HIMWARC
High IMpact Weather in the ARCtic

Fundamental understanding
and future projections

Polar lows: principle understanding and climate impacts
and Interplay between baroclinic waves and orography

Collaborators:
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Part of RCN program NORKLIMA
Polar Low Dynamics
(Annick Terpstra)

- Revise and unify Polar Low theory
- Diabatic Rossby Wave paradigm
- Validate new paradigm with case studies and observations
Polar Lows in high-res Climate Simulations
(Andrew Ballinger)

- Polar Low detection in high resolution (25 km, 50 km) global climate simulations at GFDL
- 30 years: 1980-2010 and 10 years at mid and end of the 21st century
- Check model capabilities to produce polar lows
- Analyze shifts in position and intensity
Cyclones around Greenland (Elin Tronvoll)

- Climatology of Cyclones around Greenland
- Identify patterns of Cyclone interaction
  - Bin Cyclone tracks
  - Composite study of interactions
- Case studies and observations for validation
Interplay between baroclinic waves and orography (Qi Kong)

- Idealized modeling => concept development
- Influence: upper vs. lower levels
- Strong wind and high precipitation events
- Case studies and observations for validation
Ice Edge Jet Interactions  
(Stefan Keiderling)

- WRF simulation of case studies
  - Interaction of frontal system with ice edge jet
  - Fishing vessel sunk on that incident
- Develop theory and model for ice edge jet
- Evaluate met.no capabilities to forecast them

\[
\frac{\partial^2 \psi}{\partial y^2} \left( \frac{\partial \theta}{\partial p} \frac{RT}{f_0 p \theta} \right) + \frac{\partial^2 \psi}{\partial y \partial p} \left( 2 \frac{\partial u_g}{\partial p} \right) + \frac{\partial^2 \psi}{\partial p^2} \left( f_0 \frac{\partial u_g}{\partial y} \right) \\
= 2 \frac{RT}{f_0 p \theta} \left( \frac{\partial u_g}{\partial y} \frac{\partial \theta}{\partial x} + \frac{\partial v_g}{\partial y} \frac{\partial \theta}{\partial y} \right) c_p \frac{\partial q}{f_0 p \partial y}
\]
Winter Storm ‘Dagmar’
(Mel Shapiro, Cecilie Villanger)

• Analyze synoptic evolution and dynamic causes
• Investigate forecast capabilities
• Highres WRF simulation, local effects
Polar Low ‘Blog’

- Open forum for discussion
- Get community together
- Database accessible for everyone

- Similar to European Severe Storm Laboratory (www.essl.org)
- Also tropical or synoptic mailing community
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