

EO challenges in high-latitudes and the workshop objectives

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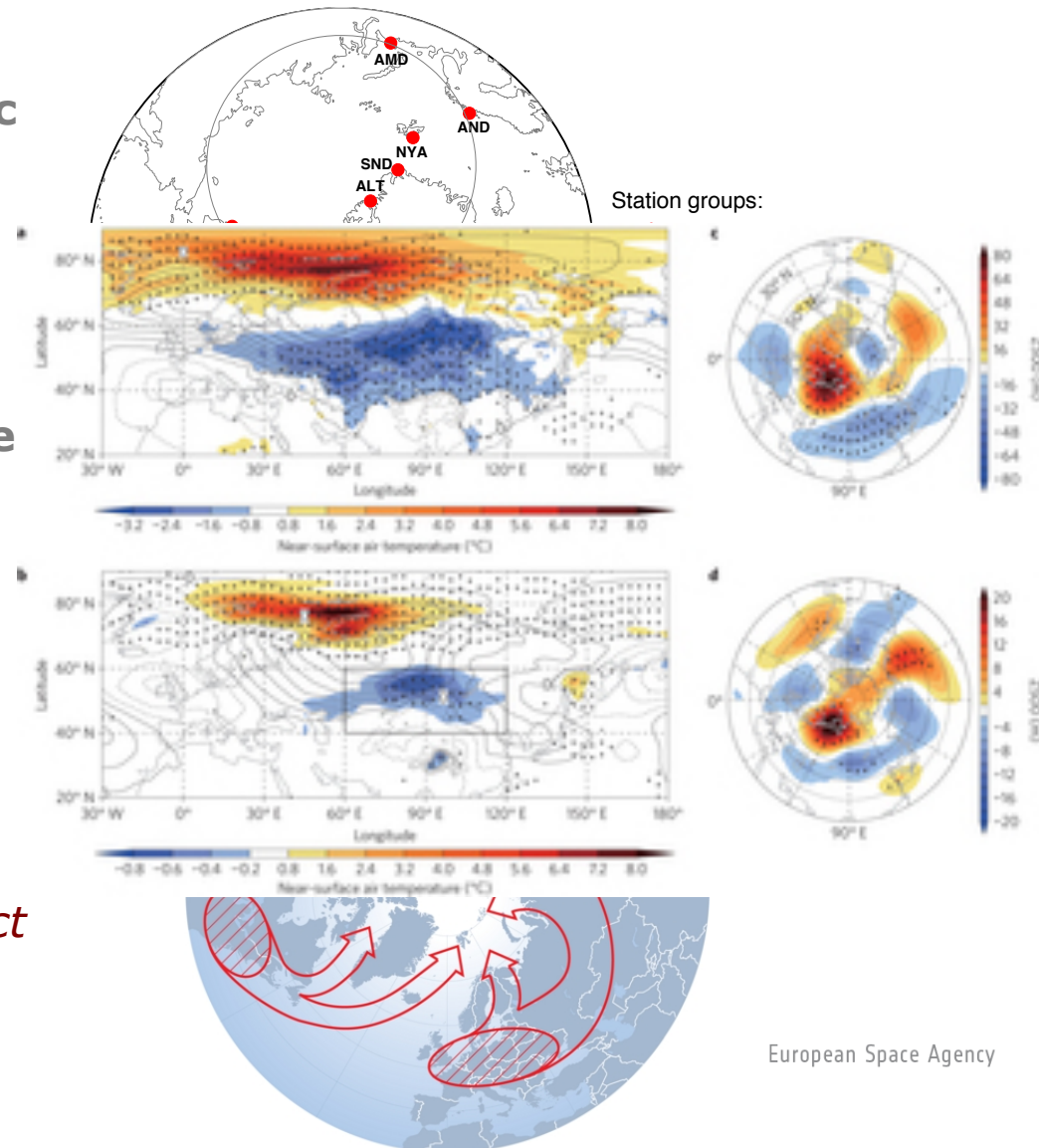
Why a series of workshops on Arctic and high-latitude product evolution and validation?

High-latitudes areas and the Arctic are sparsely populated, extremely remote, with a challenging and harsh environment

These sensitive areas are undergoing tremendous change – *human access, exploration, environmental changes, etc.*

