

HIMWARC

Thomas Spengler

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Polar Low Workshop, 21-22 May 2012

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:

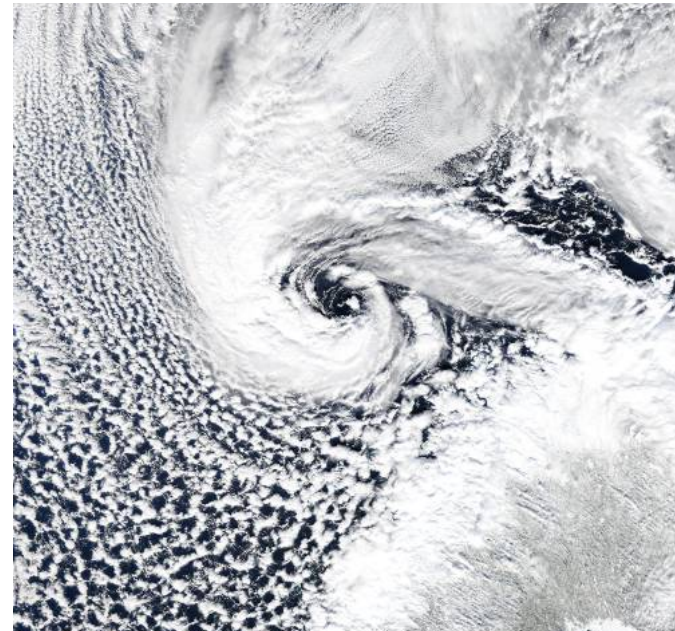
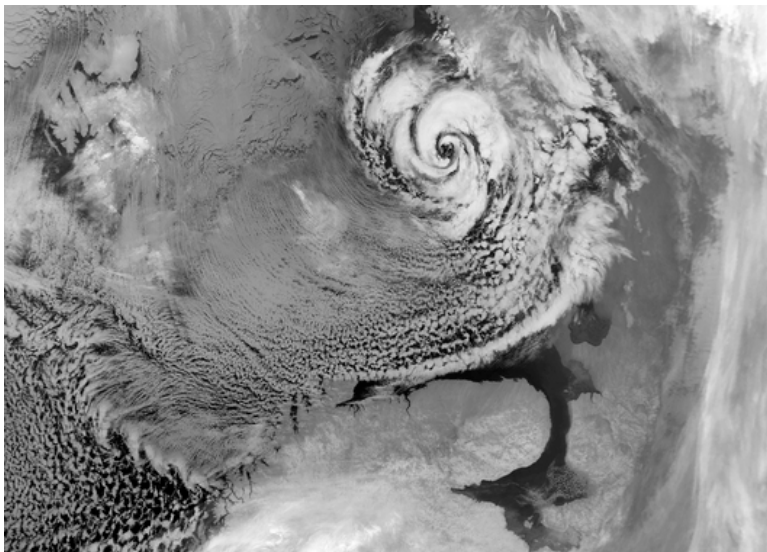
Richard Moore (Naval Postgraduate School), Mel Shaprio (NCAR), Andreas Dörnbrack (DLR), Heini Wernli (ETH Zurich), Roger Smith (University of Munich)

