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ESA Earth Explorer-7 CoReH20 Mission Update

Chris Derksen

Climate Research Division
Environment Canada

Background

- ***January 2009***: CoReH20 selected as one of three Earth Explorer-7 Phase A missions following a User Consultation Meeting in Lisbon (BIOMASS; CoReH20; PREMIER)

- ***2009-2012***: Phase-A science and technical activities

- ***March 2013***: Final Earth Explorer-7 User Consultation Meeting in Graz; Recommendation from ESAC

- ***May 2013***: Final mission selection by PB-EO

- Canadian participation in CoReH20 Phase-A science activities led by Environment Canada. Along with university collaborators, ground-based field campaigns conducted in Churchill (2009/10 and 2010/11 winter seasons) jointly funded by EC, CSA, and ESA.

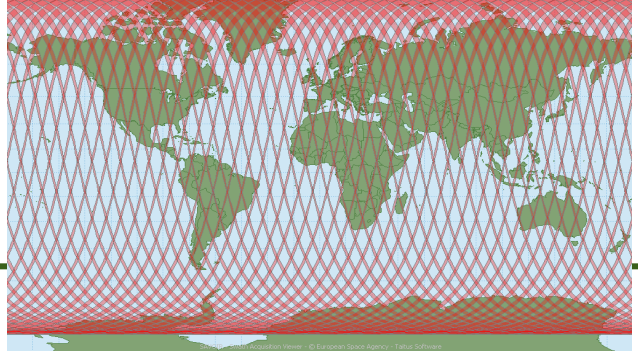
- Environment Canada and ESA funded airborne SnowSAR campaign out of Inuvik NT currently in progress.

The CoReH20 Mission

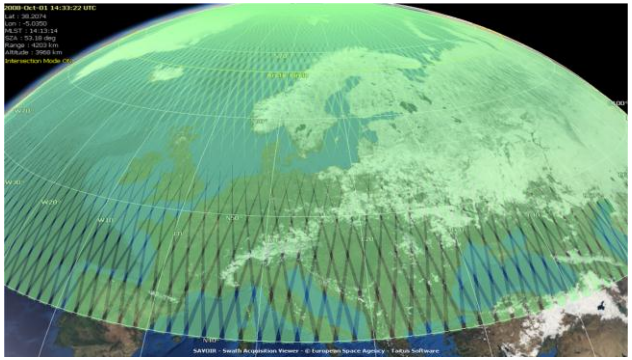
- The Cold Regions Hydrology High-resolution Observatory (***CoReH2O***) aims at providing high-resolution observations of fresh water stored as snow.
- The mission employs dual-frequency SAR in two consecutive mission phases to deliver snow and ice information over two temporal scales.

Payload

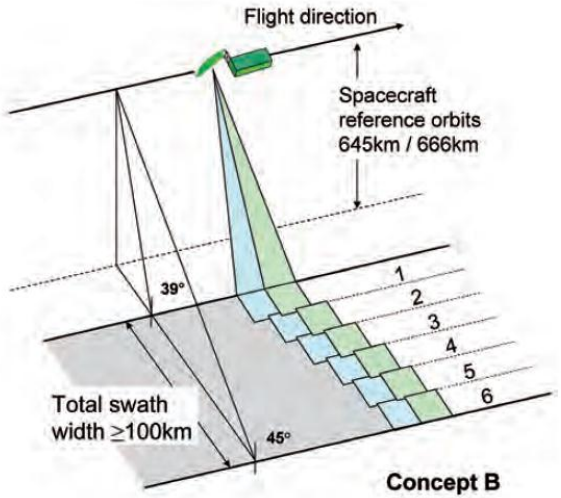
- ❑ SAR: 9.6 GHz (X-band) & 17.2 GHz (Ku-band)
- ❑ Polarisations: VV and VH
- ❑ Incidence angle: 30° to 45° (range)
- ❑ Swath width: ≥ 100 km
- ❑ Spatial resolution: 50 m x 50 m (≥ 5 looks)



