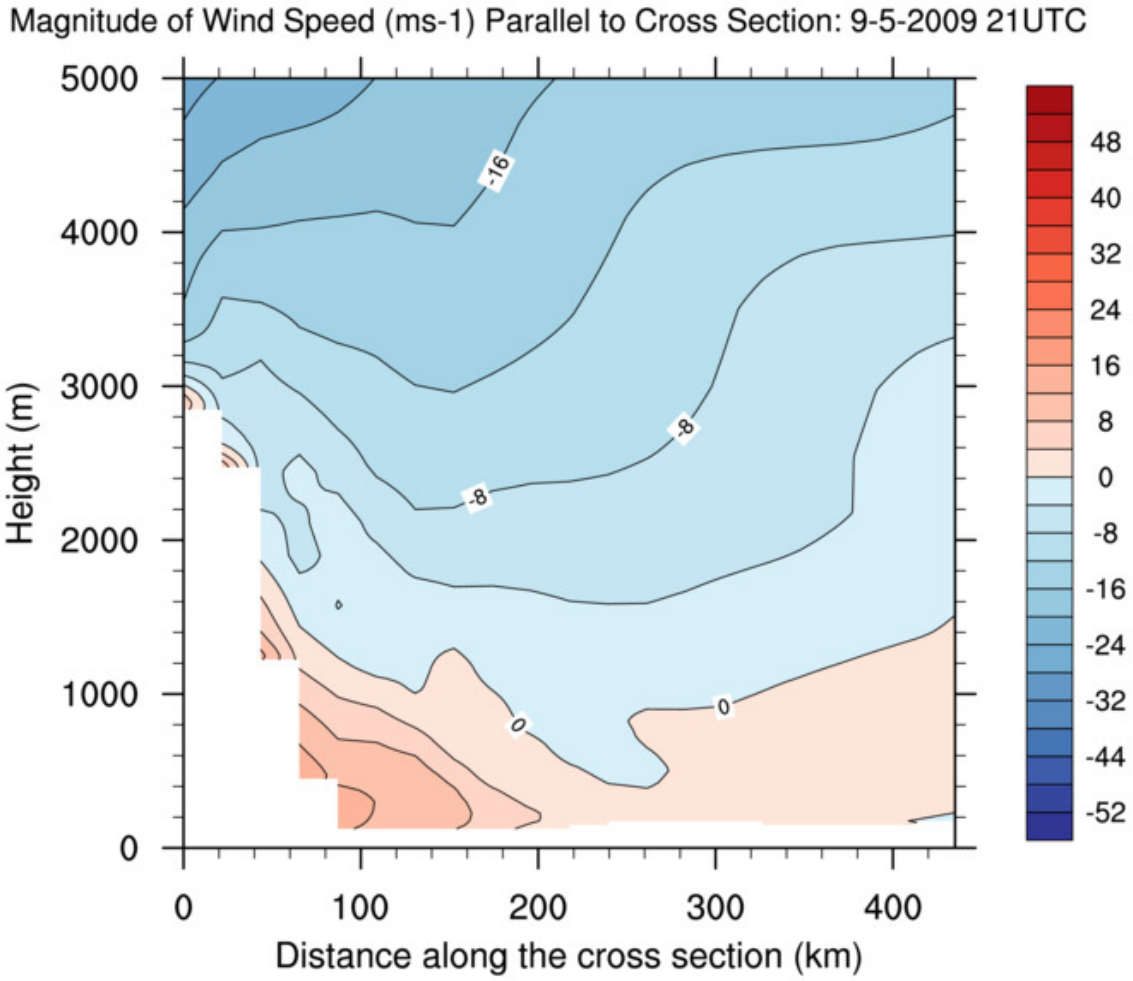
Barrier Wind Development





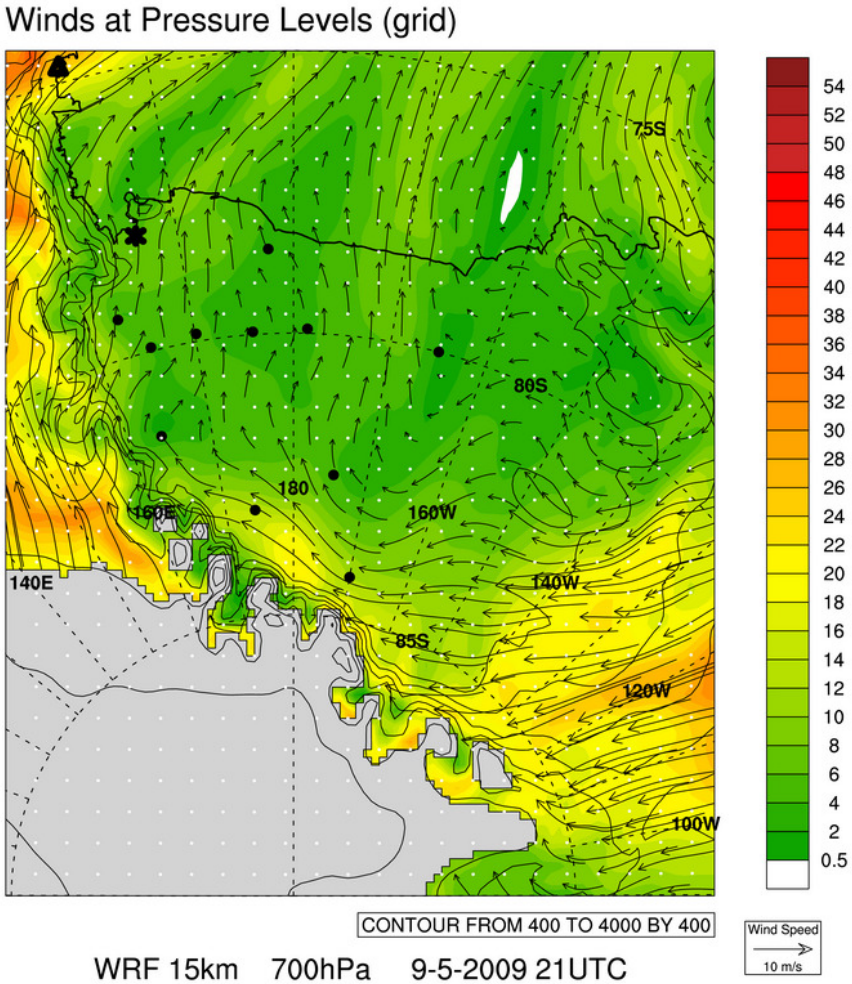
High Wind Event: 9-5-2009 21 UTC Barrier Wind Development