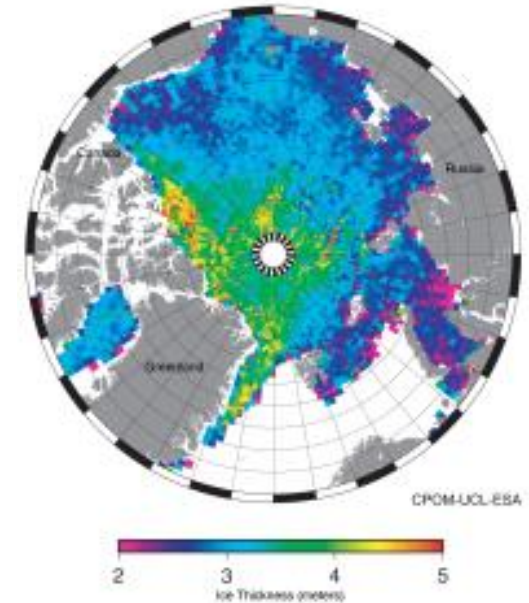
These areas are impacted by the mid-latitudes through long-range transport

and vice-versa as recently published by Mori et al., Nature Geosciences 10/2014 (Arctic impact on severe mid latitude winters)



Climate change / Science

- A more variable and unpredictable Arctic sea-ice regime
- Accelerating Greenland glaciers, increased glacier calving, increased production of ice-bergs
- Improved predictability of Arctic weather and climate



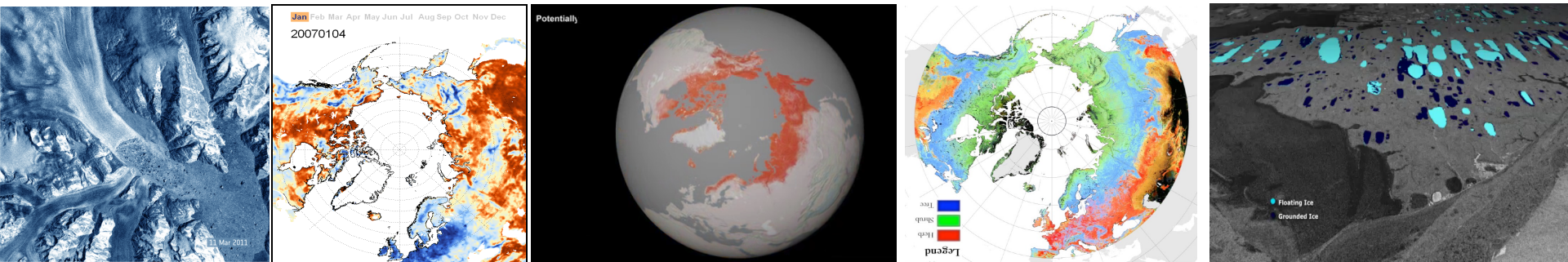
Operational needs

- Increased pressure to exploit Arctic natural resources (oil and gas, mining, fisheries) demanding environmental baseline and tactical information
- New trans-Arctic shipping highways
- Increased demand for Search and Rescue operations

