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

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Outline

• Motivation: Local jets over the RIS

• Sabrina AWS: High Wind Event

• Tip Jet: What is this?

• Conclusion

Photo: Melissa Nigro

Sabrina AWS
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

Wind Speed at Sabrina for 09-2009

Wind Speed (m/s)

Day of the Month
High Wind Event: 9-5-2009
12 UTC
Initial State

Sea-Level Pressure

Winds at 10 m (grid)
High Wind Event: 9-5-2009
21 UTC
Barrier Wind Development

Magnitude of Wind Speed (ms⁻¹) Parallel to Cross Section: 9-5-2009 21UTC
High Wind Event: 9-5-2009 21 UTC

Barrier Wind Development

Winds at Pressure Levels (grid)

Geopotential Height at Pressure Levels

CONTOUR FROM 400 TO 4000 BY 400

WRF 15km  700hPa  9-5-2009 21UTC

CONTOUR FROM 400 TO 4000 BY 400

WRF 15km  500hPa  9-5-2009 21UTC
High Wind Event: 9-6-2009 21 UTC

Barrier Wind + Tip Jets

Sea-Level Pressure

Winds at 10 m (grid)

WRF 15km 9-6-2009 21UTC

CONTOUR FROM 400 TO 4000 BY 400

Wind Speed
10 m/s
Greenland Reverse Tip Jet

Prince Olav Mtns. Tip Jet

Sea-Level Pressure

Winds at 10 m (grid)
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 event
Questions?

Photo: Melissa Nigro