SVALI phd course/workshop at Center for Ice and Climate, University of Copenhagen,
12-16 March 2012

Applications of radar data from ice sheets to understand ice flow processes

Concluding discussions:

Notes from the concluding discussions on Friday Afternoon by Christine Hvidberg.

Overall questions:

What are the problems?
How should they be addressed?
What needs to be done?

- Data needed (radar, other data)
- New processing techniques
- Models needed

Comments to these overall questions are listed below, and grouped according to the theme.

New processing techniques and interpretation of the radar signal:

Develop models to simulate the radar reflection from specific layer types (roughness, anisotropy, ..)

- look at the waveforms
- depends on the antenna characteristics

It may be important to apply more advanced scattering models to investigate the signal.

Data and model studies of deep internal layers: folding, basal melting etc:

What does existence of micro-folds mean for the radar reflectors in the bottom part?
Modeling is needed to clarify how changes on glacial cycles would affect the internal structure, for example changes in composition and rheology related to glacial cycles. Folds seem to form at glacial-interglacial cycles.
What kind of studies would be necessary in order to distinguish between layer disturbances due to accretion of basal water and folding of layers due to rheology differences?
Is accretion of ice at the bottom a consequence of thermal history and may thus vary over time, or is it the result of a local hot spot.
Does ”accretion type” features always appear near mountains?
The characteristics of accreted ice should be better understood, for example investigate the fabric and crystal orientation of accreted ice. Is accreated ice different from non-accreated ice? One possible idea could be to use exisiting deep ice cores, for example at NEEM, to investigate the fabric of folded ice.
Think of controlled laboratory experiments to investigate the relation between anisotropy, rheology and radar reflection.

Models and data needed:

Investigate with ice flow model what conditions are required for large scale folding to form (simplified models to investigate the critical parameters, thermal models, kinematic models).

Investigate how much ice can realistically be accreted within thermal models and assuming a realistic geothermal heat flux. Use thermal models to investigate how much heat is released and how much can be transported away.
Search for analogues in Iceland that can be used as an easier accessible test site for studies to understand the processes (locations with accretion of basal meltwater). There are such locations in Iceland, and at Engabreen, Northern Norway (accreted ice on the lee side of bumps).
At the Vostok site in Antarctica, there is also accreted ice. At Vostok, properties of the accreted ice could be investigated, in relation to radar investigations. (are there polarimetric data available near Vostok?)

CReSIS data:
Data is available from the CReSIS homepage (and toolbox), look under “data products”.
John Paden is the person to contact for information regarding data.