

Boreal Products

(A) Process Monitoring. Time-series data required.

- _ Freeze/thaw-based products

(B) Mapping of spatial features. Single contiguous acquisition or acquisitions once per season

- _ Wetlands maps
- _ Biomass maps

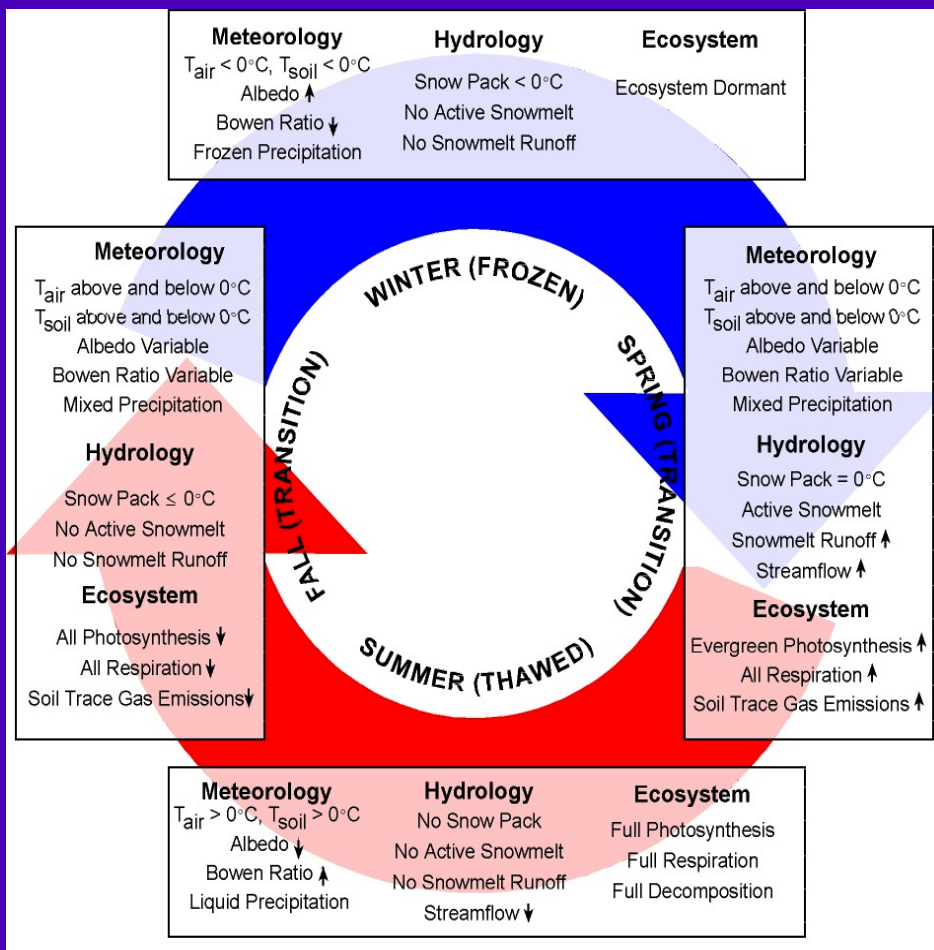
Kyle McDonald

J.C. Shi

Larry Smith