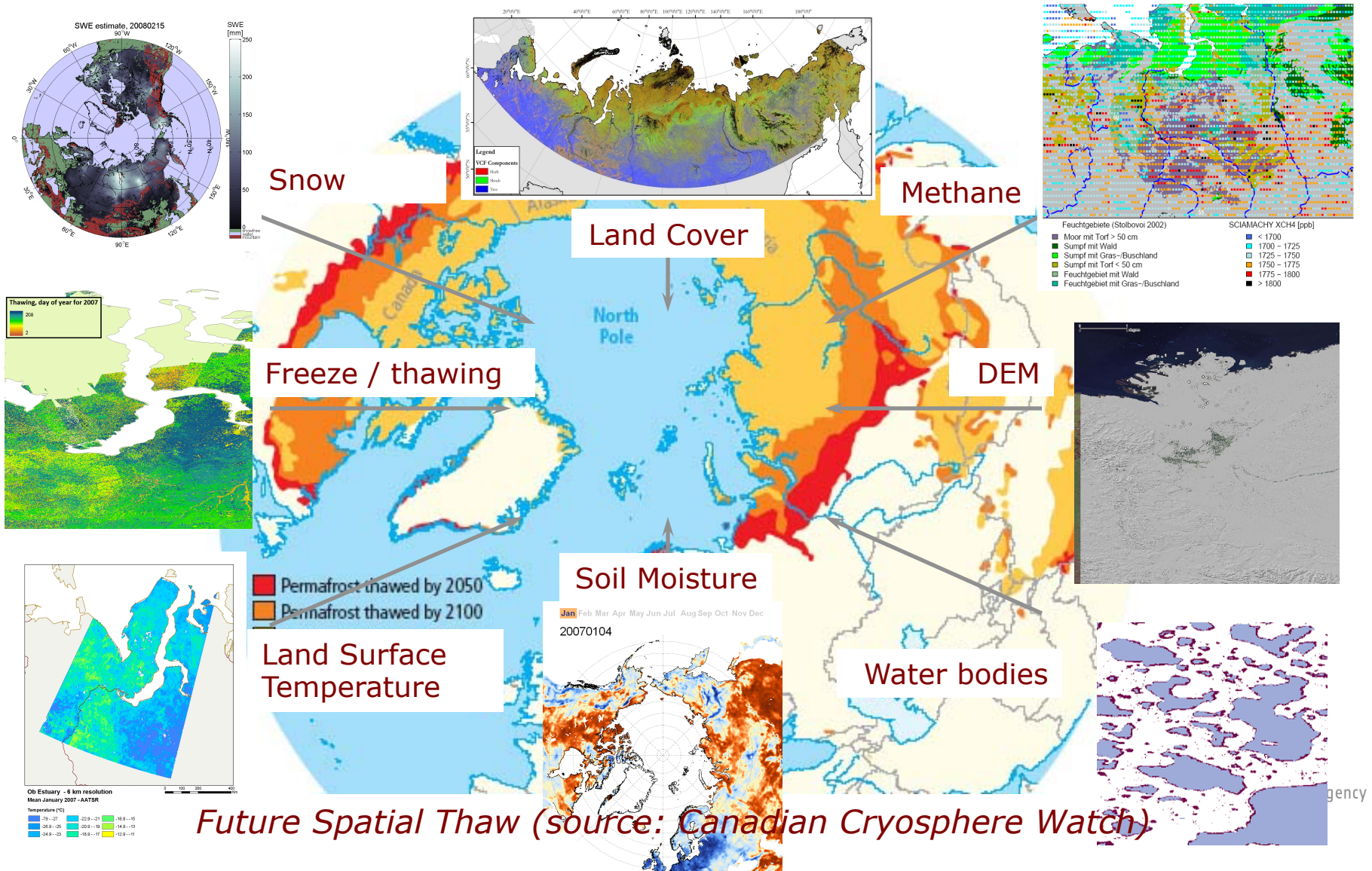


Some key Historic Events/Milestones:

- ***Space and the Arctic***
 - 2009: Stockholm workshop under the auspices of the Swedish Presidency of the EU council
 - 2012: Copenhagen workshop under the auspices of the Danish Presidency of the EU council
 - 2012: “Space and the Arctic” Joint Communication to EU parliament and council
- ***2015: ESA/EC RTD agreement on Arctic programmatic coordination (incl. for future H2020 calls)***



