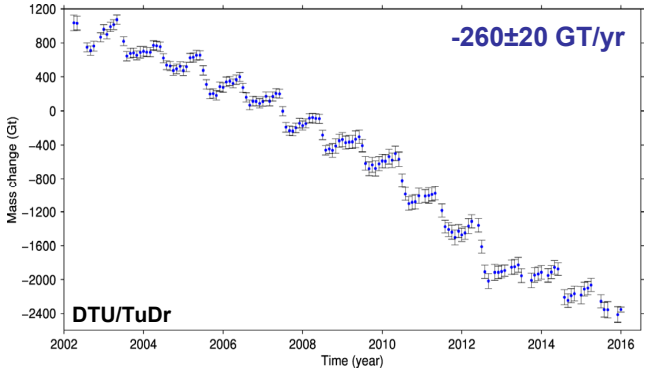
Greenland Ice Sheet CCI project

Essential Climate Variables for GIS ice sheet changes across multiple EO missions – *Ice velocities, elevation changes, mass balance, calving fronts and grounding line data*

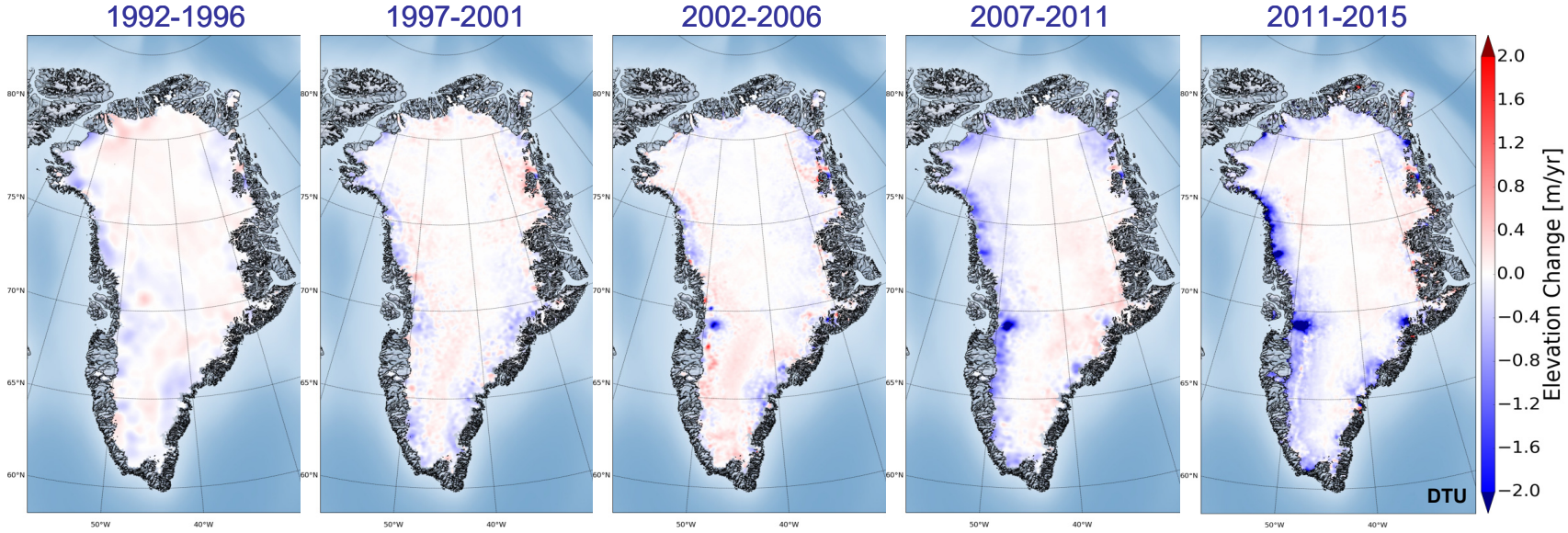
Achievements and latest developments:

- *25-year continous time series of elevation changes (ERS, EnviSat, CryoSat)*
- *Greenland SAR ice velocity time series 1992-present (ERS, EnviSat, ALOS/Palsar, Sentinel-1)*
- *Monthly basin mass balance since 1992 (GRACE)*
- *Outlet glacier calving front time series from space radar 1992-present (ERS, EnviSat, S-1)*