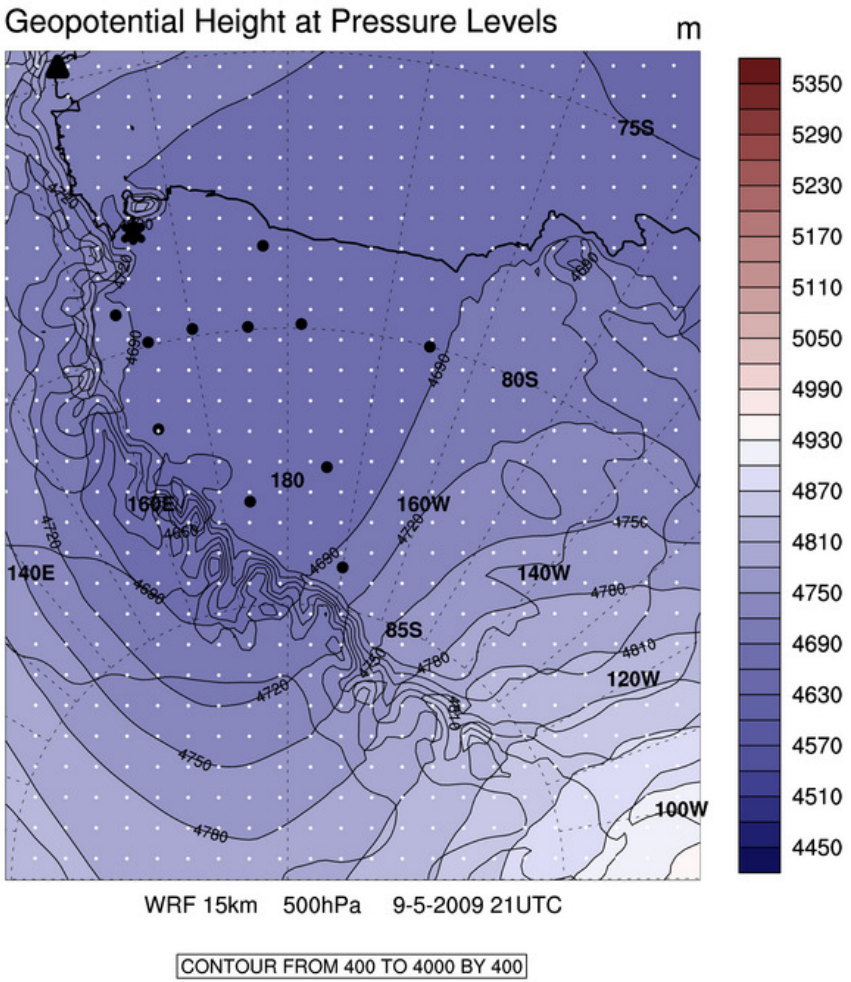




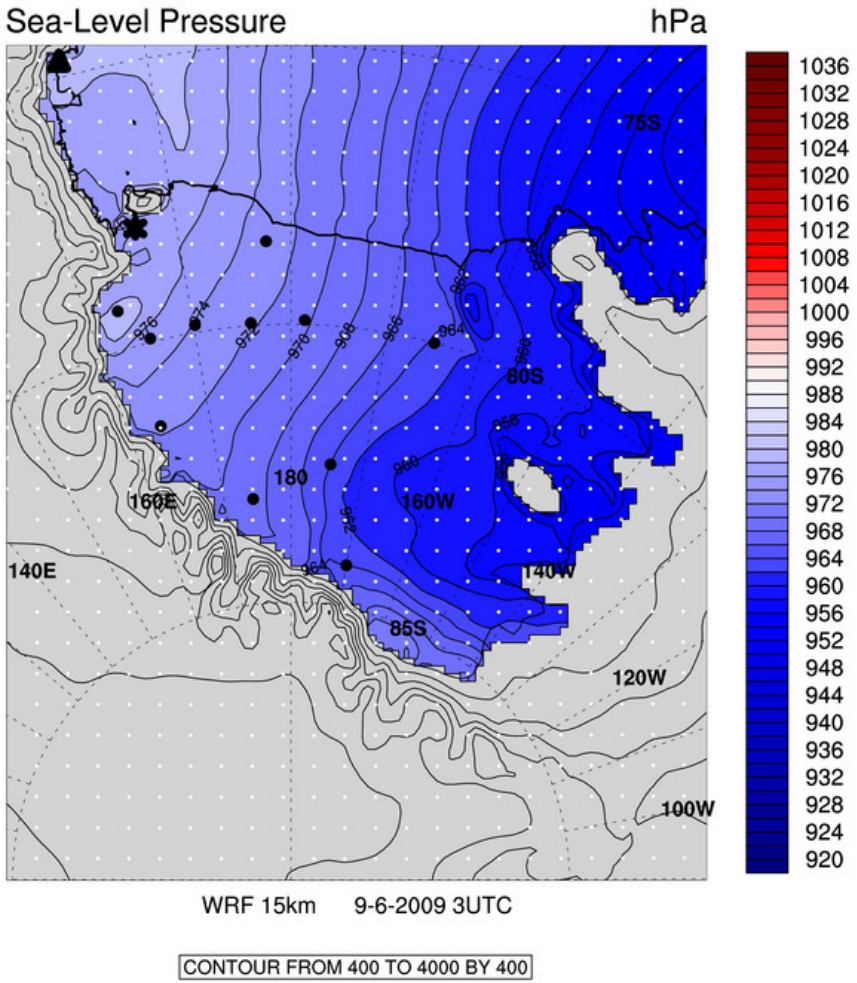
