

# Agenda WP2



We will have a discussion on the themes below. I think it would make sense to structure it. We are a smallish group, so we can discuss on a round table and I would suggest that everyone takes his or her material (e.g. power points, word documents, papers) with you and consider what you can contribute to each theme presented below.

I would like for each theme an idea on how:

- We can join forces to get results by synergies
- We can reach the CRAICC objectives
- We can have synergies with other CRAICC WP:s.

**Thursday 16.01.2014**

**12.00-13.00: Lunch at the hotel**

**13.00-13.30: Welcome and short overview by the WP leader**

**13.30-14.30**

Short and long term variability of the surface albedo, in particular deposition of aerosols and snow and ice cover changes

**14.00-15.00**

The long and short term variability of reflected radiation and near-surface heat transport in relation to changes in surface albedo and snow/ice cover, aerosol concentrations, and cloud cover and properties

**15.30- 16.00: Coffee break**

**16.00-17.30**

Changes in precipitation and its effects on the radiation balance in the cryosphere and on lakes and rivers

**17.30-19.00**

Presentation (Matti Leppäranta) Discussion on synergies between the themes

**19.00 Dinner at the hotel**

**Friday 17.01.2014**

**9.00-9.30**

The evolution of snow and ice climatological zones

**9.30-10.00**

The influence of changing ice conditions on boreal and arctic lakes and wintertime utilization of lakes

**10.00-10.30**

The impact of changing climate to the coastal zone and river basins, and implications to power plants, flooding and water quality in Baltic region

**10.30-11.00: Coffee break**

**11.00-12.00**

Feedback into other WPs especially WP8 (Earth system modeling)

Rounding up and end of meeting

**12.00-13.00: Lunch at the hotel**

## List of participants:

1. Jon Egill Kristjansson, University of Oslo
2. Michael Boy, University of Helsinki
3. Gerrit de Leeuw, FMI & Univ. Helsinki
4. Knut Alfredsen, Norwegian University of Science and Technology
5. Outi Meinander, Finnish Meteorological Institute
6. Ville Kasurinen, Norwegian University of Science and Technology
7. Frank Berninger, University of Helsinki
8. Matti Leppäranta, University of Helsinki
9. Ingibjorg Jonsdottir, University of Iceland
10. Andreas Massling, Aarhus University
11. Erik Swietlicki

## Summary

Arctic albedos are well covered

UV albedo

Soot and snow both monitoring and experimental

Parameterization of albedo for GCMs summary paper is coming....

There are weaknesses in the socio-economic research

Integration to WP8 has to be further planned at.

**The discussion was build around the five themes selected mentioned in the CRAICC science plan and agenda above:**

**Theme 1: Short and long term variability of the surface albedo, in particular deposition of aerosols and snow and ice cover changes**

A presentation in WP3 by **Aki Virkulla** described the work and experiments at the FMI on black carbon. Soot experiment, testing against albedo relationships and snow measurements in collaboration with Ingibjorg Jonsdottir in the arctic.

**Outi Meinander** presented her work on UV albedo over snow:

- Effect of BC on UV albedo was larger than for other wavelengths

- There are UV albedo measurements in Sodankylä since 2007
- Black carbon and organic carbon in the snow since 2009
- Carbon concentrations increase over the wintertime in the surface snow
- 2 Papers out and one new paper submitted
- Black carbon in experiments first differs from natural black carbon
- A new observation is the correlation of the BC concentration correlates negatively with density of snow in BC experiment data
- Limited data of BC and snow density
- Methodological work, comparison of different methods to measure black carbon
- There is a kind of a review paper on different albedo parameterizations of climate models in writing by Matti Räisänen (FMI) and Outi Meinander
- In addition Outi Meinander works on Antarctic UV albedo
- Measurements start at Åbo station measurements first done at another station

There was a discussion why UV albedo may be important:

UV albedo has links to snow blindness and other health effects including effects on plants. Also chemical processes inside the atmosphere are often fuelled by UV light.

It was seen that this might have a role in earth systems models WP 2 could offer a re-parameterization of UV albedo models.