Overall mass change of the Greenland ice sheet

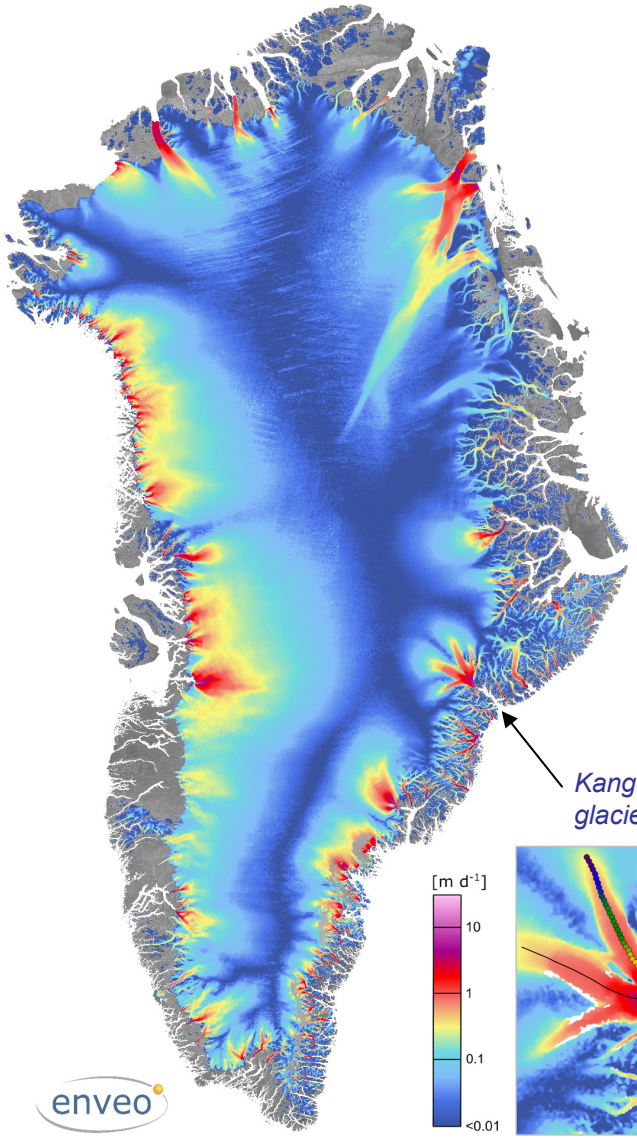


Seamless surface elevation change rates from ERS-1, ERS-2, Envisat and CryoSat (5 year running means)

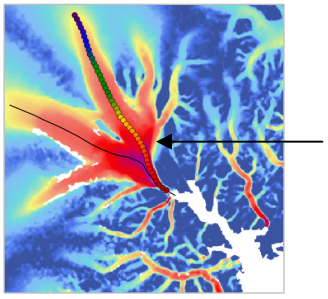


Greenland Ice Sheet CCI project: product examples

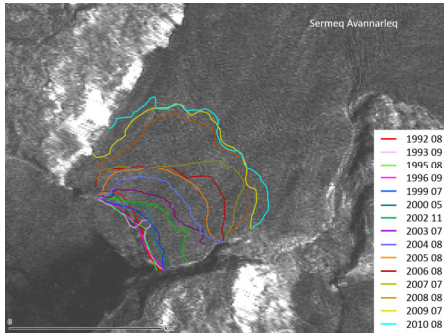
Composite ice velocity map from Sentinel-1

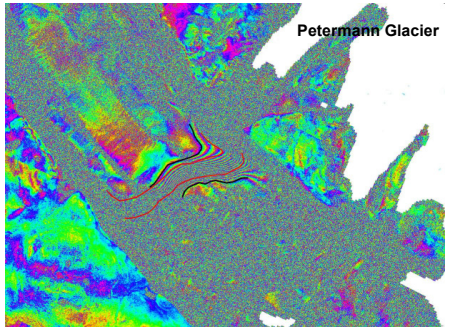


Kangerlussuaq glacier zoom-in



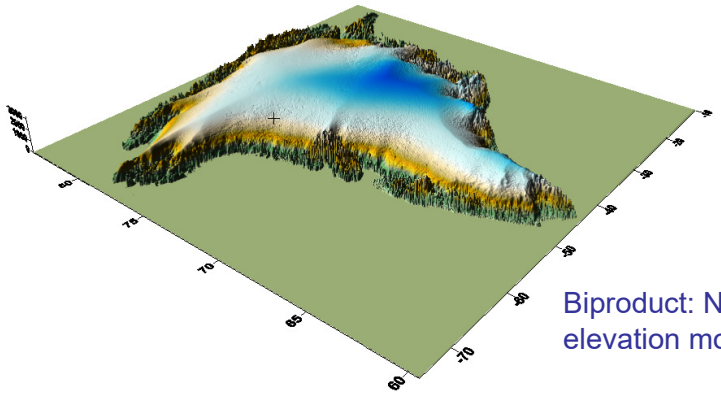
Calving front and SAR grounding line examples (W and N Greenland)





Ongoing:

- *Yearly velocity coverage of entire ice sheet (Sentinel-1 average)*
- *6-day time series of all major outlet glaciers (S-1A/S-1B)*
- *Incorporation of AltiKa Ku-band radar altimetryContinue time series*
- *Closing sea level budget (with CCI-Glaciers/-Antarctica/-Sealevel)*
- *New proposed high-resolution mass change product (IV + GRACE + altimetry + SMB/firn density models)*