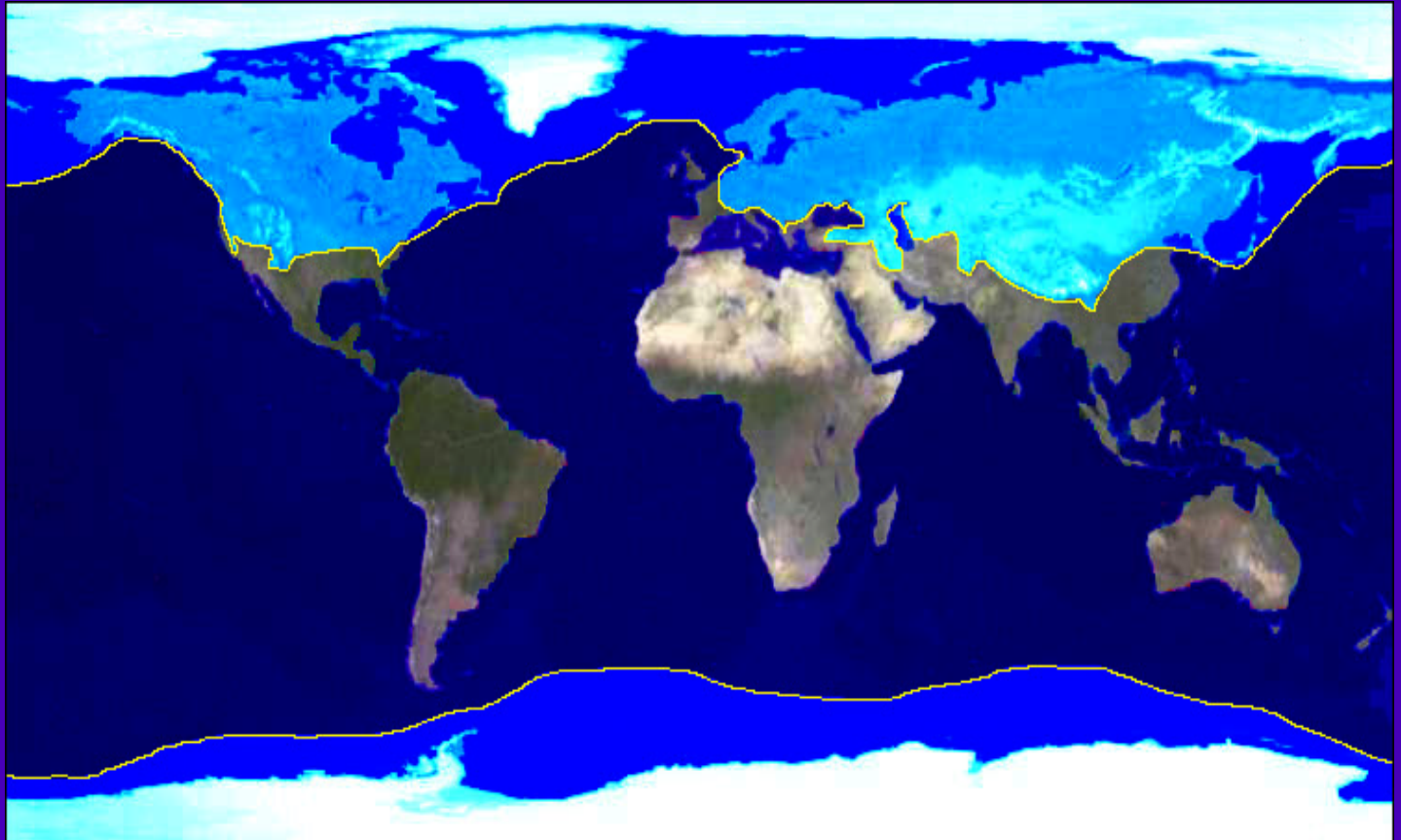
Science Implications

Importance of Freeze/Thaw



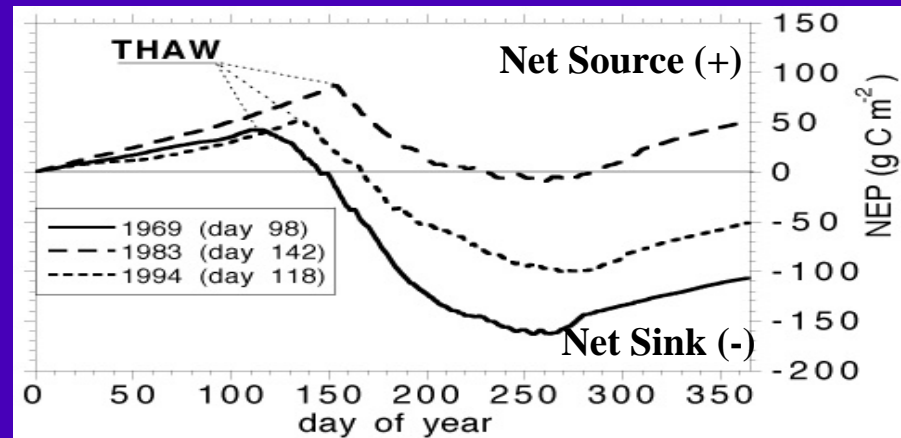
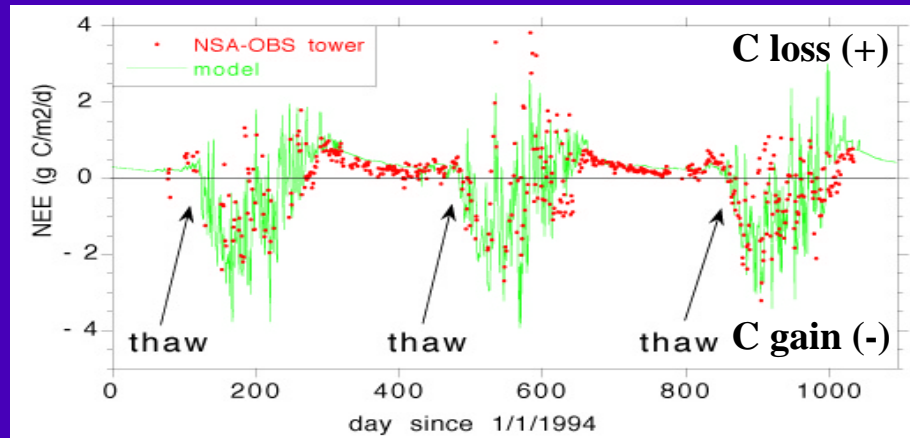
Conceptual diagram showing the general effects of freeze/thaw status and snow on meteorological, hydrological, and ecosystem processes throughout the year.