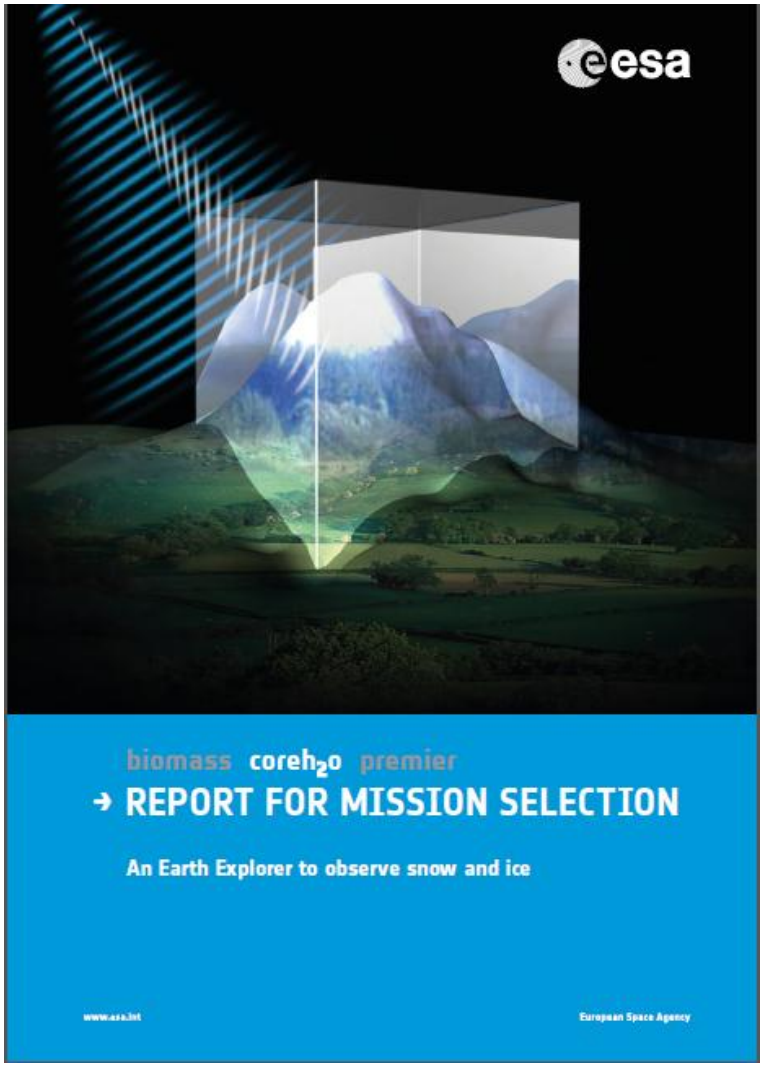
Coverage map for Phase 1 (3 days repeat cycle)



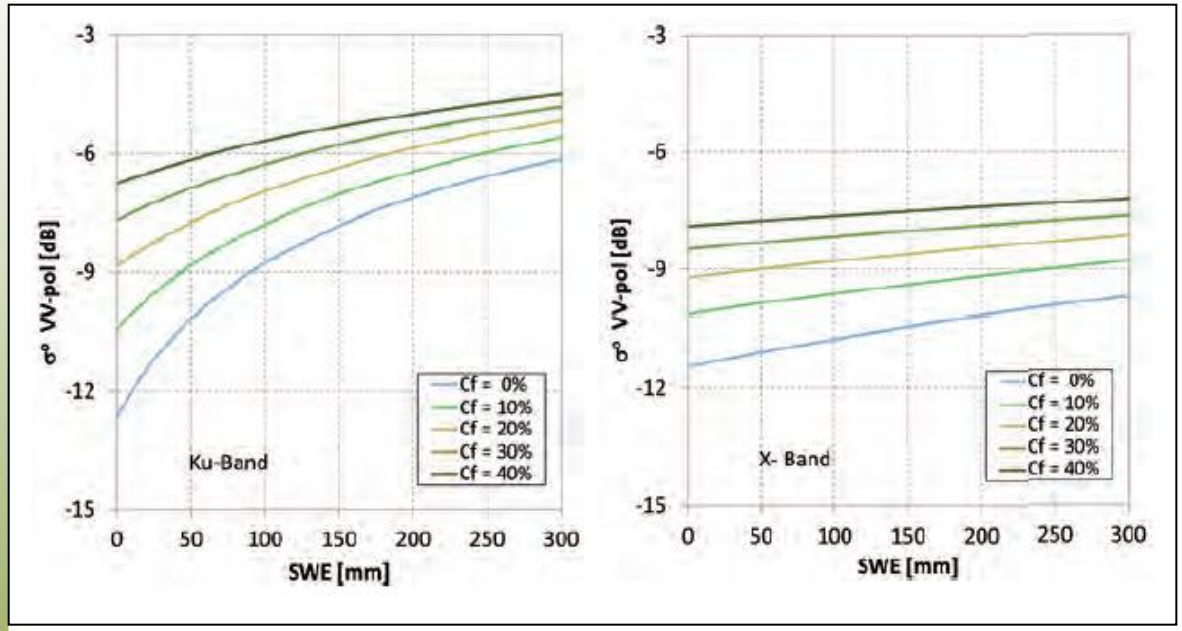
Coverage map for Phase 2 (15 days repeat cycle)