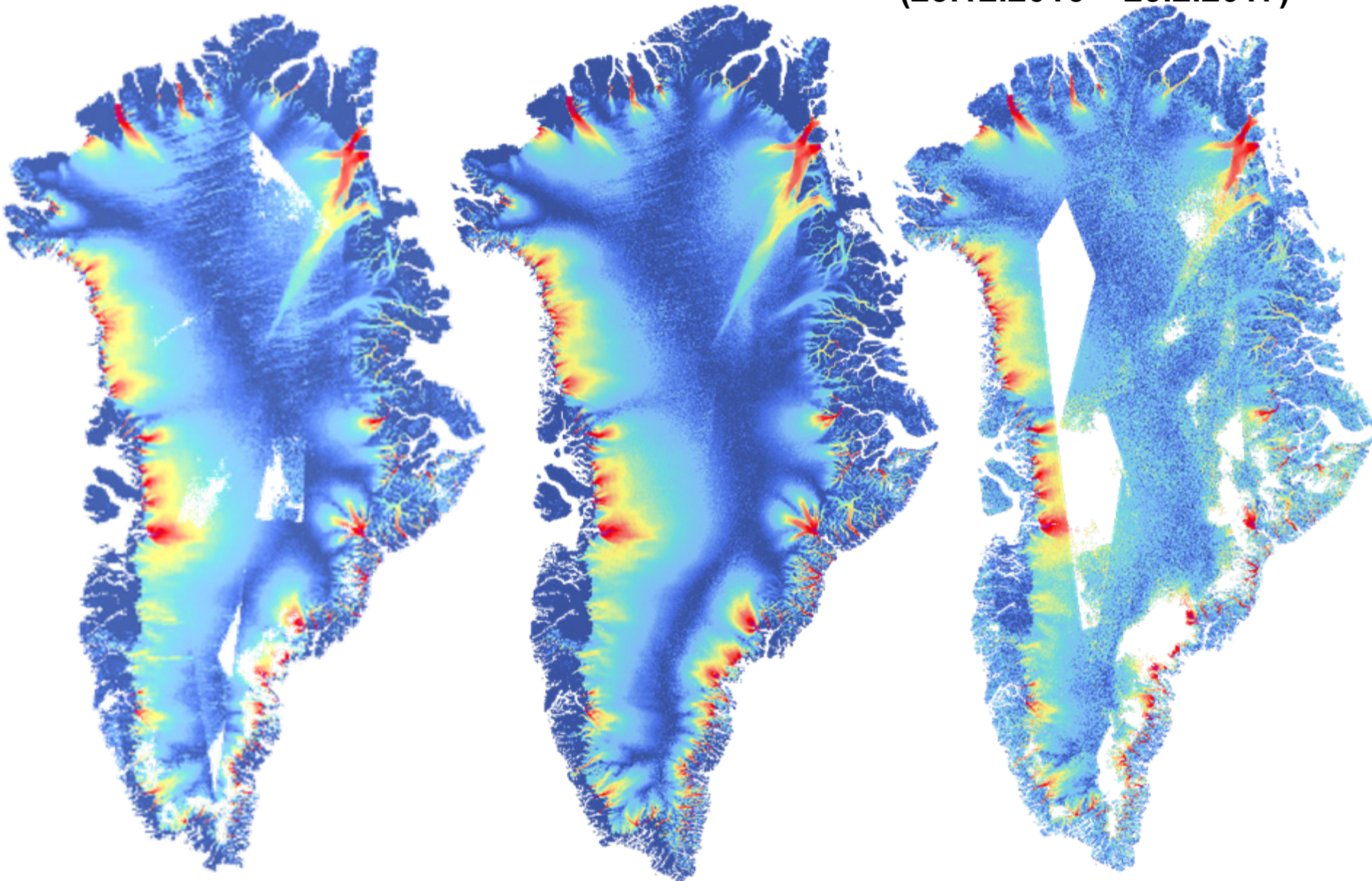
Biproduct: New CryoSat elevation model (DEM) ..