Terrestrial Cryosphere



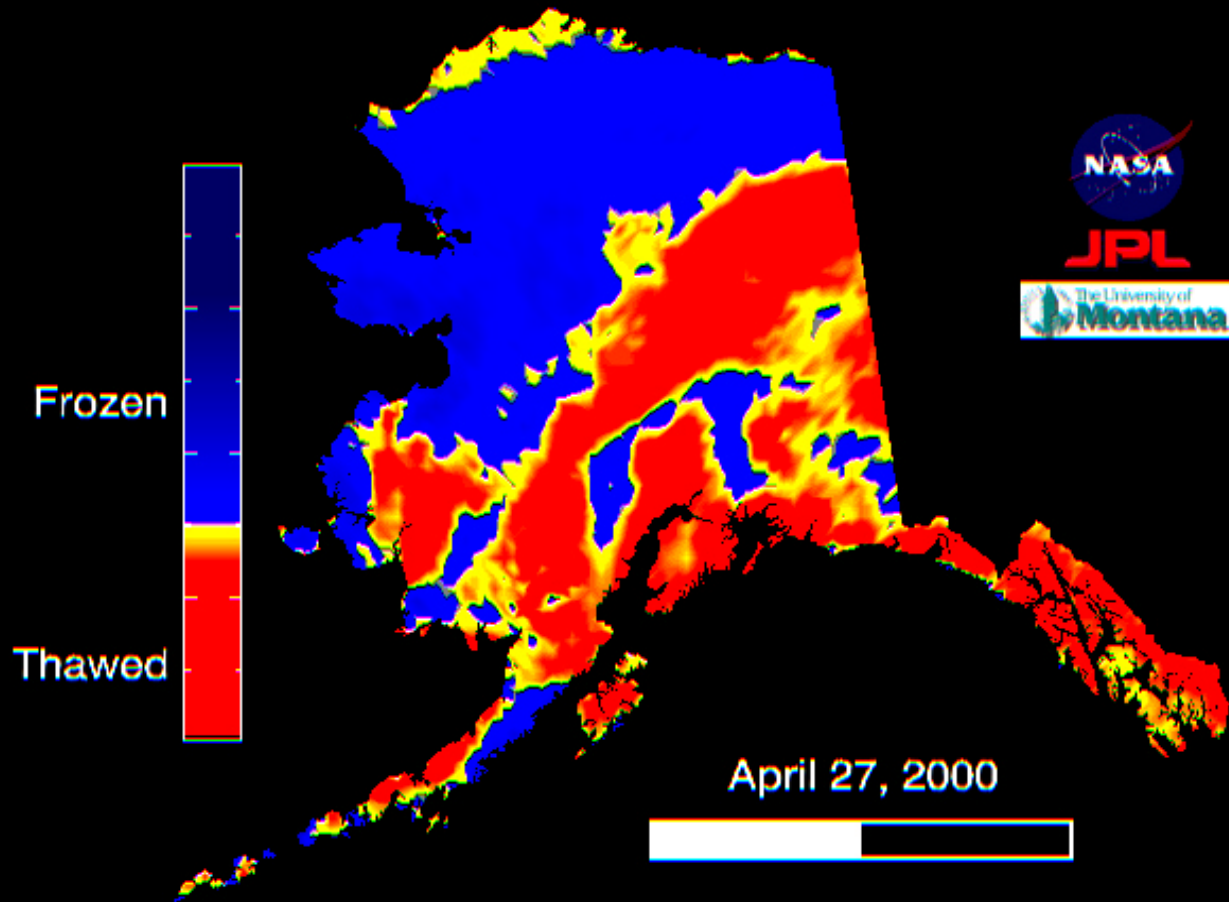
Boreal Carbon Dynamics

BOREAS NSA Black Spruce



Boreal Products

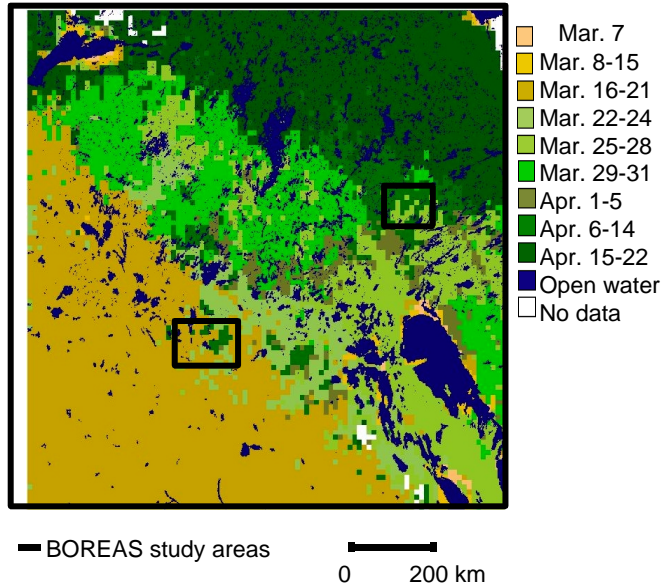
Freeze/Thaw classification



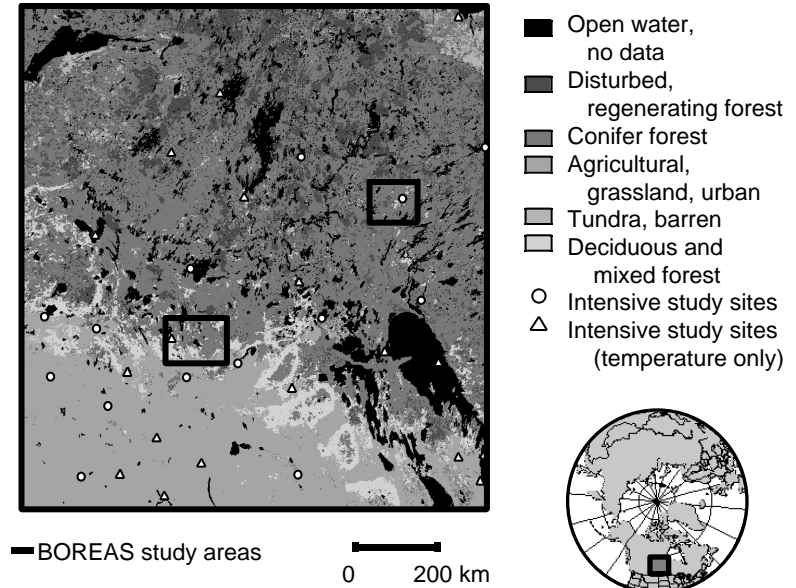
Boreal Products

Thaw onset date; transition duration

Initial Thaw Date



BOREAS Region Landcover



NSCAT data were applied to map the spatial and temporal domains of the spring thaw transition within the BOREAS study region of Canada. At left, date of initial thaw is shown over the 