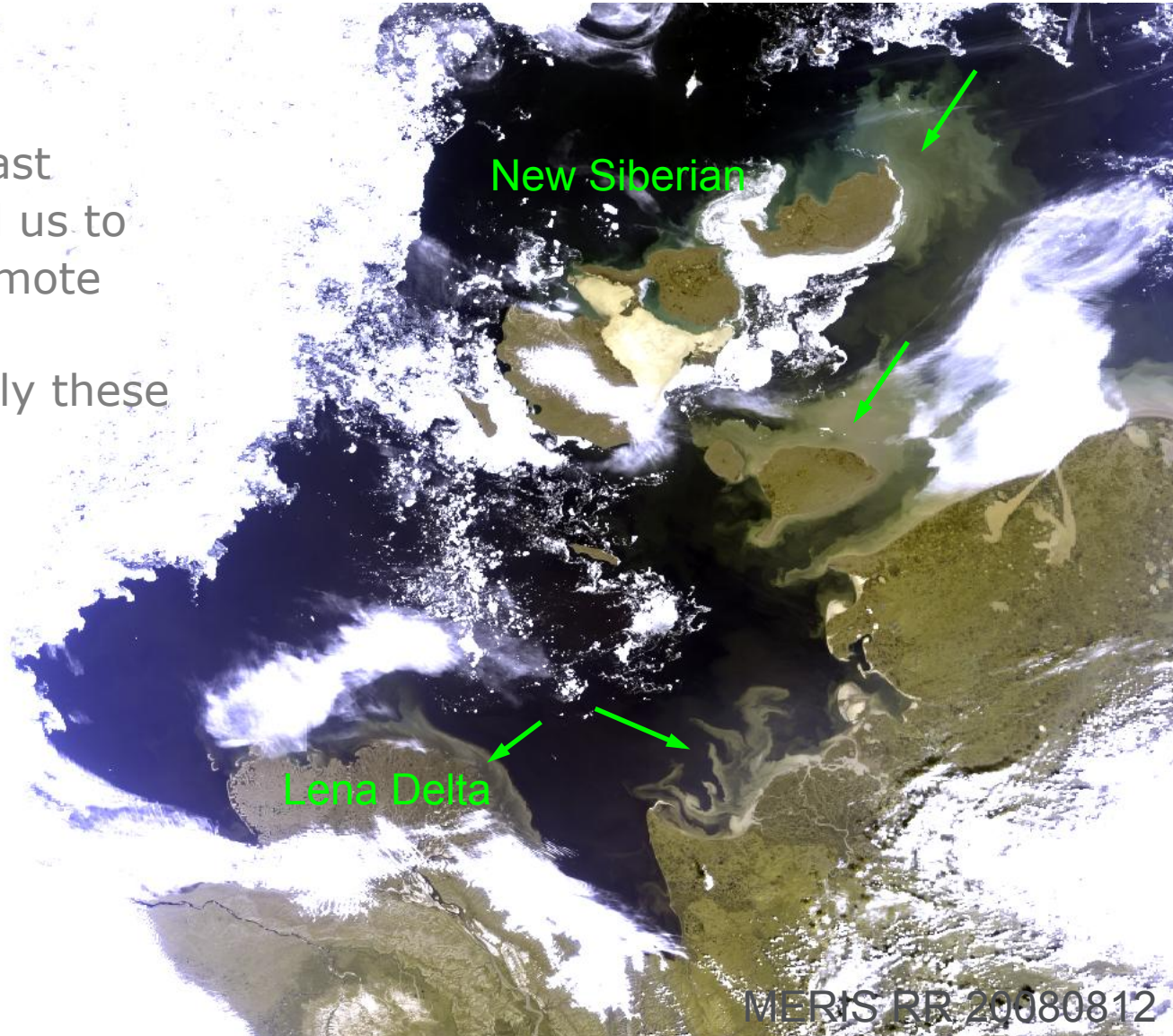
Motivation - *interconnections*



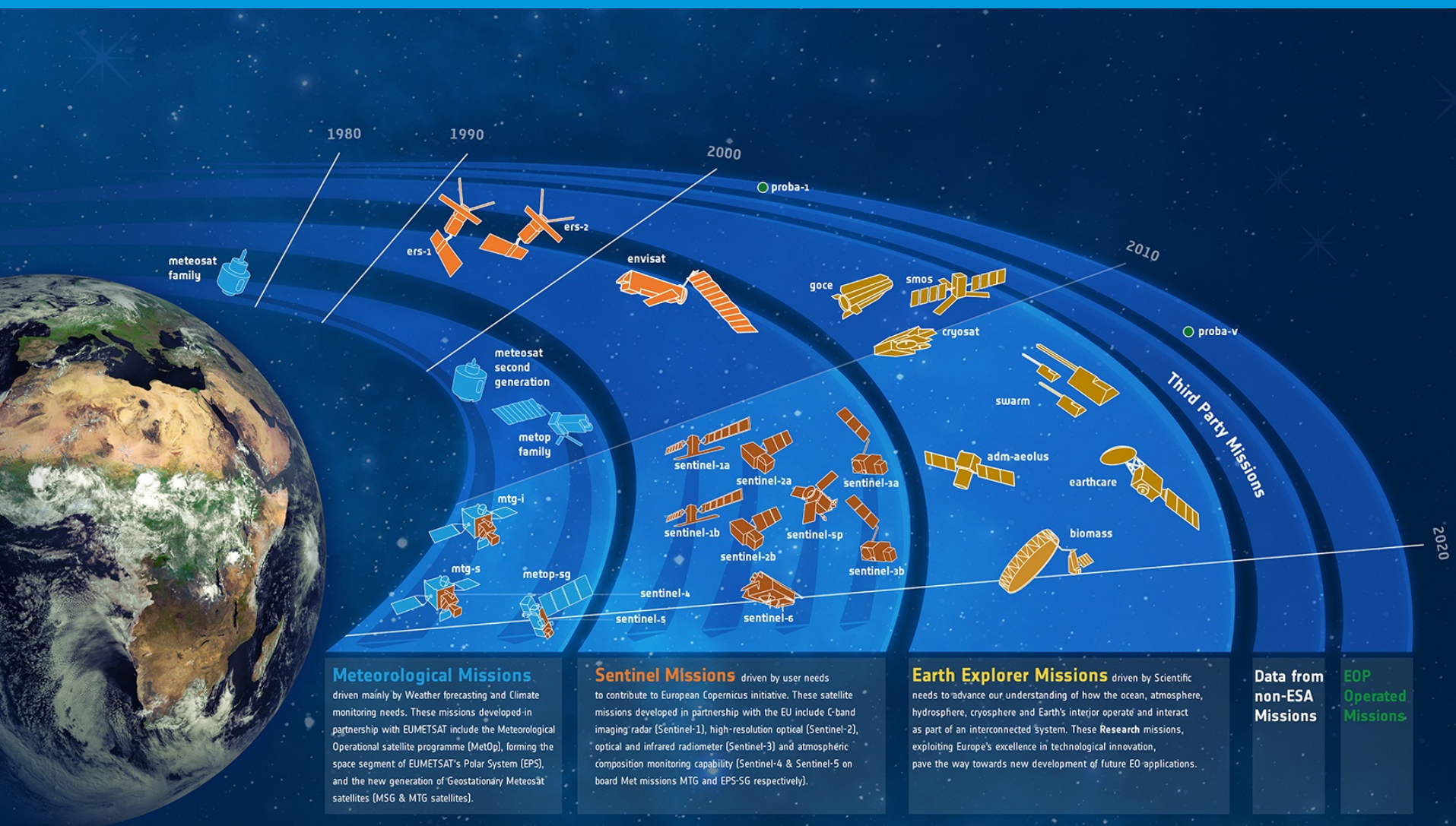
Motivation – *ready access to EO data*



Space-borne Earth Observation in the last decades has allowed us to witness nature in remote areas and to further “explore” scientifically these phenomena