Part of RCN program NORKLIMA

Polar Low Dynamics

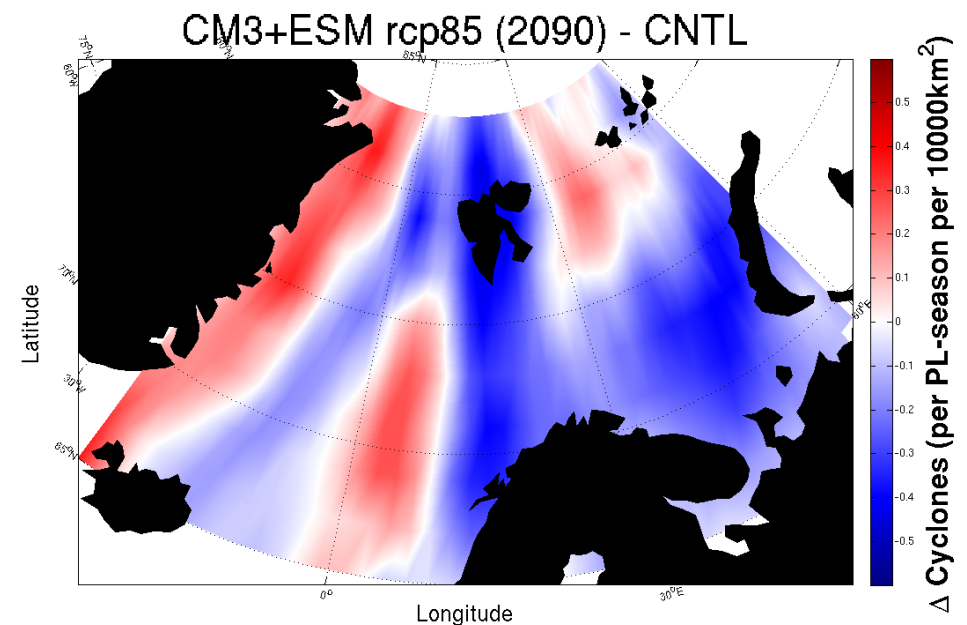
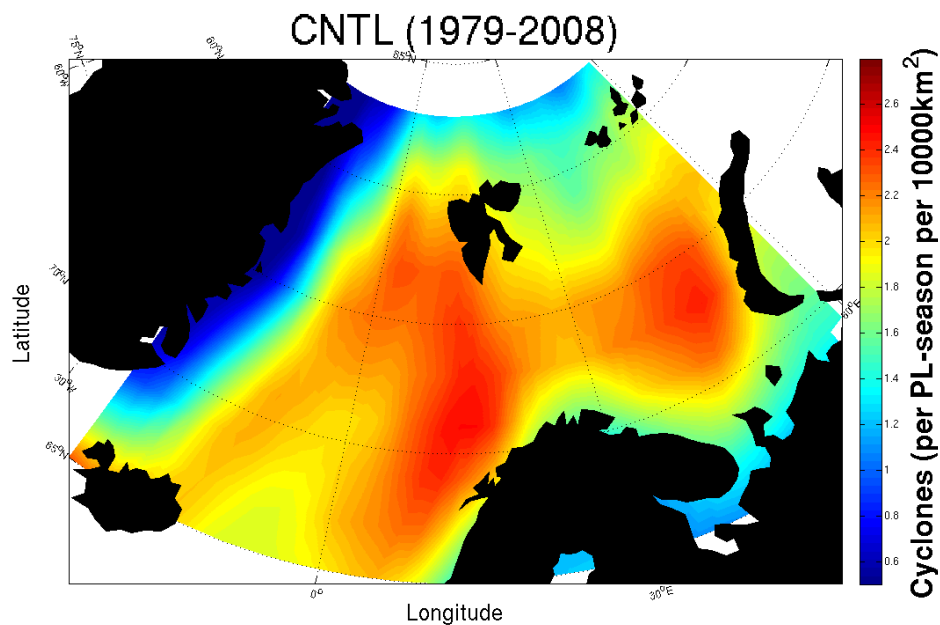
(Annick Terpstra)

- 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)