S-1 velocity maps

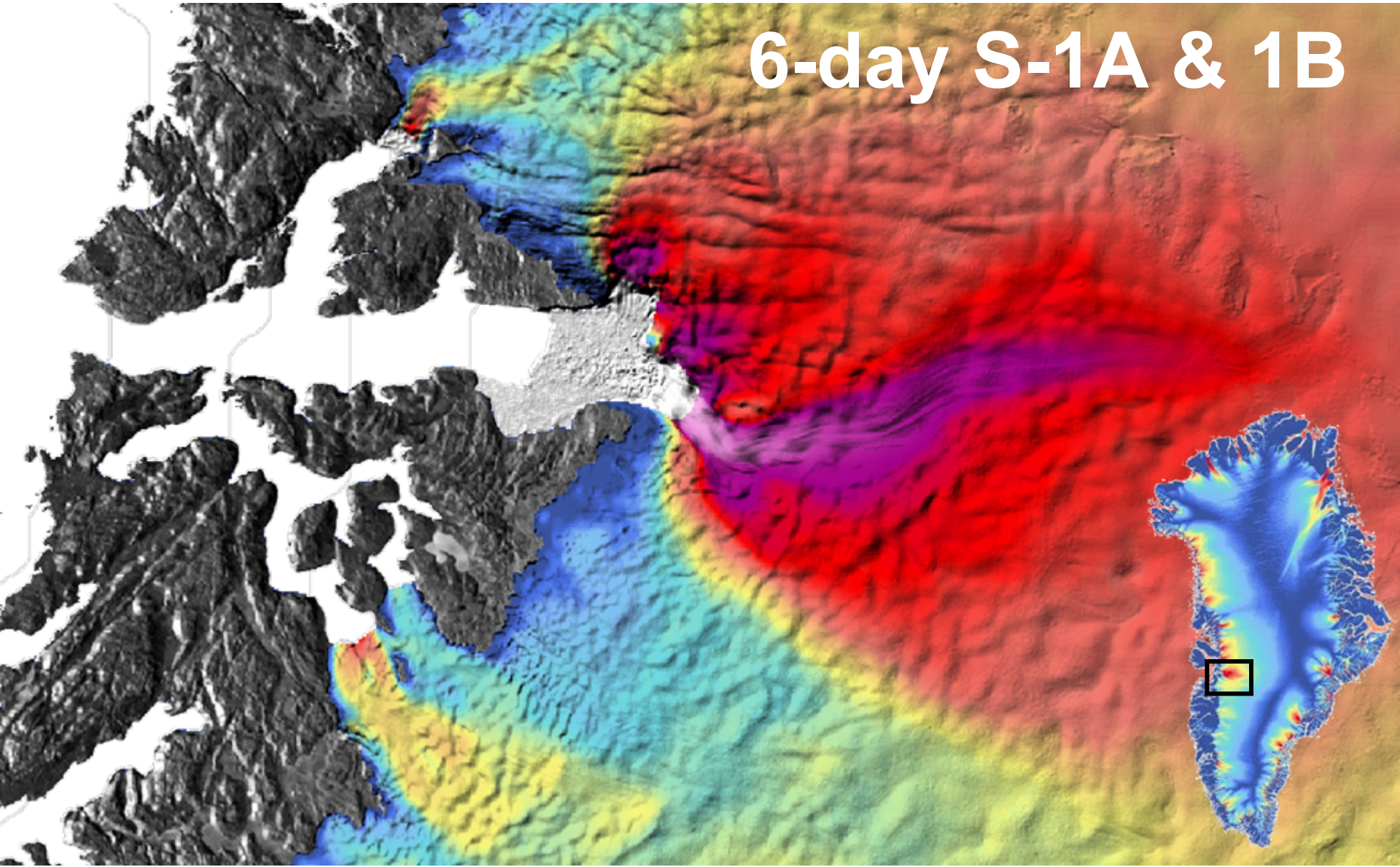
2014/15

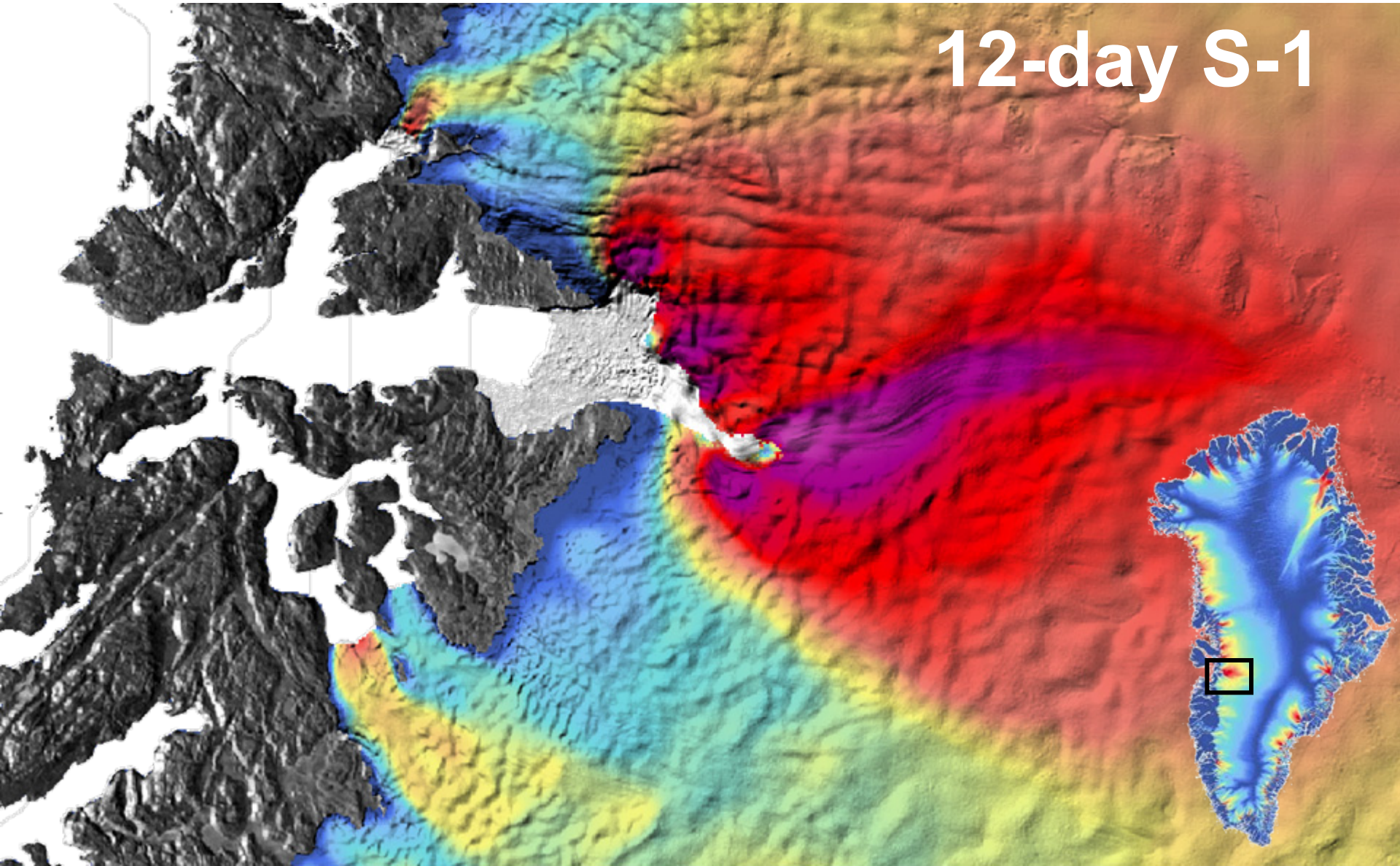
2015/16

2016/17 – in processing
(23.12.2016 – 23.2.2017)