Challenges – increasing European EO capacity



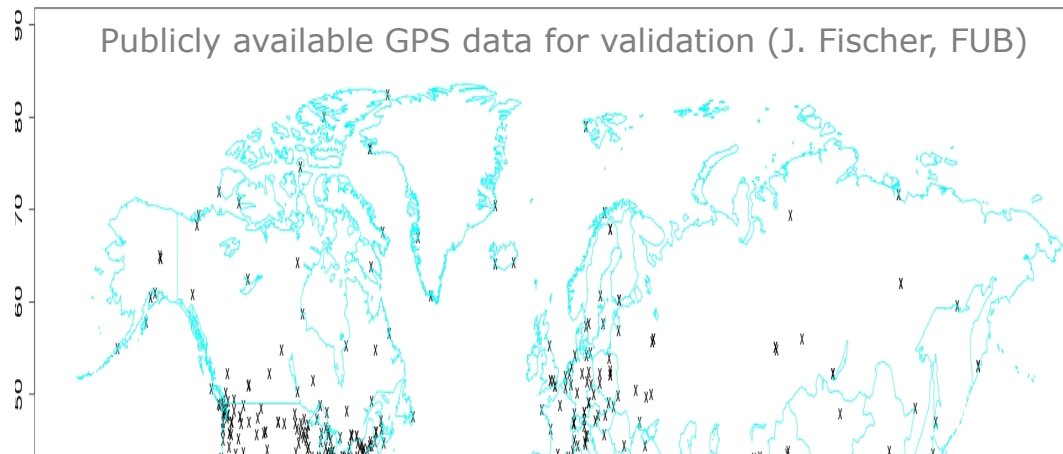
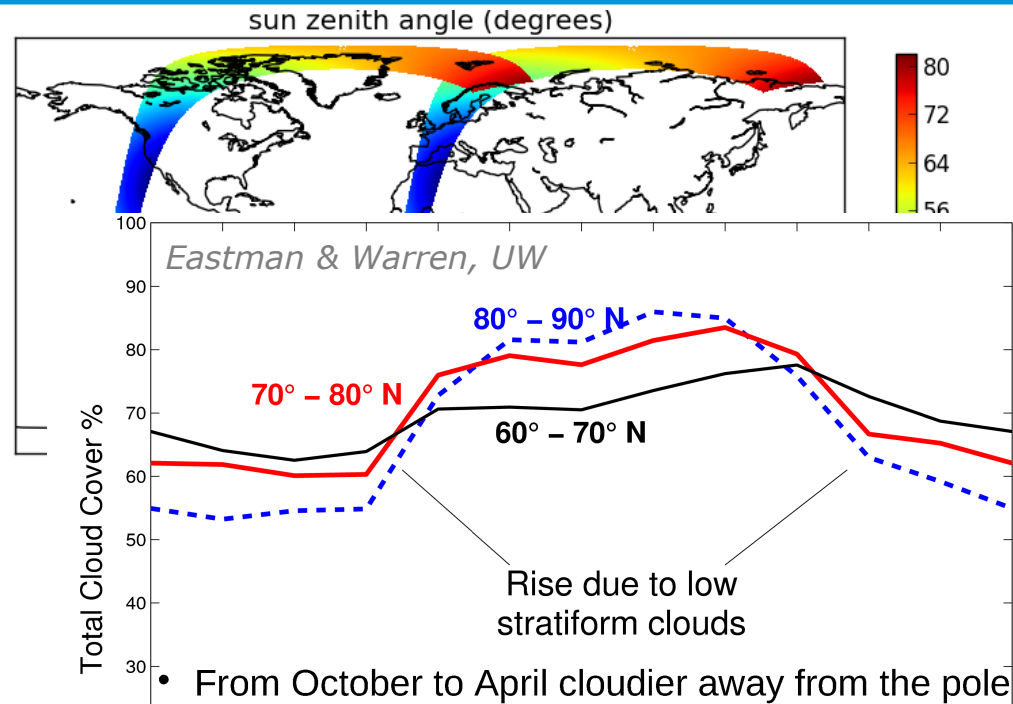
Challenges - measurement environment

Earth Observation, as illustrated here, has a tremendous potential for high-latitudes by:

- *Monitoring sea ice change*
- *Monitoring hemispheric temperature change*
- *Identifying land cover changes and permafrost change*
- *Help estimate river runoff (with models)*
- *etc.*

but, the high-latitudes are challenging for EO, especially for optical type measurements:

- *Extended polar night and periods with (very) high solar zenith angles*
- *High cloud occurrences (and all the related problems of layering, shadows, snow, etc.)*
- *Difficult environment for validation (and few validation data)*



The workshop expectations

To clearly identify the areas for improvement for existing/new algorithms and products in high-latitude and the Arctic – *this includes new approaches, improved auxiliary information (RT, met data), and additional products*

To formulate requirements for validation of high-latitude and Arctic products – *including proposed improvements to the ground-based observation networks, such as WMO/GCW, National sites, Sustained Arctic Observing Networks (SAON), or the creation/addition of new measurement capabilities*

Outcome from the first APVE (Ottawa, November 2015) and other EDA activities

APVE: Ottawa, November 2015



70 participants from industry, government agencies, academia and national centres of excellence from Canada, US and Europe

37 presentations covering: User Perspectives, Land, Lake/Coastal, Cryosphere, and Atmosphere

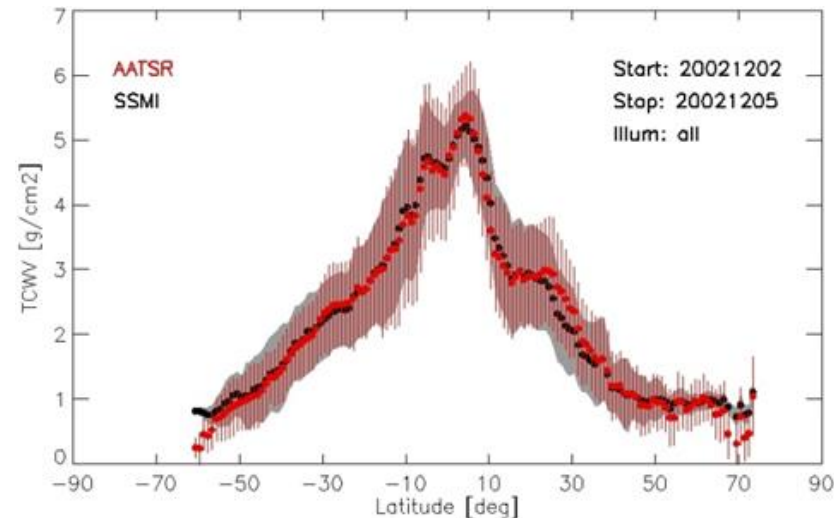
Key recommendations:

- *Need for data compatibility and data interoperability*
- *Sustaining key validation sites and identifying sites representative of high-latitude regime (for new products/ new missions)*
- *Formulate requirements for validation of Arctic/high-latitude data products*



TIR med-resolution total column water vapour retrievals at high-latitudes

- *PI: S. Casadio Serco/ESA, Italy*
- *Focus on the characterisation of the TCWV retrievals (AIRWAVES) at high-latitudes from an algorithmic and validation point of view*
- *CCN (7/2015) to the LTDP ALTS project (see <https://earth.esa.int/web/sppa/activities/multi-sensors-timeseries/alts>)*



ODIN SMR mission recalibration and reprocessing

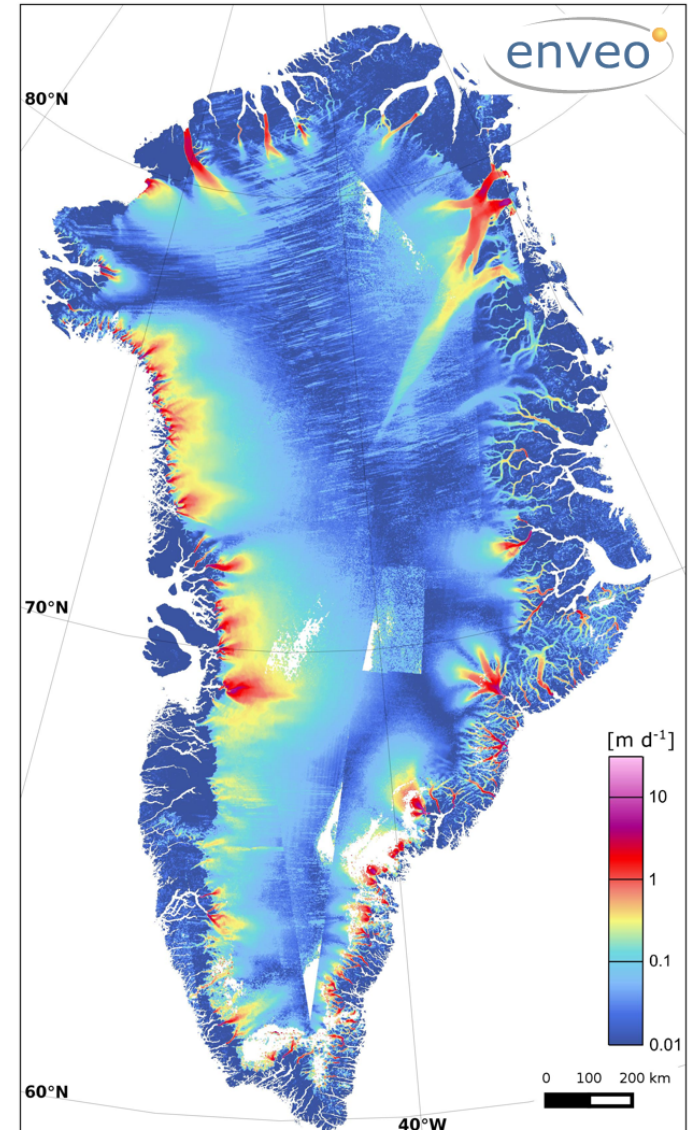
- *PI: D. Murtagh, Chalmers U., SE*
- *Stratospheric species key to understand Arctic ozone loss and dynamics*
- *KO: Sept. 2015 (see <http://odin.rss.chalmers.se>)*