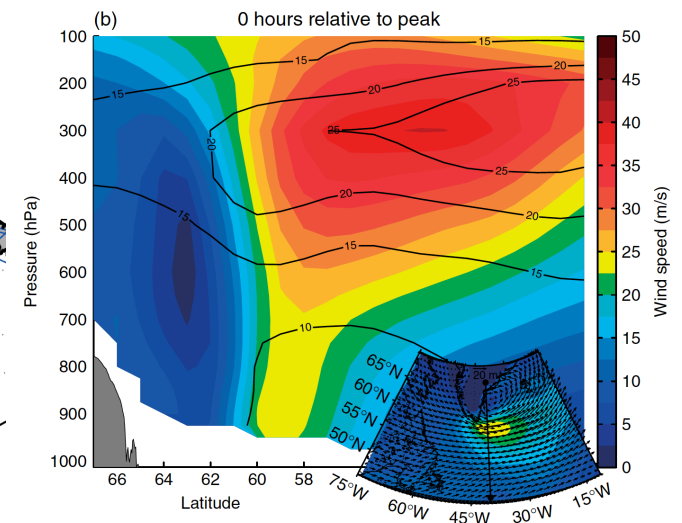
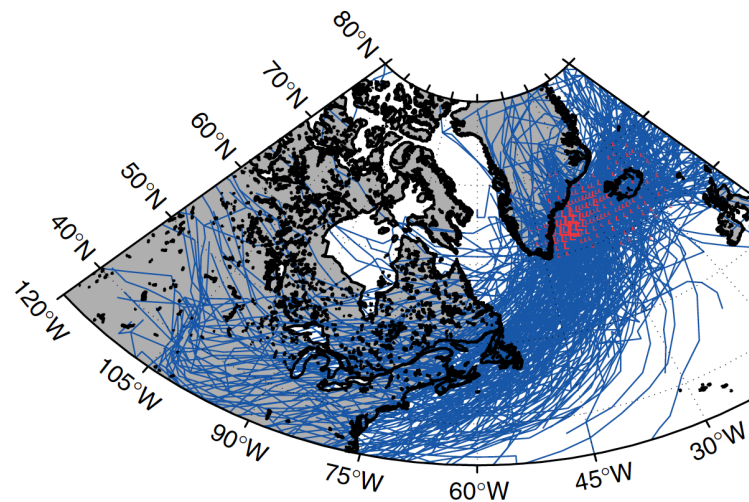
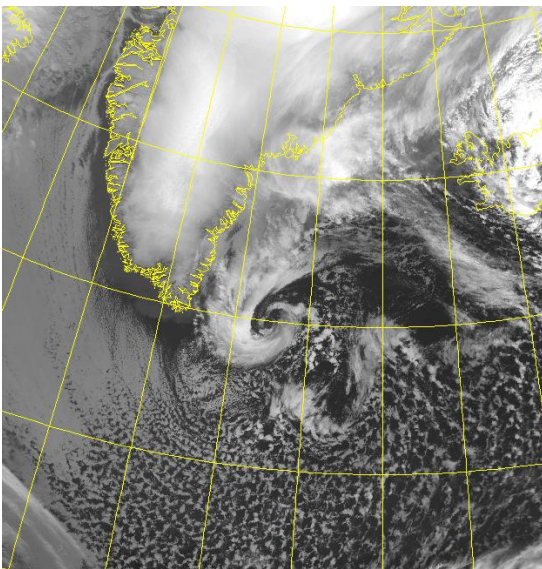
- Polar Low detection in high resolution (25 km, 50 km) global climate simulations at GFDL
- 30 years: 1980-2010 and 10 years at mid and end of the 21st century
- Check model capabilities to produce polar lows
- Analyze shifts in position and intensity



Cyclones around Greenland

(Elin Tronvoll)

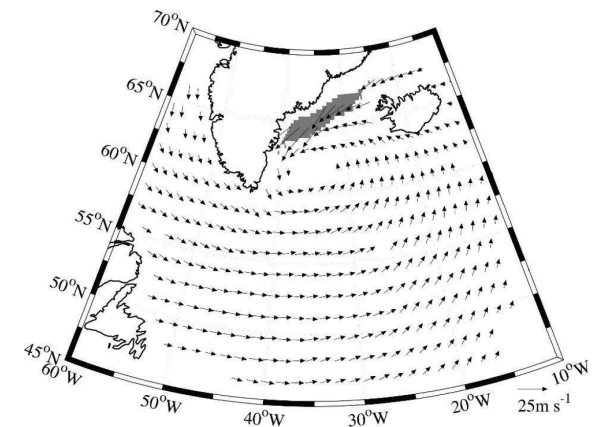
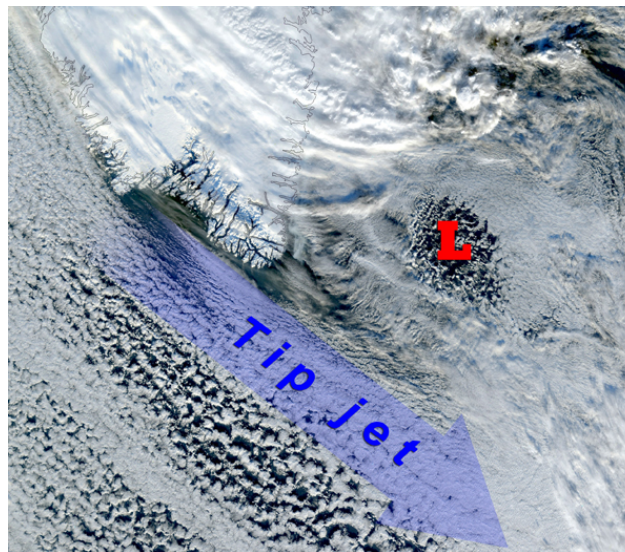
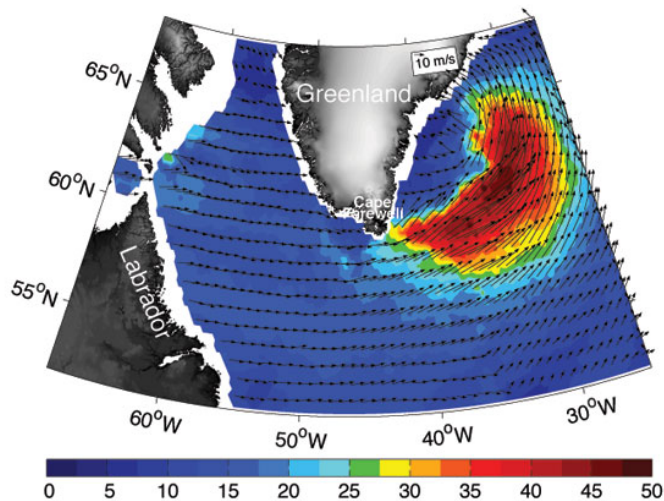
- Climatology of Cyclones around Greenland
- Identify patterns of Cyclone interaction
 - Bin Cyclone tracks
 - Composite study of interactions
- Case studies and observations for validation