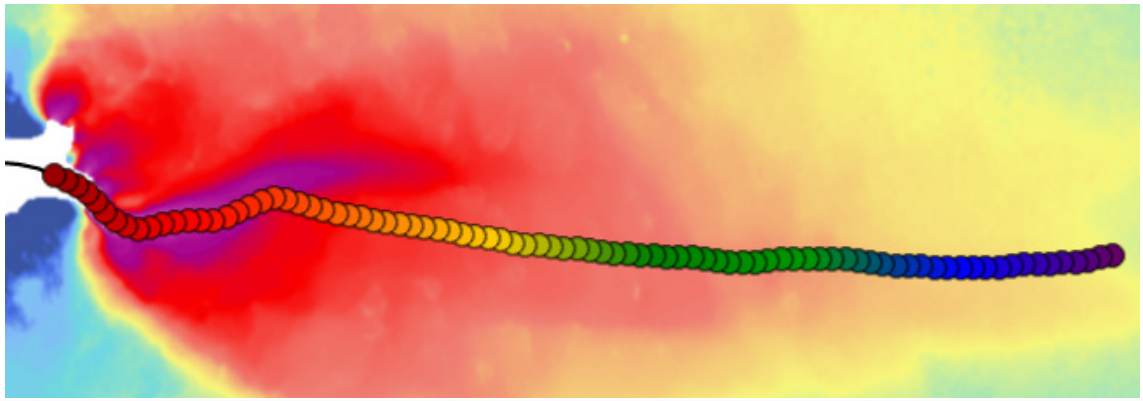


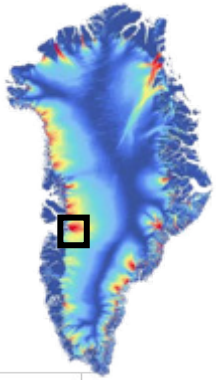
Coverage of Jakobshavn Glacier IV all the way to Calving Front