Pilot airborne campaign for high-latitude validation of land products

- *PI: NRC, co-I: McGill U. (both CND)*
- *Use of Mer Bleue site outside of Ottawa (Canada) during Spring/Summer 2016 as proxy for high-latitudes*
- *Future campaigns expected to follow in 2017/2018*

High Resolution SAR Algorithms for Mass Balance and Dynamics of Calving Glaciers

- *PI: DLR (D), co-I Enveo (A)*
- *Improve on the in-situ methodologies by using hi-res SAR (and optical) datasets*
- *KO: Q1/2016*



Infrastructure support to stations and laboratories:

- *Direct support to **Eureka** station (2 aircraft, infrastructure/instrument upgrades) through U. Toronto/Dalhousie (CND)*
- *Negotiating direct support to **Thule** station infrastructure operations for 2016-2018 (through DMI, DK)*
- ***Support annual European Brewer inter-calibration campaigns**, including high-latitude instruments (AEMet-Izaña, SP)*
- ***Atmospheric Composition calibration laboratory upgrades: PMOD/WRC (CH), PHOTON/RIMA(F)***

FRM4GHG

- *PI: J. Nothold (IUP, D) and M. de Maziere (BIRA/IASB, B)*
- *IR instrument intercomparisons (TCCON and NDACC) and best practice development for GHG measurements at FMI Arctic Centre (Sodankylä, FIN)*
- *Campaign: 4/2016-Summer 2017*
- *KO planned for November/December 2015*

Coordinated ground-based aerosol cluster of excellence

- *PI: D. Nicolae (INOE, RO)*
- *Preparation of aerosol FRM infrastructure/calibrations, ground-based algorithm consolidation, **and with special focus on lunar/night-time measurements***
- *Key: PHOTONS/RIMA/AERONET, EARLINET, Pandonia (2018 with NDACC)*
- *KO Q1 2016*

Related/on-going activities at ESA



Polar Thematic Exploitation Platform - P-TEP (PolarView and partners)

- Pilot project focussing on glacier and ice/iceberg behaviour, driven by scientific and operational needs

STSE Polaris



- Gather and establish information requirements for the polar regions
- Identify information gaps considering space and non-space based systems
- Consolidate and prioritize information gaps with key user bodies

EOPA Polaris Mission Concepts

- Explore & select mission concepts based on Polaris Results
- Explore synergy opportunities with Telecommunication and Navigation
- Assess feasibility of 1 to 3 mission concepts

STSE Arctic + (ITT Open)

- Response to the needs of the Arctic community
- Addressing 5 major priorities identified in the ESA-CliC Arctic Science Agenda
- ITT prepared in consultation with EC RTD
- Preparing future activities coordinated with H2020