Interplay between baroclinic waves and orography

(Qi Kong)

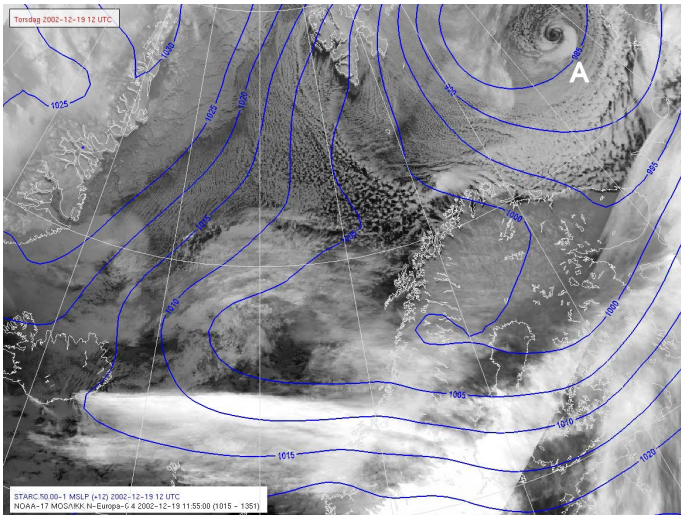
- Idealized modeling => concept development
- Influence: upper vs. lower levels
- Strong wind and high precipitation events
- Case studies and observations for validation



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



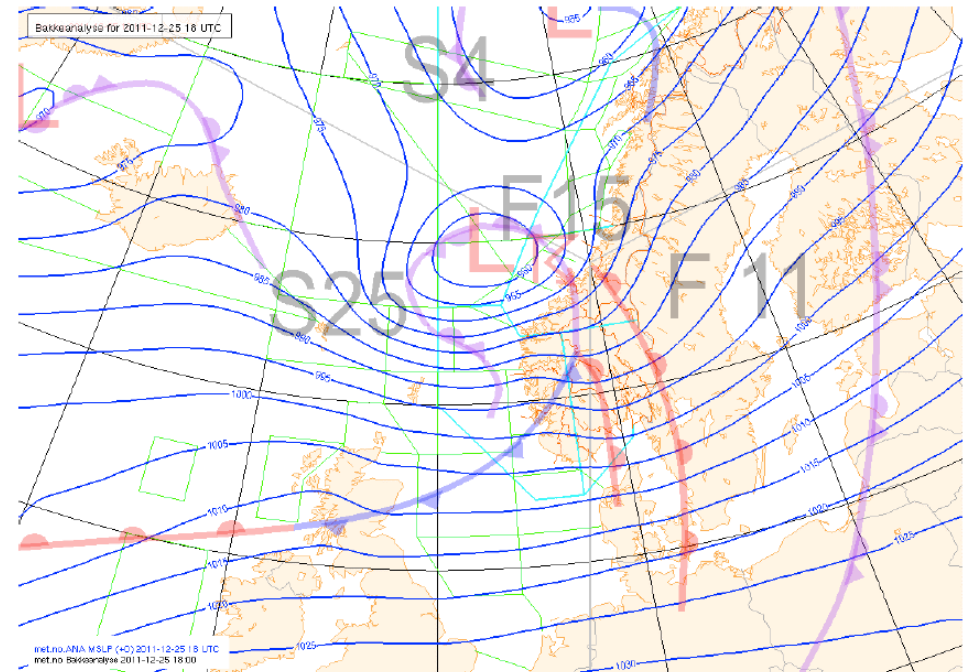
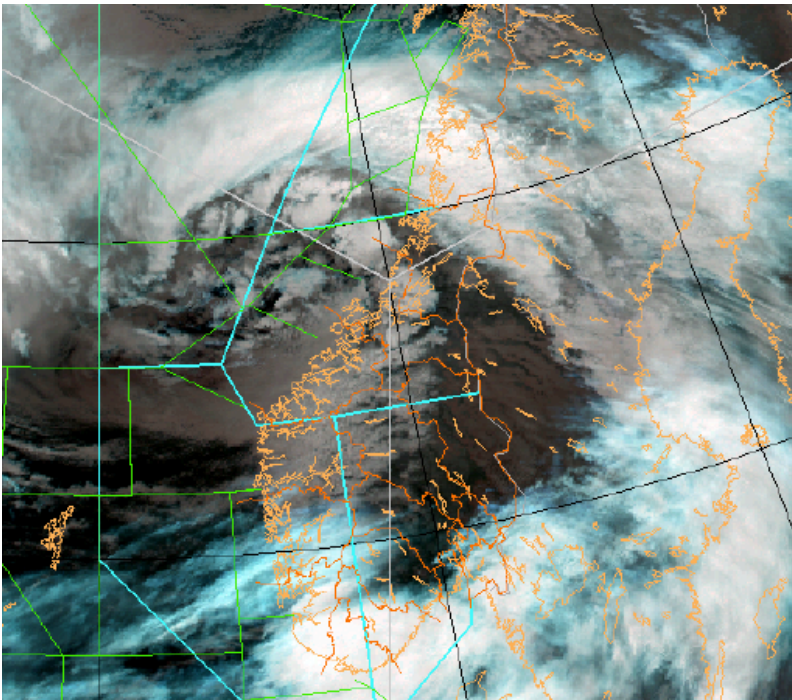
$$\frac{\partial^2 \psi}{\partial y^2} \left(\frac{\partial \theta}{\partial p} \frac{RT}{f_0 p \theta} \right) + \frac{\partial^2 \psi}{\partial y \partial p} \left(2 \frac{\partial u_g}{\partial p} \right) + \frac{\partial^2 \psi}{\partial p^2} \left(f_0 \frac{\partial u_g}{\partial y} \right)$$

