Forcing Mechanisms of the Ross Ice Shelf Airstream

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Ross Ice Shelf Airstream

A dominant stream of air flowing northward from the interior of continent across the western to central RIS to the Ross Sea (Seefeldt and Cassano, 2012)

RAS Forcing:
- Katabatic winds
- Barrier winds
- Synoptic forcing

Barrier Winds

Mountains

O’Connor et al. (1994), Parish et al. (2006), Seefeldt et al. (2007), Steinhoff et al. (2009)
What about other dynamics?
Agenda

- Self Organizing Maps (SOM)
- Ross Ice Shelf Airstream Patterns
- Forcing of the Ross Ice Shelf Airstream
- Conclusions and Future Work
Self Organizing Maps

- **Technique**
  - Neural network algorithm
  - Unsupervised, iterative learning process
  - Identifies user specified number of patterns within a dataset

- **Training**
  - AMPS-WRF 15 km
  - 3 hourly output from Oct 2008 – Sept 2010
  - Trained on the u and v component of the 10 m winds
  - Trained with 10 m winds of RAS patterns
SOM Patterns

WRF 10m_wind Average
SOM of RAS Patterns

RAS 10m_wind Average
SOM Transitions
Weather Patterns

10 m winds:

Sea Level Pressure Anomalies:

Pressure Gradient Force:
Cross Sections
Pressure Gradient Force

--- PGF at the Surface
----- PGF Below Hgt of Mtn
----- PGF Above Hgt of Mtn

1) Dynamics below hgt of mtn
2) Dynamics above hgt of mtn
3) Atmospherically deep dynamics
Pressure Gradient Force at Sabrina

Perpendicular Wind:

Parallel Wind:

PGF:

PGF RRoD:
Pressure Gradient Force at Elaine

Perpendicular Wind:

Parallel Wind:

PGF:

PGF RRoD:
Pressure Gradient Force at Eric
Conclusions

- Strong, barrier parallel winds within the Rossby radius of deformation are not necessarily barrier winds

- RAS forcing includes: synoptic, katabatic, barrier and something else – frontal dynamics?

- This work is in preparation for a two part paper in Monthly Weather Review

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Pressure Gradient Force

SAB:

ELN:

ERC:

10 m Wind:
Weather Patterns

Pressure Gradient Force:

850 mb Winds:

700 mb Winds:
Weather Patterns

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Pressure Gradient Force at Sabrina

RAS PGF Cross Section at Sabrina Rossby Radius of Def