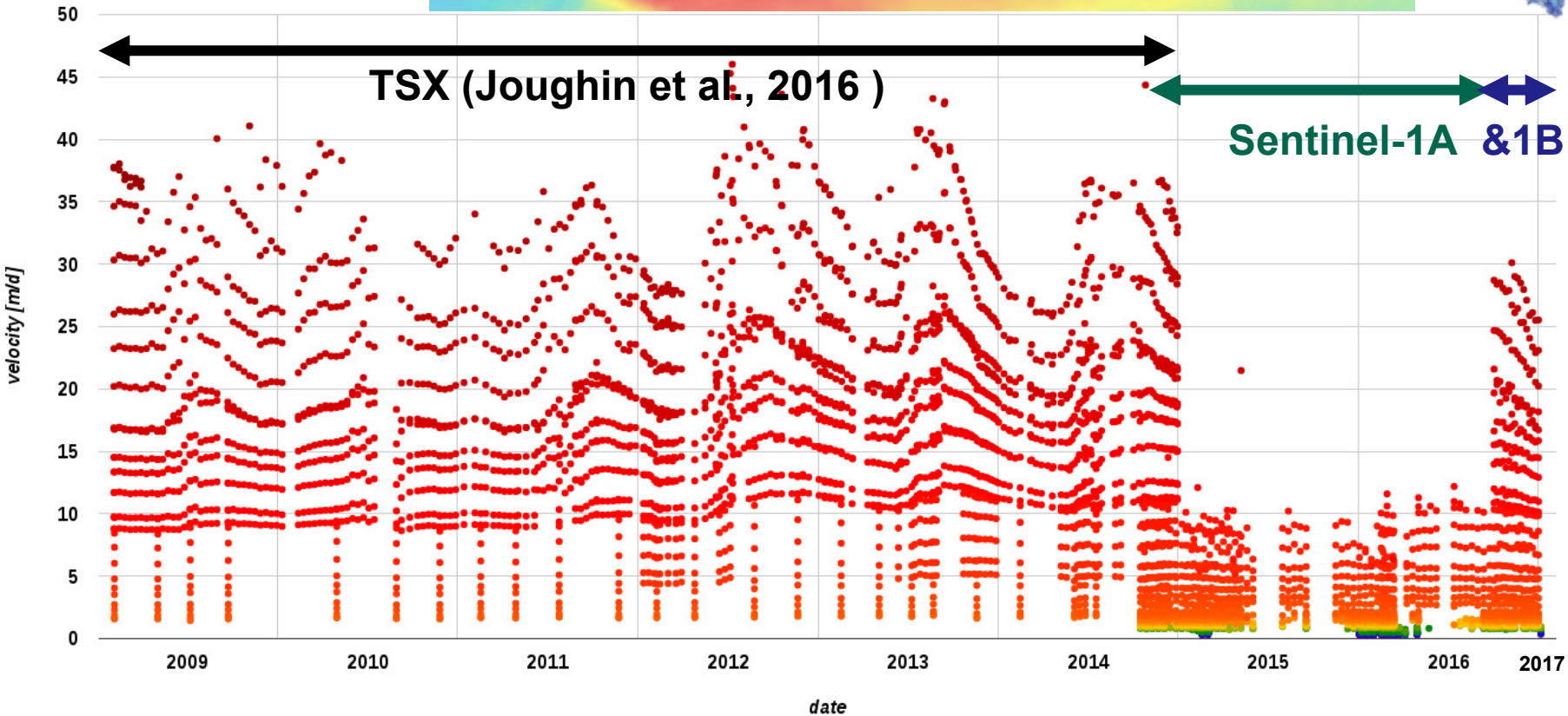

12-day S-1

Time series of Jakobshavn Glacier



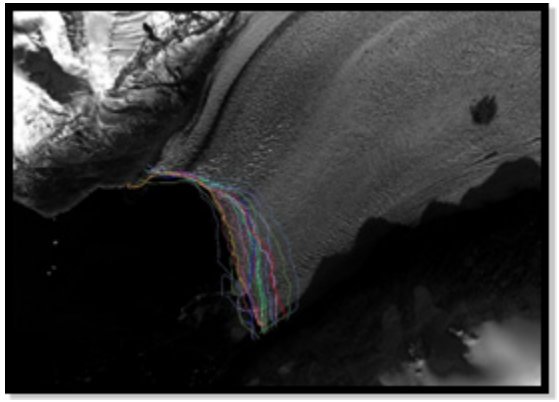


Jakobshavn Isbræ

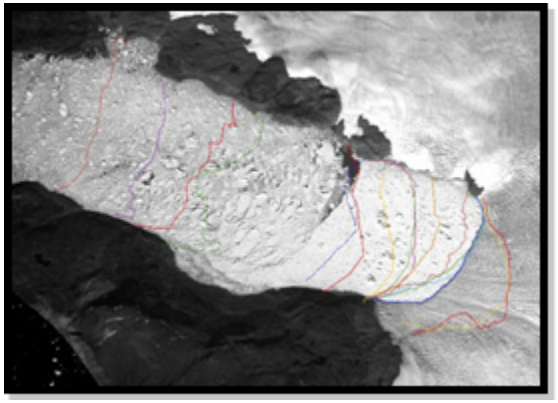


Calving front locations 1992-present

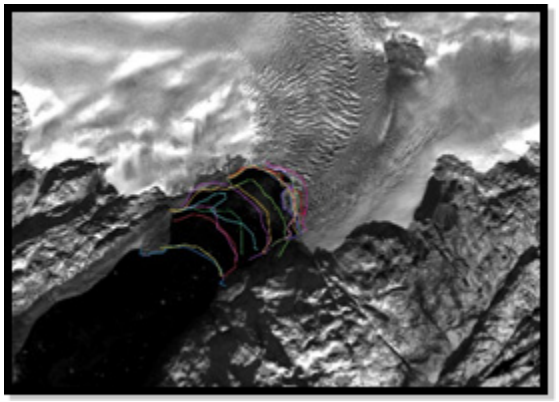
Rink Isbrae

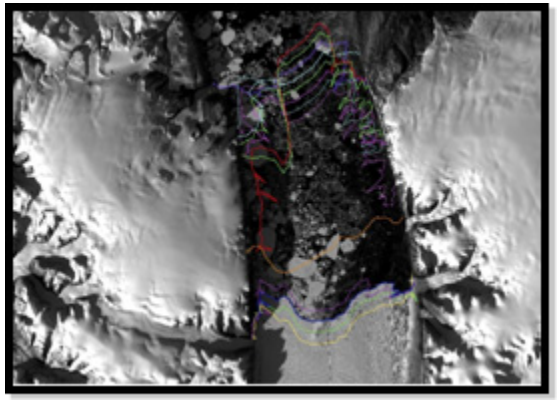


Nunatakassaap

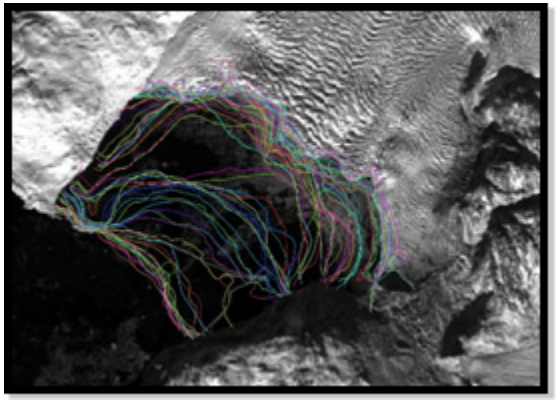


Sermilik

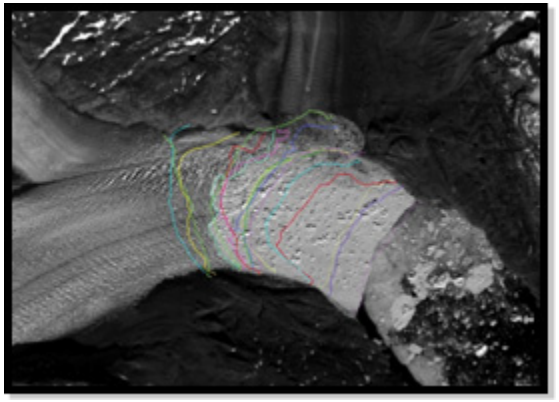




Petermann

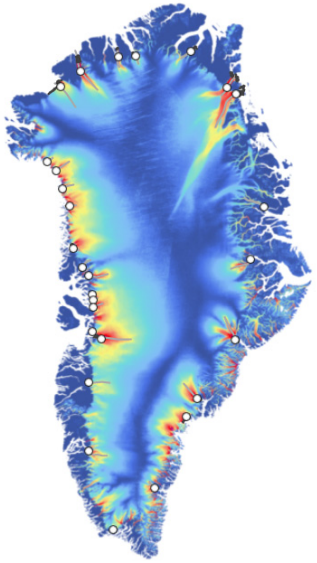


Sermerq



Tingmjarmiut

Data for download and visualization through Cryoportal



cryoportal.enveo.at

Ice Flow and Calving - Timeseries

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REGION SELECTION | ICE VELOCITY | MASS FLUX | CALVING FRONT | GROUNDING LINE | IMAGE SERIES