High Wind Event: 9-5-2009 21 UTC

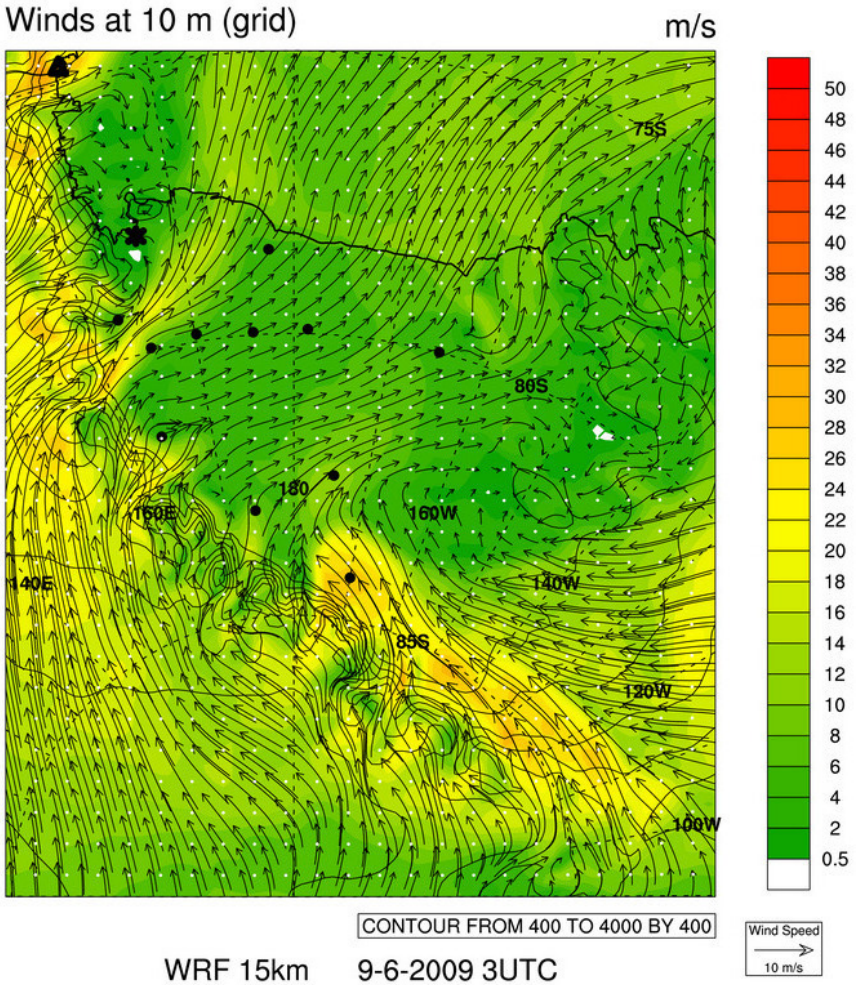
Barrier Wind Development