1,000,000 km² region. At right, a landcover map shows locations of the 31 intensive study sites used for freeze-thaw product derivation and validation. The locations of the BOREAS North and Southern study areas are outlined. Landcover information was derived from 1 km NOAA AVHRR data (Cihlar et al., 1997). NSCAT-based initial thaw was within one day of that estimated from mean daily air temperature 97% of the time.

Ref: Kimball, McDonald, Frolking and Running: "Radar Remote Sensing of the Spring Thaw Transition Across a Boreal Landscape," Remote Sensing of Environment BOREAS Special issue.

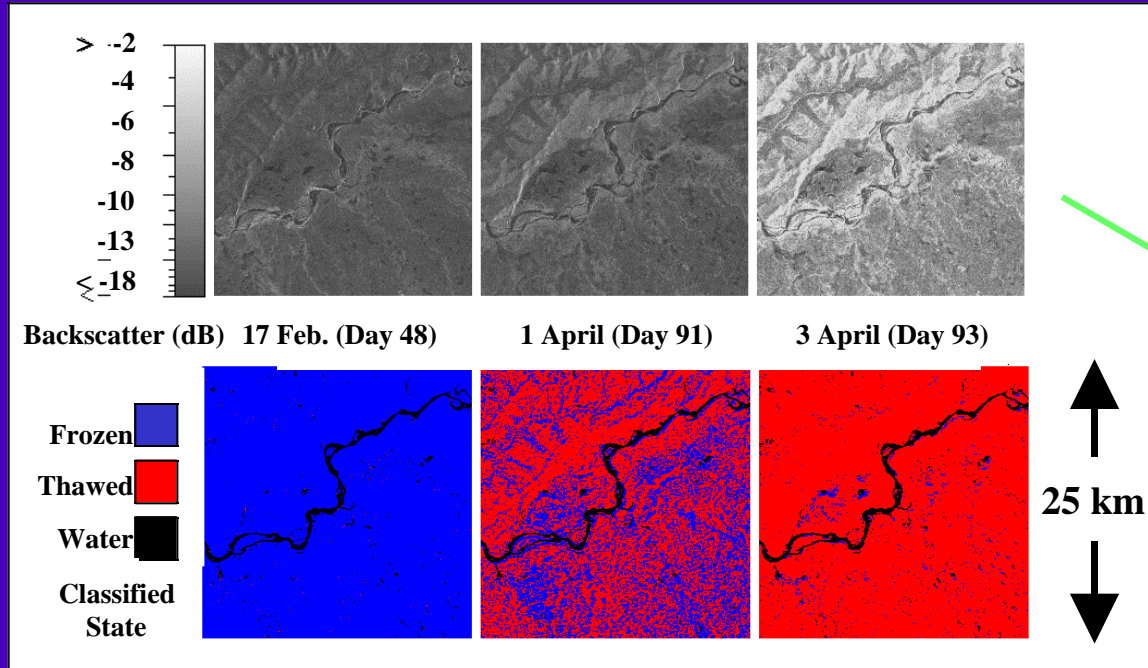
Boreal Freeze/Thaw Products

- Thaw onset date
- Thaw transition duration
- Autumn freeze-up
 - Less critical for quantifying carbon exchange
 - L-band is better than existing techniques (Ku-band)
 - Allows derivation of growing season bound.
- Users:
 - Global carbon studies
 - Regional carbon studies
 - Ecologists, hydrologists, climatologists
- Organizational Structure:
 - JPL
 - UMT – product development center (?)