Greenland

Overview

Glacier: G321627E66422N · Helheim Gletsjer

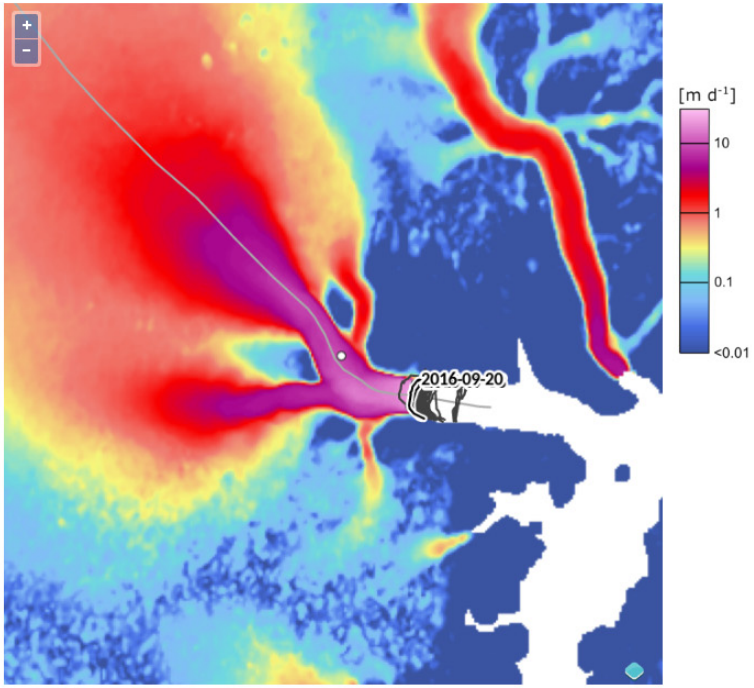
Refresh

Previous | Next

Download Calving Fronts for Helheim Gletsjer (G321627E66422N)