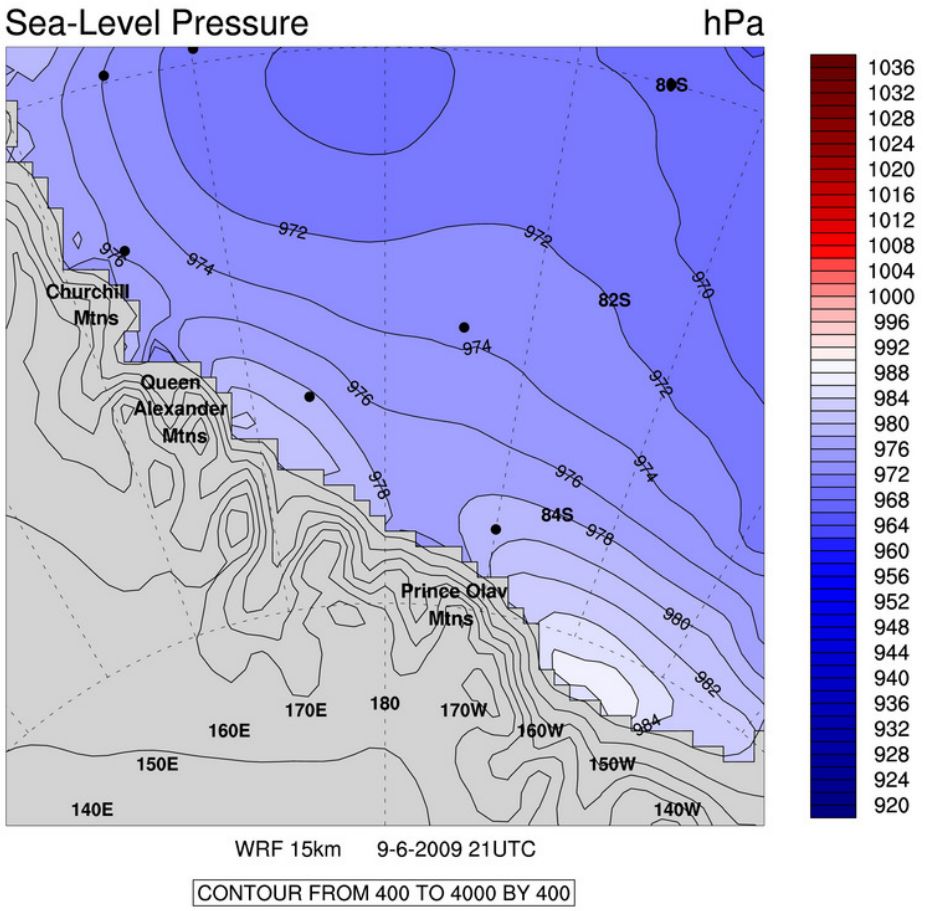
High Wind Event: 9-6-2009 03 UTC
Barrier Wind