Report for Mission Selection

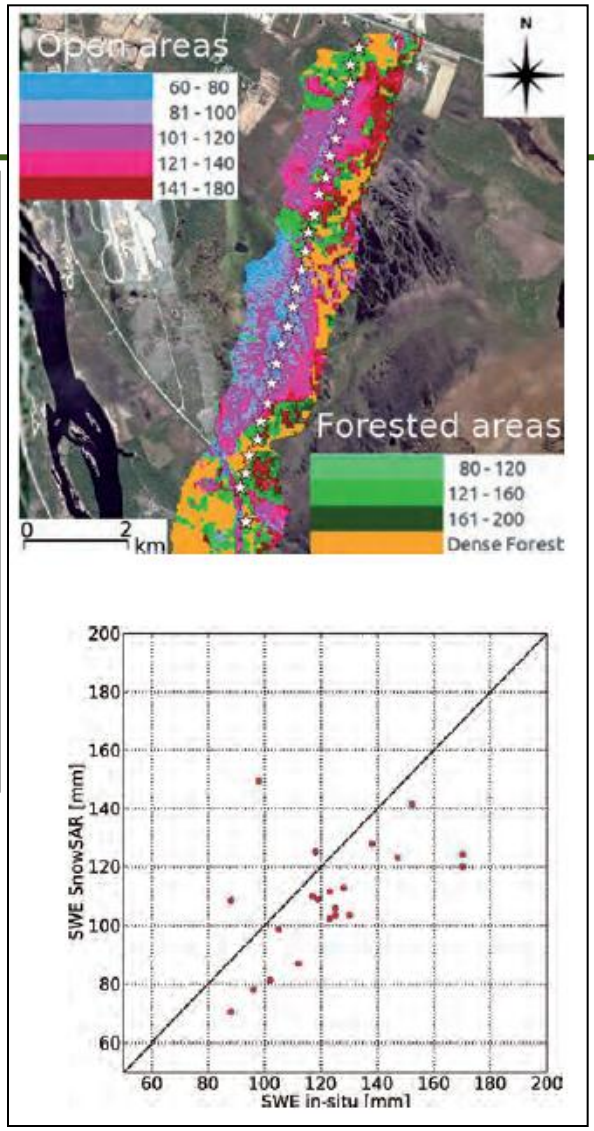


Retrieval Concept



Backscatter vs. snow water equivalent (SWE) for a range of forest fractions (theoretical)

- Strongest sensitivity to SWE at Ku-band
- Forest fraction >25% is problematic
- A priori grain size and SWE required
- Additional analysis of airborne datasets from Finland, Austria, and Canada is necessary