Boreal Freeze/Thaw Products

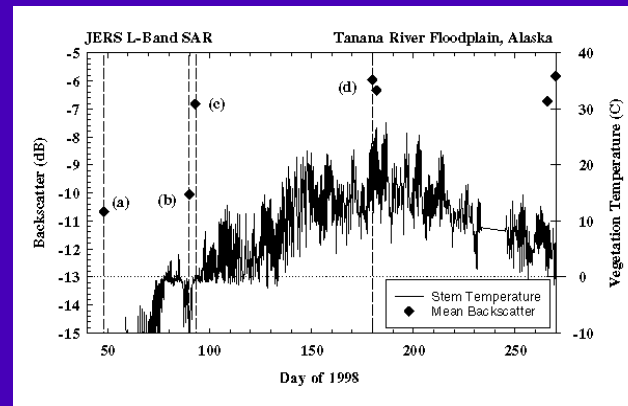
- Requirements for realization:
 - NASA funding(?; TBD)
 - High temporal monitoring from April-July
maximum possible repetitive observation,
until transition is complete
 - September-November for freeze-up
 - Product derivation is data intense
- Level of Ambition: Pan-boreal
 - One year's transition cycle as demo
 - Each spring for interannual variability measure,
and for operational development
- HH-pol ScanSAR; variable incidence angle algorithm needed
- Synergy with scatterometer to improve temporal fidelity
- Current plan is non-existent for these products

Utility of JERS-1 L-band SAR



Validation with *in situ*
Biophysical Measurements

Also have extensive plan
developed for HYDROS utilizing
integrated *in situ* networks



Boreal Products: Wetlands

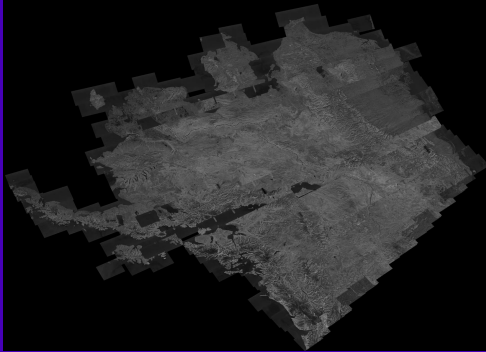
- Open water map
- Wetland classification
- Max. summertime extent
- Monitoring for selected regions
(e.g. Coastal plains, Canadian peatlands,
west Siberia lowlands)
- Scientific relevance:
CO₂, CH₄ fluxes
source/sink identification, magnitude, spatial
distribution and extent
- Users:
Global and regional carbon studies
- Organizations:
JPL (lead), CCRS, UCLA, UCSB, GISS

Boreal Products: Wetlands

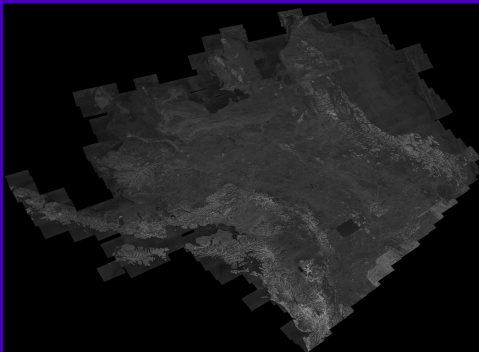
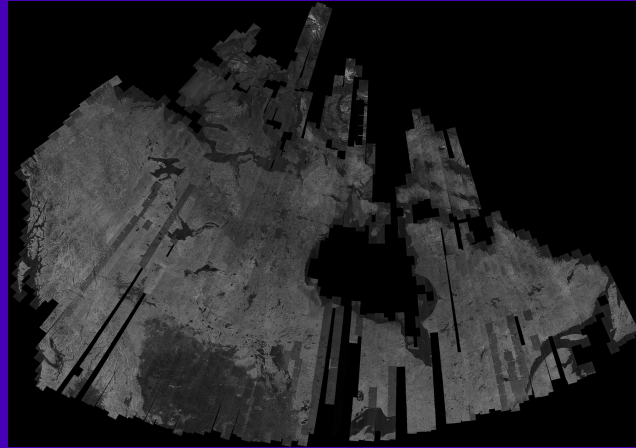
- Requirements for realization:
 - NASA funding(?; TBD)
 - Early summer maps of max inundation (as a minimum)
 - Late June or July coverage
- Level of Ambition: Pan-boreal
 - One year for baseline
 - Subsequent years for variability (perhaps selected regions)
- Minimum requirement is 100 meter ScanSAR (HH)
Dual-pol HH, HV preferred for higher resolution
- Utilize mosaic products for continental map development
- Validation: AVNIR II for small areas
- Current plan looks OK. Must be out of thaw transition.