$$= 2 \frac{RT}{f_0 p \theta} \left(\frac{\partial u_g}{\partial y} \frac{\partial \theta}{\partial x} + \frac{\partial v_g}{\partial y} \frac{\partial \theta}{\partial y} \right) - \frac{R}{c_p f_0 p} \frac{\partial q}{\partial y}$$

Winter Storm 'Dagmar'

(Mel Shapiro, Cecilie Villanger)

- Analyze synoptic evolution and dynamic causes
- Investigate forecast capabilities
- Highres WRF simulation, local effects



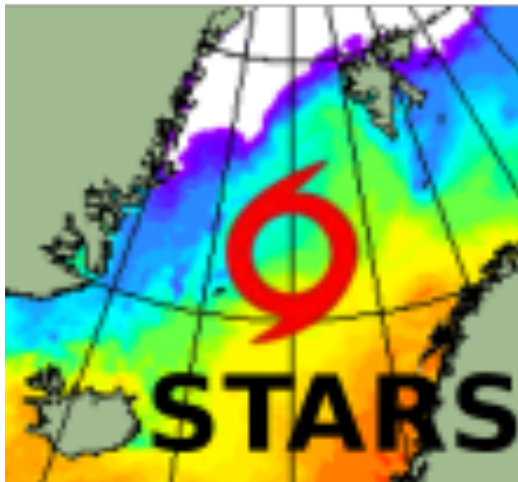
Polar Low 'Blog'

- 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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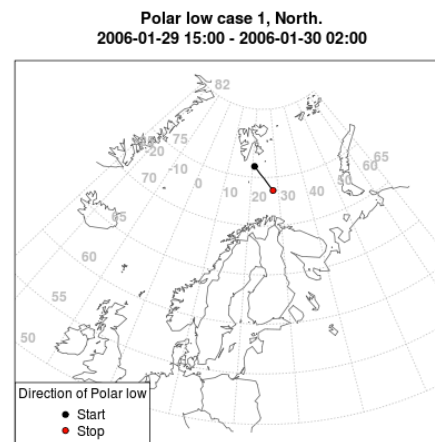


Quicklooks of STARS-DAT

STARS Data Set Image Data Base. Select Polar Low area, number and type of plot (Left and Right)

Area: PLid: PlotL: PlotR: [Return to STARS page](#) [User Manual](#)

Track of polar low event from observed start to end.



AVHRR IR image of polar low event at one selected time.