**Gerrit de Leuw** is currently running source sink models for black carbon transport into the arctic regions (the work will be done by Jonas Svensson - CAICC fellow).

**Frank Berninger, Nea Kuusinen and Ville Kasurinen** surface albedo and forests:

Work included the characterization of albedo. They found that there is a high temporal variation of albedo during the winter, which is associated with snow-cover in the tree canopies. Linear un-mixing procedures help to estimate the albedo of different land cover types in boreal regions.

**Ville Kasurinen** (CAICC fellow) is working on latent heat exchange and re-parameterizing a variable stomata resistance version of the Penman Monteith equation using data from FLUXNET.

The work from Timo Vihma on Ice and snow effects on cloud formation was mentioned but the work is taking place through SVALI,

Frank Berninger proposed to write an albedo summary paper in 2015 understanding on Forest, Lakes, Sea Ice, Lakes, BC.

## **Theme 2 The long and short term variability of reflected radiation and near-surface heat transport in relation to changes in surface albedo and snow/ice cover, aerosol concentrations, and cloud cover and properties**

Effects of clouds on the melting of sea ice has been covered in Svali. **Ville Kasurinen (CRAICC fellow)** is working on latent heat exchange and reparametrising a variable stomatal resistance version of the Penman Monteith equation using data from fluxnet. **Frank Berninger** promised to write an article on heat transfer (H and turbulence statistics over snow and snow free periods) towards the end of 2014.

## **Theme 3 Changes in precipitation and its effects on the radiation balance in the cryosphere and on lakes and rivers**

**Martti Leppäranta** has a model of ice thickness including the surface albedo of different snow forms.

He presented work on the formation of ice, circulation of water below an ice surface and the effects of wind on the ice cover. His model has a good description of ice energy balance.

Other issues discussed in this theme:

- the influence of changing ice conditions on boreal and arctic lakes and wintertime
- utilization of lakes
- the impact of changing climate to the coastal zone and river basins, and
- implications to power plants, flooding and water quality in Baltic region
- CRAICC contribution to other work packages could be to make the albedo more realistic

- Martti Leppäranta could perhaps do a summary of lake ice sensitivity to precipitation
- Knut Alfredson provide downscaled GCM data.

#### **Theme 4 the evolution of snow and ice climatological zones**

**Ksenia Atlaskina** has collected ample information on the evolution of snow and ice zones from satellite pictures as well as compared snow and ice models with remote sensed evidence.

#### **Theme 5 and 6: The influence of changing ice conditions on boreal and arctic lakes and wintertime; utilization of lakes & the impact of changing climate to the coastal zone and river basins, and implications to power plants, flooding and water quality in Baltic region**

**Knut Alfredsson** has a student working on ice constraints hydropower production in run-through plants and to avoid bad ice conditions downstream.

**Martti Lepäranta** could try to report changes in unsafe periods in the future.

There was a separate presentation about CRAICC activities in Iceland by **Ingibjorg Jonsdottir**.

- Project on iceberg and glacier dynamics in east Greenland.
- Combination of different data sources,
- Project is in the lake ice inland. Some exact observations exist and use of remote sensing over the last 10 years using MODIS.
- Project sea ice in the Greenland Sea. Since 1850 based on different proxies. Thinning makes sea ice more sensitive to wind.

**Jon Egill Kristjansson** from WP8 gave a talk on ESM models.

All input to the model has be done before beginning of 2015 approximately because thereafter the model will be frozen and no changes will be possible thereafter.

Input should have priorities on CRAICC processes

Downscaling data will not be available for the ESM data

## **Potential impact for WP8**

1. New and better albedo parameterizations for the boreal / arctic including UV albedo and the effect of BC on albedo (Berninger, Meinander and Kuusinen)
2. Better models of heat exchange for boreal landscape, particularly a better partitioning of energy between latent and sensible heat flux during winter based on EC data. (Kasurinen and Berninger)
3. Models of lake ice and its dynamics to compare and test to ESM (Leppäranta, Alfredson)
4. Testing data for models of cryosphere dynamics (De Leuw, Atlaskina)