ESA-CliC workshop on EO and Arctic Science Priorities, Tromsø, 20th January 2015

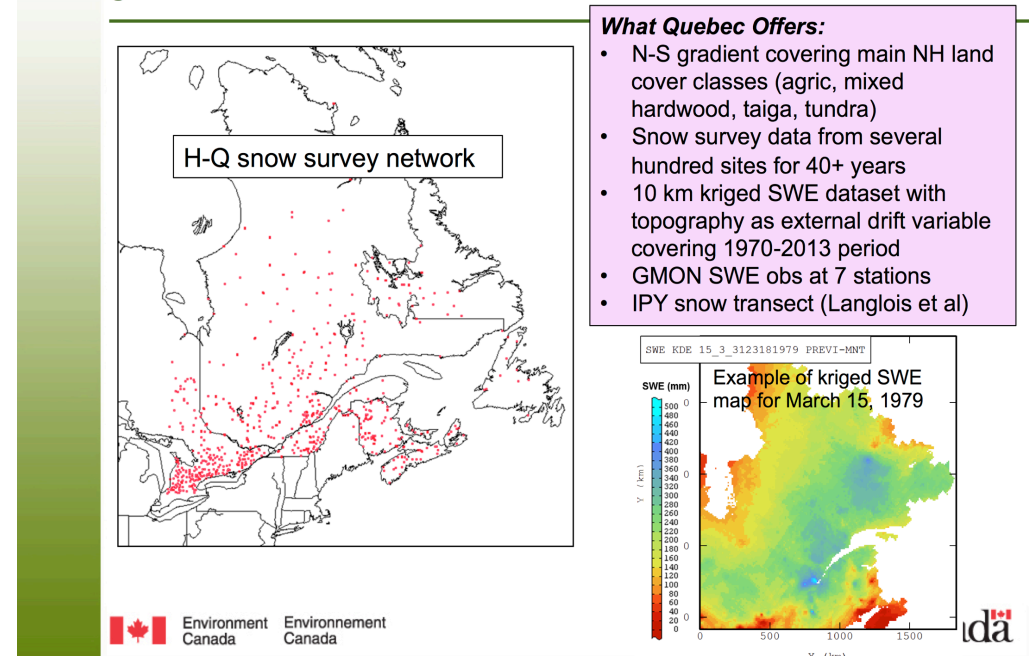
The workshop expectations (revisited)

Expectations (ii)

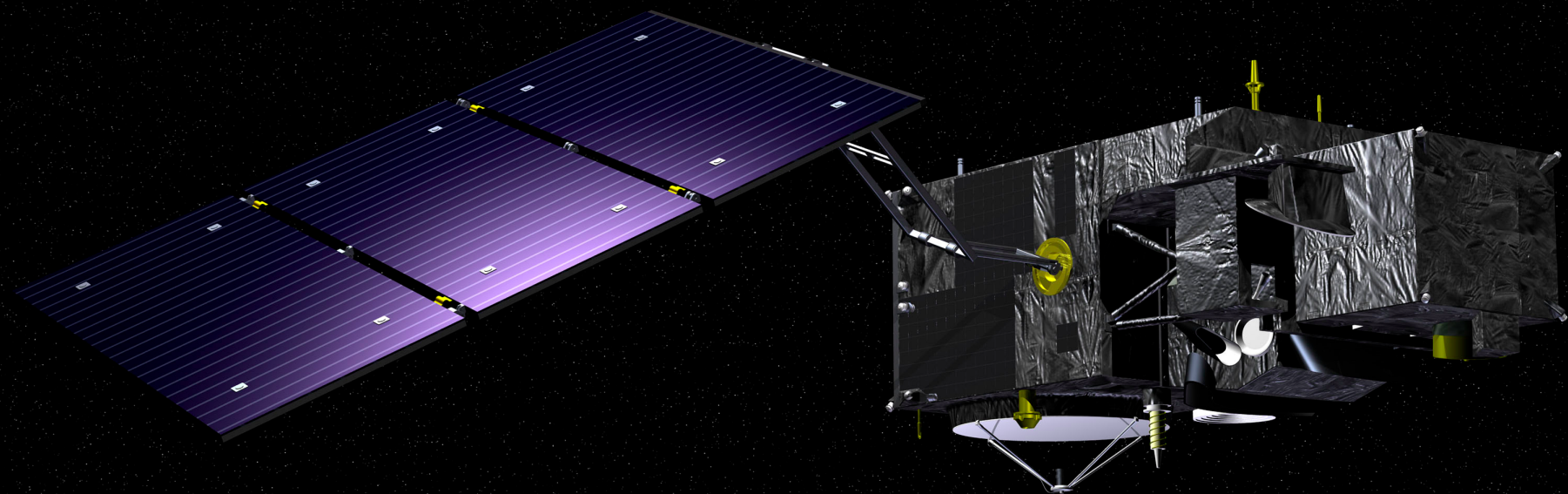
Define key EO reference sites/areas targeting specific representativity issues (i.e mountainous areas, coastal zones, climatic variability)

For example: the use of the Province of Quebec for snow products due to its geographic and climatic variability (recommendation from the SnowPEX ISSPI WS - right) or planning of targeted field/aircraft campaigns

Now that you mention it, Québec is a potentially data-rich SnowPEX validation region! Hydro-Quebec have expressed willingness to contribute data to SnowPEX



Ross Brown's 2014 ISSPI presentation



Thank you for your attention!

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B. Bojkov - APVE II, Norrköping 27-28 October 2015