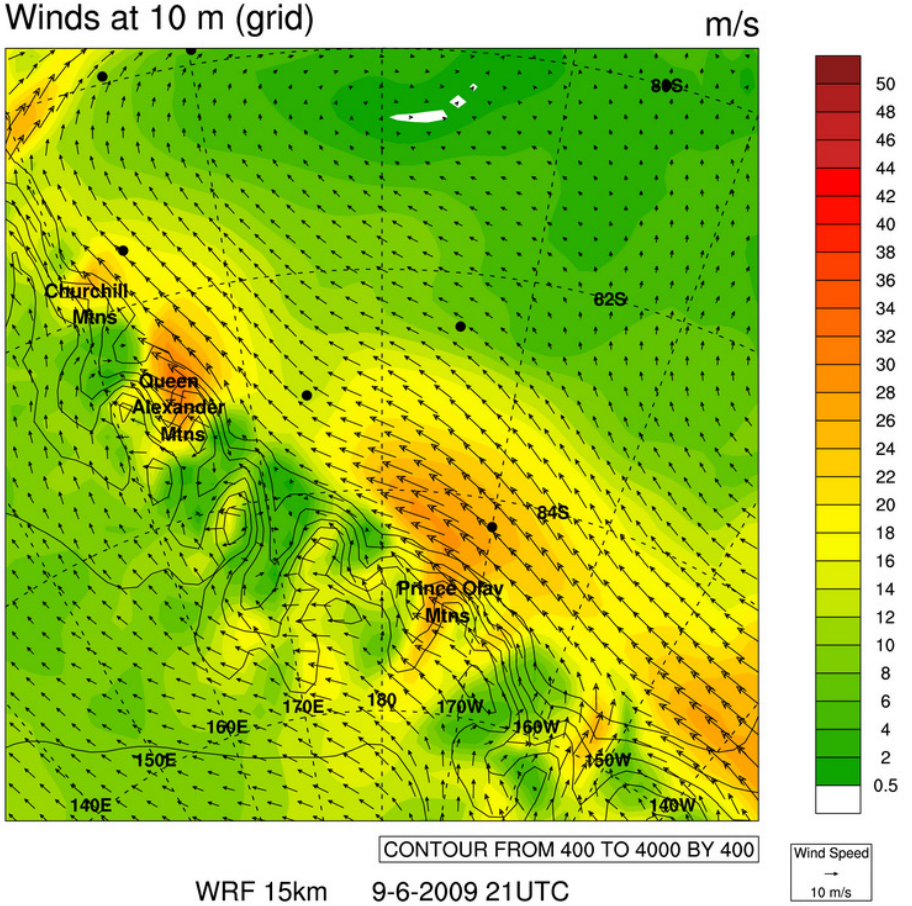




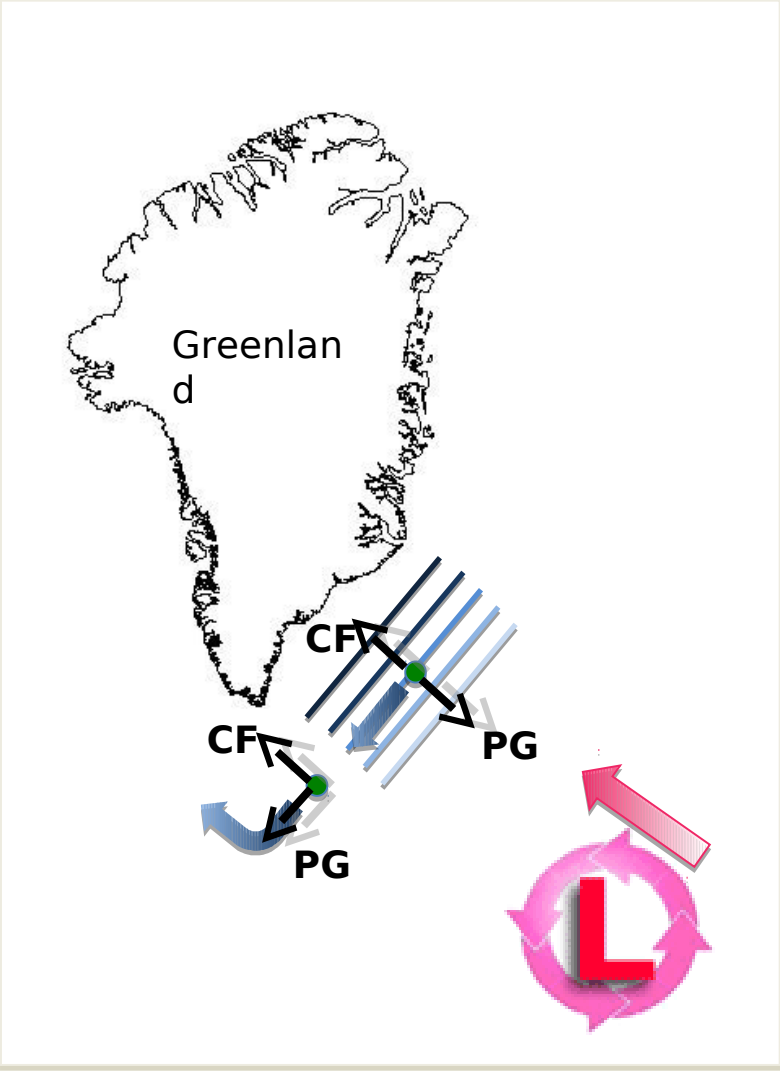
High Wind Event: 9-6-2009 21 UTC

Barrier Wind + Tip Jets



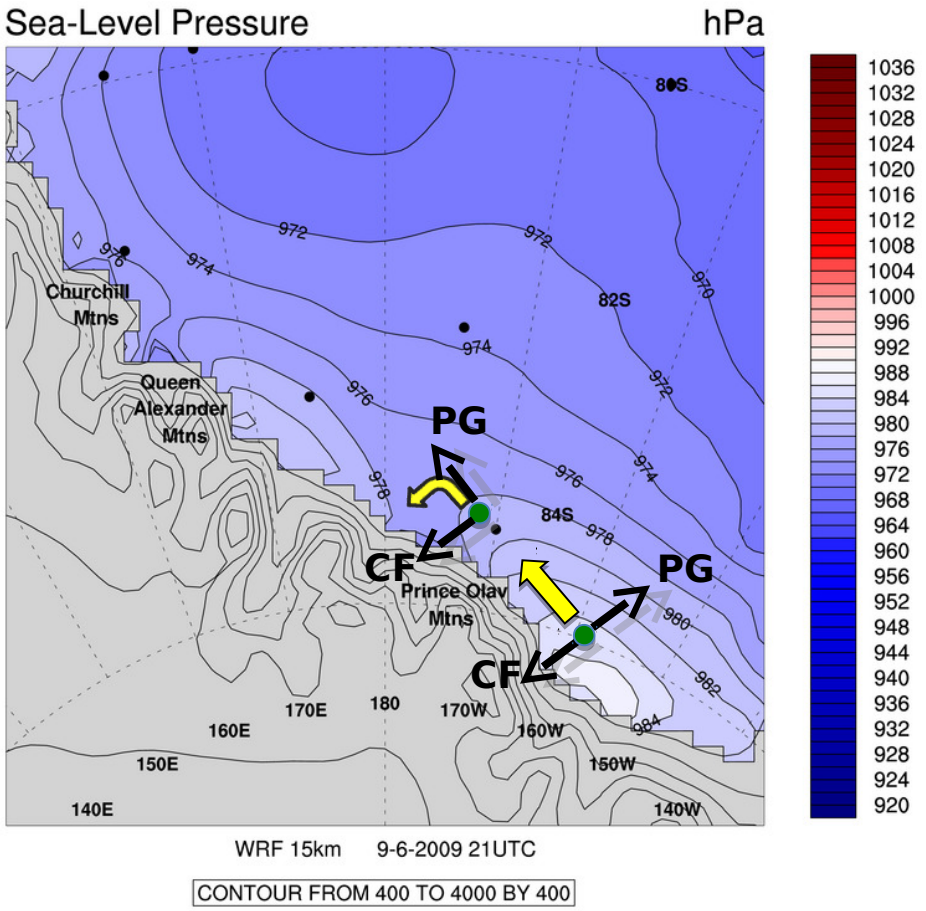


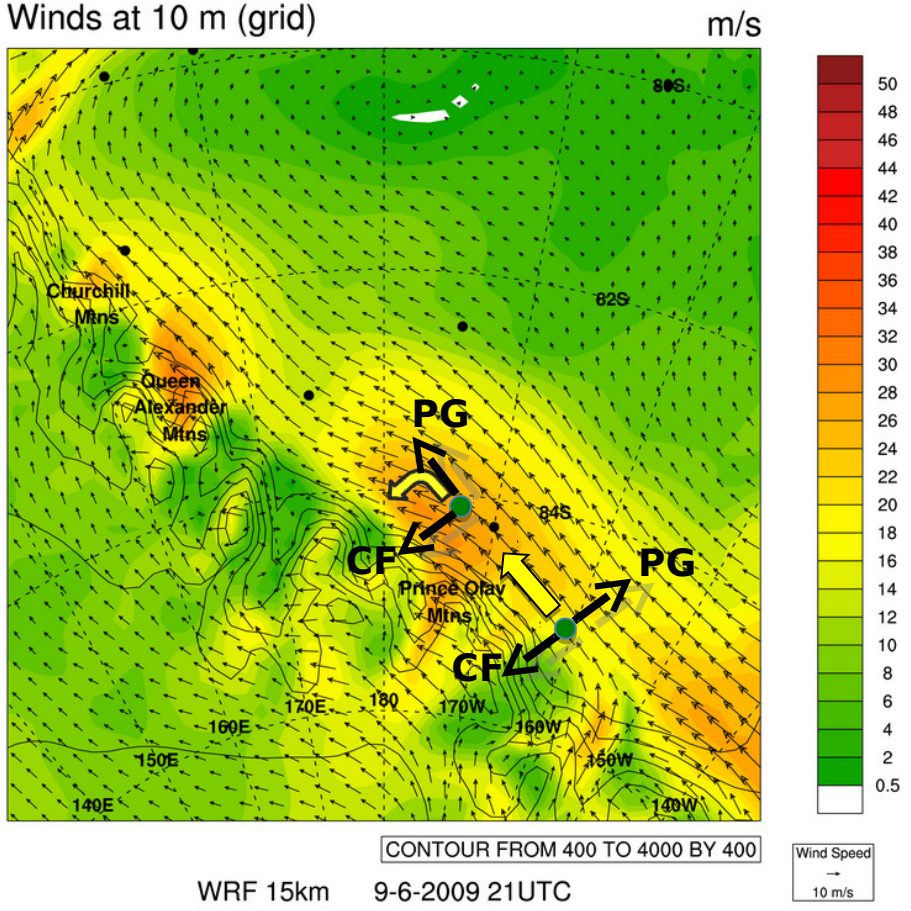
Greenland Reverse Tip Jet

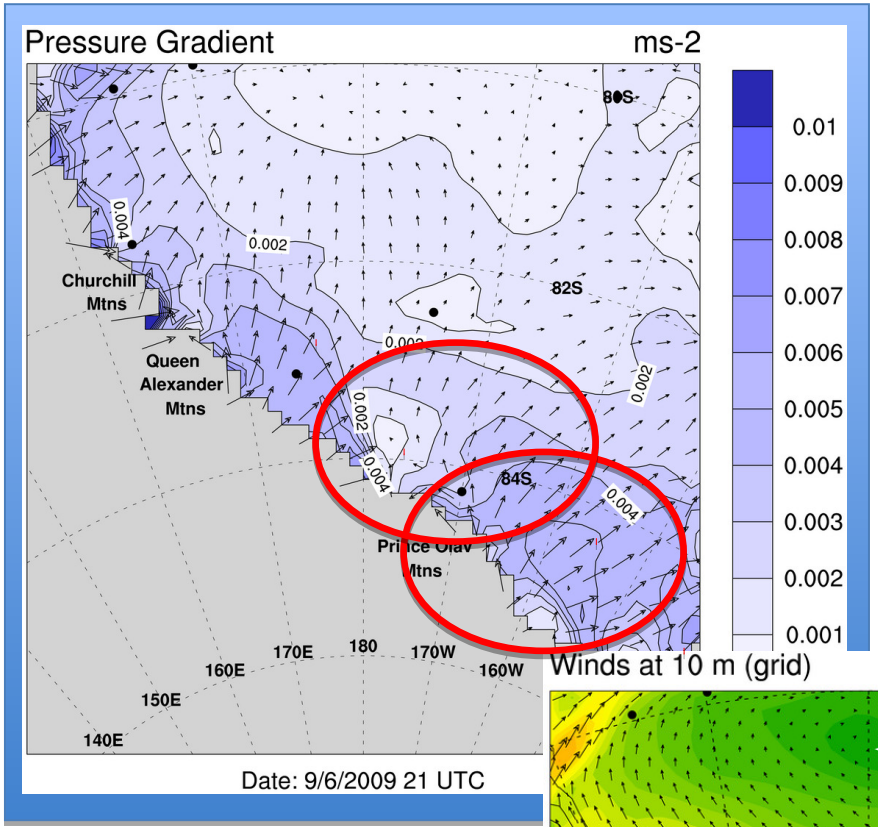