Boreal Products: JERS-1 Utility

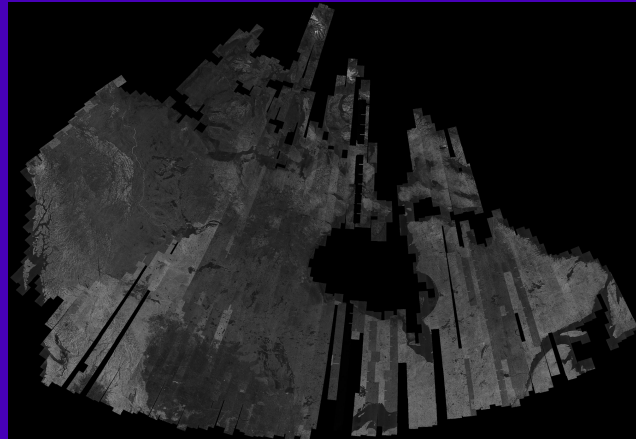
JERS-1 GBFM Project Mosaics



Focus on Summertime



Focus on Wintertime



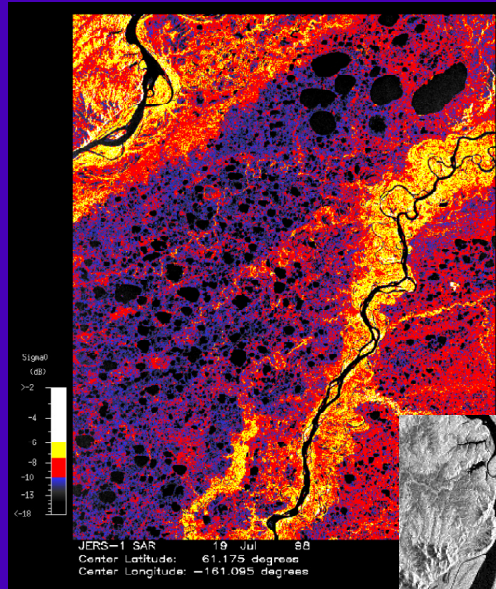
Boreal Products: Biomass

- Scientific relevance:
Carbon stocks and distribution
- Users:
Global and regional carbon studies
- Organizations:
JPL, CCRS, ESA
- Requirements for realization:
 - NASA funding(?; TBD)
 - Late June and July coverage
 - Winter coverage may be useful to address confusion on structural classes caused by liquid water distribution

Boreal Products: Biomass

- Level of Ambition: Pan-boreal
 - One year for baseline
 - Subsequent years for monitoring
- Dual-pol HH, HV
- PRISM / optical sensor synergy warrants exploration
- Utilize mosaic products for continental map development
- Current plan looks OK. Must be out of thaw transition.

VEGETATION STRUCTURE: Yukon-Kuskokwim Delta



In the Yukon-Kuskokwim Delta, backscatter images at left, high biomass woodlands along the rivers (yellow) contrast strongly with shrublands (red), herbaceous wetlands (blue), ponds, and watercourses.