SWE retrieval from airborne SAR measurements versus ground measured SWE

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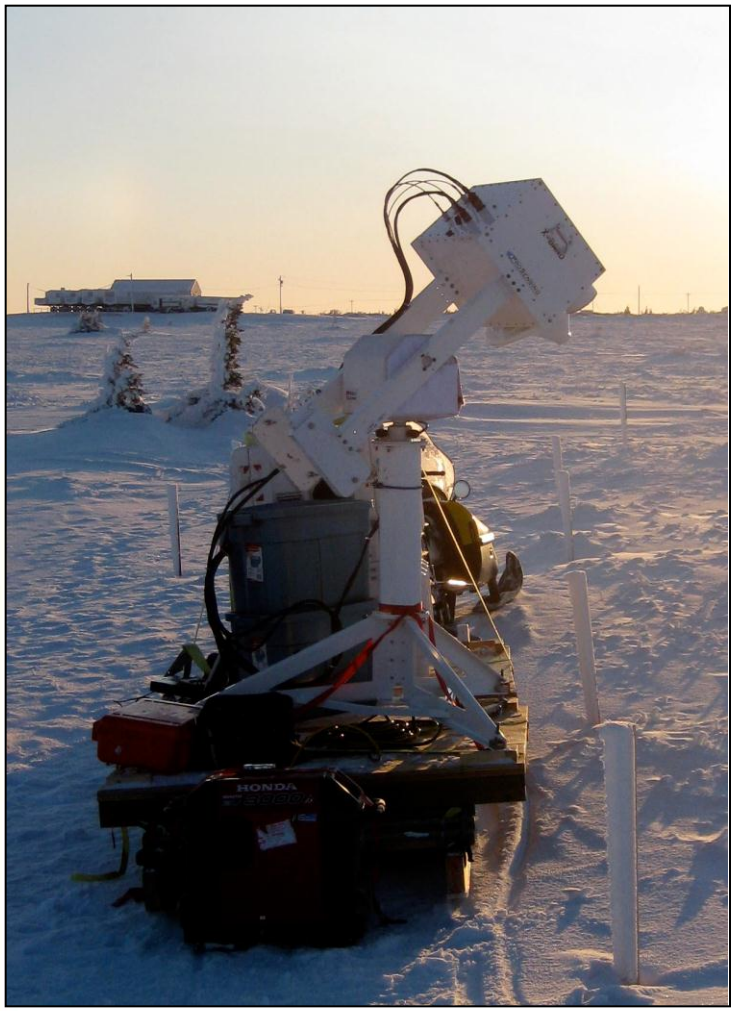
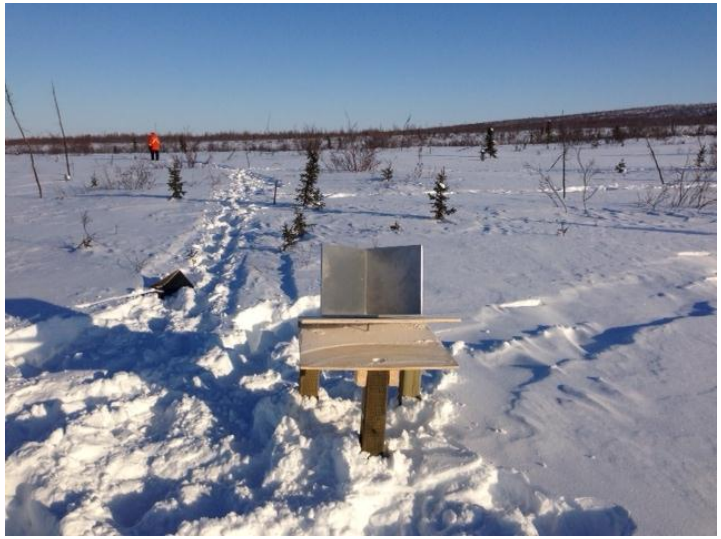
Canadian Field Campaigns: 2009/10 & 2010/11



Ground based scatterometers (X- and Ku-band) from University of Waterloo and passive microwave radiometers (19, 37, 89 GHz) from Environment Canada.

Canadian Field Campaigns: 2012/13

- Airborne SnowSAR flights over Trail Valley Creek
- Analysis to include in situ observations, radar retrievals, and distributed hydrological model simulations



Next Steps

- PB-EO decision for Earth Explorer-7 announced in early May
- Completion of Canadian SnowSAR campaign, including NASA funded SAR/LiDAR flights in Alaska
- NASA snow remote sensing workshop in Boulder, August 2013

What will be the status of a 'snow mission' in the context of other water cycle missions (SMAP; GPM; SWOT)?

Canadian CoReH20 Field Campaign Collaborators

Environment Canada / Environnement Canada	Chris Derksen, Arvids Silis, Peter Toose, Anne Walker
esa	Dirk Schuettemeyer
University of Waterloo / IC3	Claude Duguay, Richard Kelly, Josh King, Grant Gunn
Cartel – Centre d'applications et de recherches en télédétection	Alain Royer, Alexandre Langlois, Benoit Montpetit, Alexandre Roy, Charles Papasodoro
Ilmatieteen Laitos / Meteorologiska Institutet / Finnish Meteorological Institute	Juha Lemmetyinen, Juho Vehvilainen, Jouni Pulliainen
METASENSING	Alex Coccia
northumbria UNIVERSITY	Nick Rutter, Thomas Watts
Boise State University	H-P Marshall, Esther Babcock
University of Alaska Fairbanks	Matthew Sturm

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