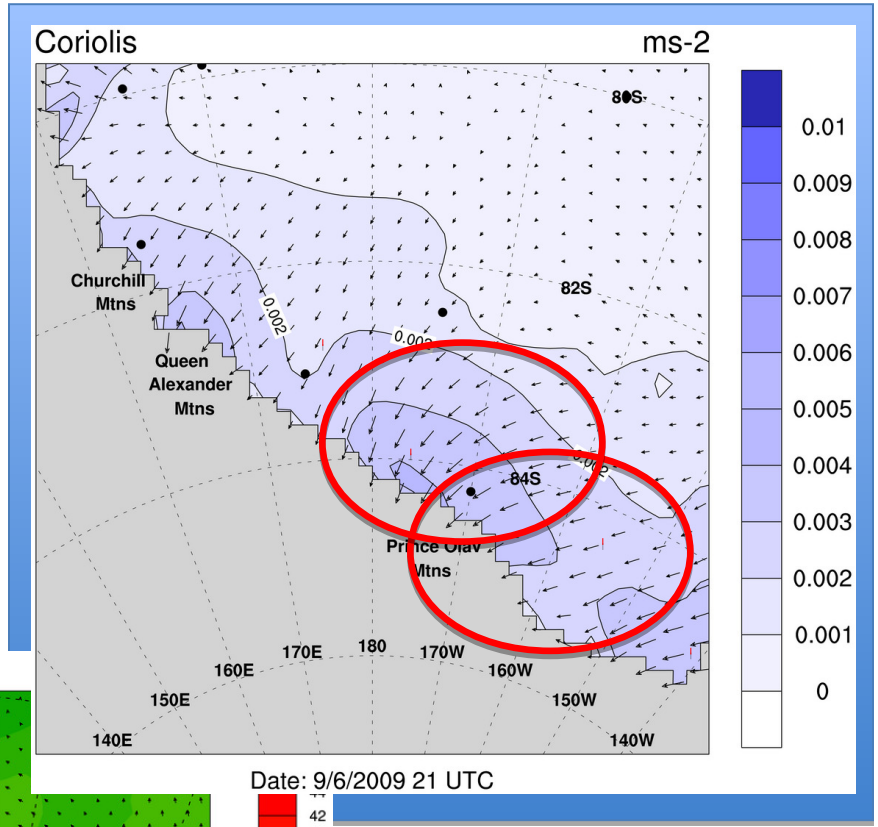
Moore, G. W. K., I. A. Renfrew, 2005: Tip Jets and Barrier Winds: A QuikSCAT Climatology of High Wind Speed Events around Greenland. *J. Climate*, **18**, 3713–3725.

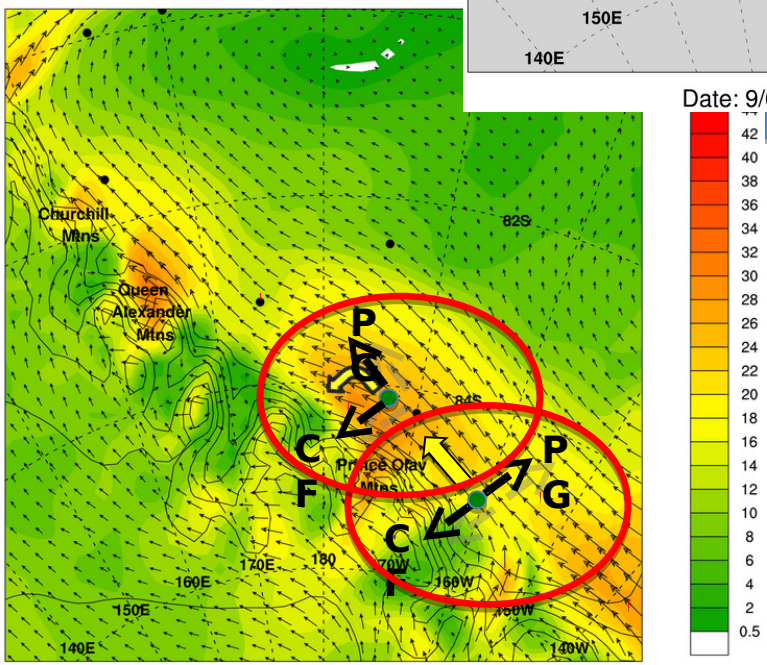
Prince Olav Mtns. Tip Jet











WRF 15km 9-6-2009 21UTC

Conclusions

- Forcing for the high wind event at Sabrina AWS:
  - Katabatic winds
  - Synoptic circulation / blocked flow
  - Barrier winds
    - Enhanced by mesoscale surface low over the RIS
  - Topographic influences from the Prince Olav Mountains

- The acceleration downstream of the Prince Olav Mountains is consistent with the dynamics of a Greenland reverse tip jet

- Due to unique topography, three tip jets are induced along the base of the Transantarctic Mountains in this events

Questions?

Photo: Melissa Nigro