Download all available Calving Fronts for Greenland

Description of Calving Front Products

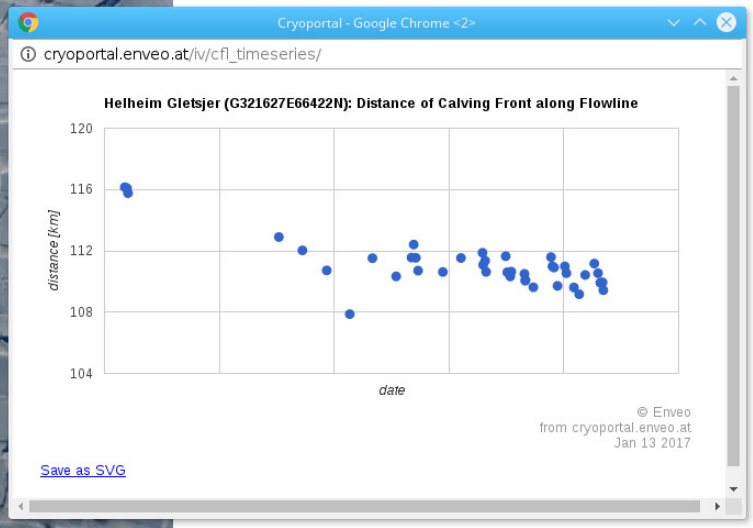


Download Map as PNG

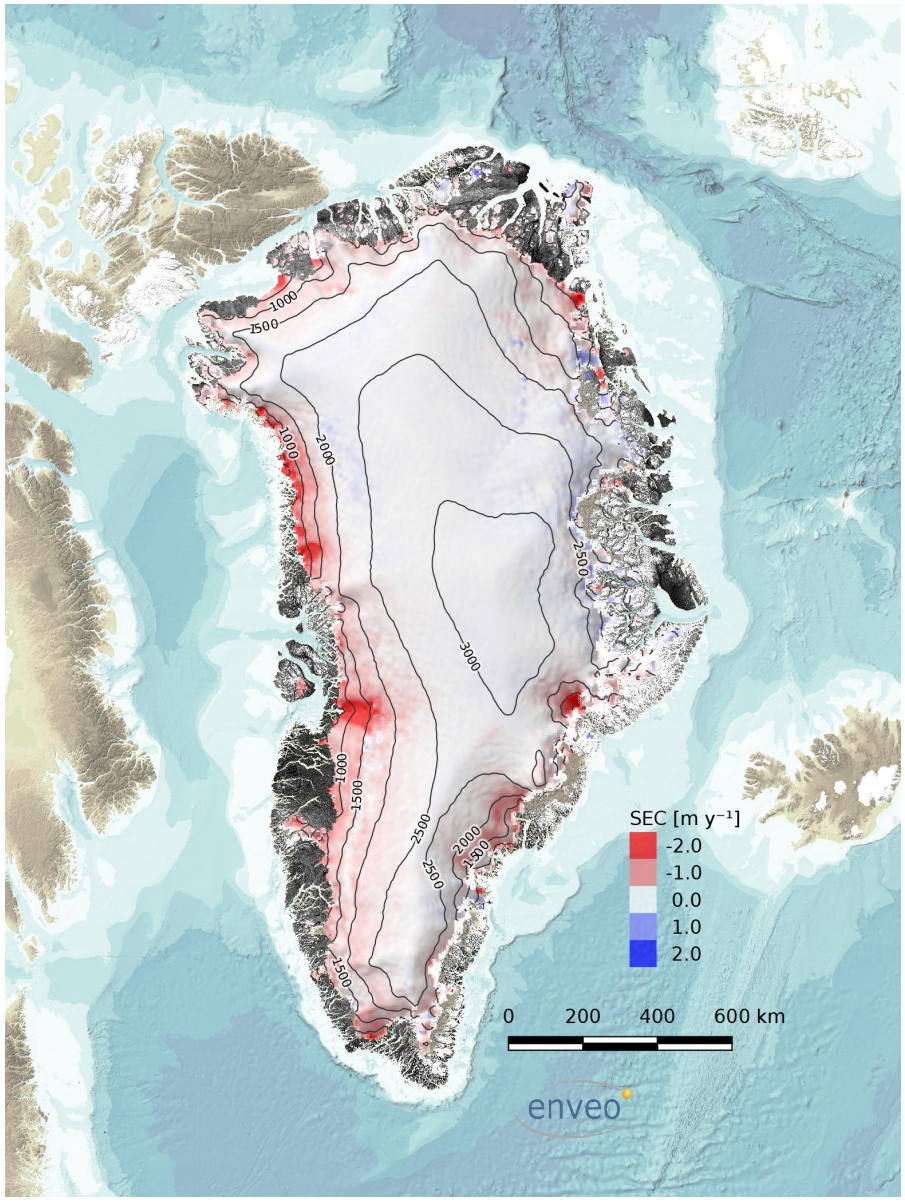
Choose a date to show Calving Front Locations:

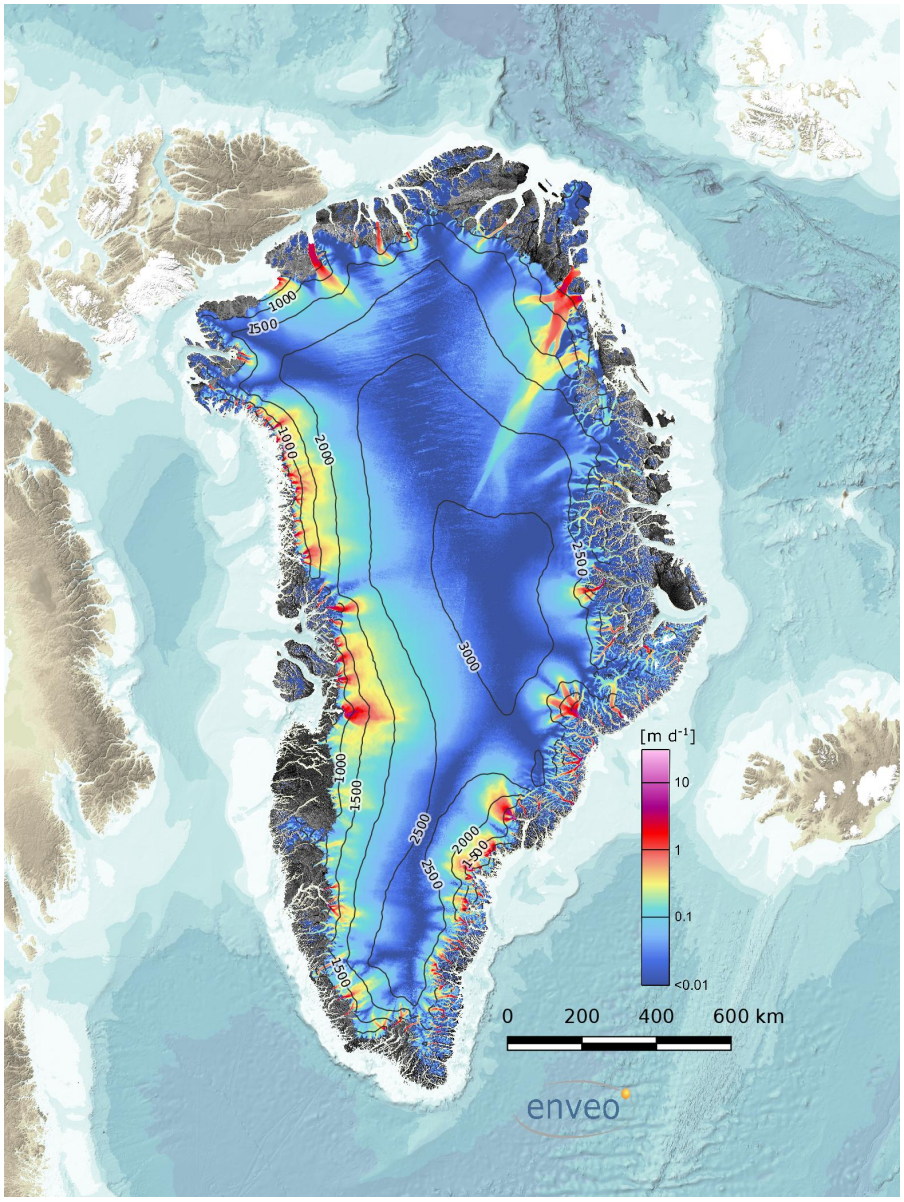
Dec 1991 — Oct 2016

Play

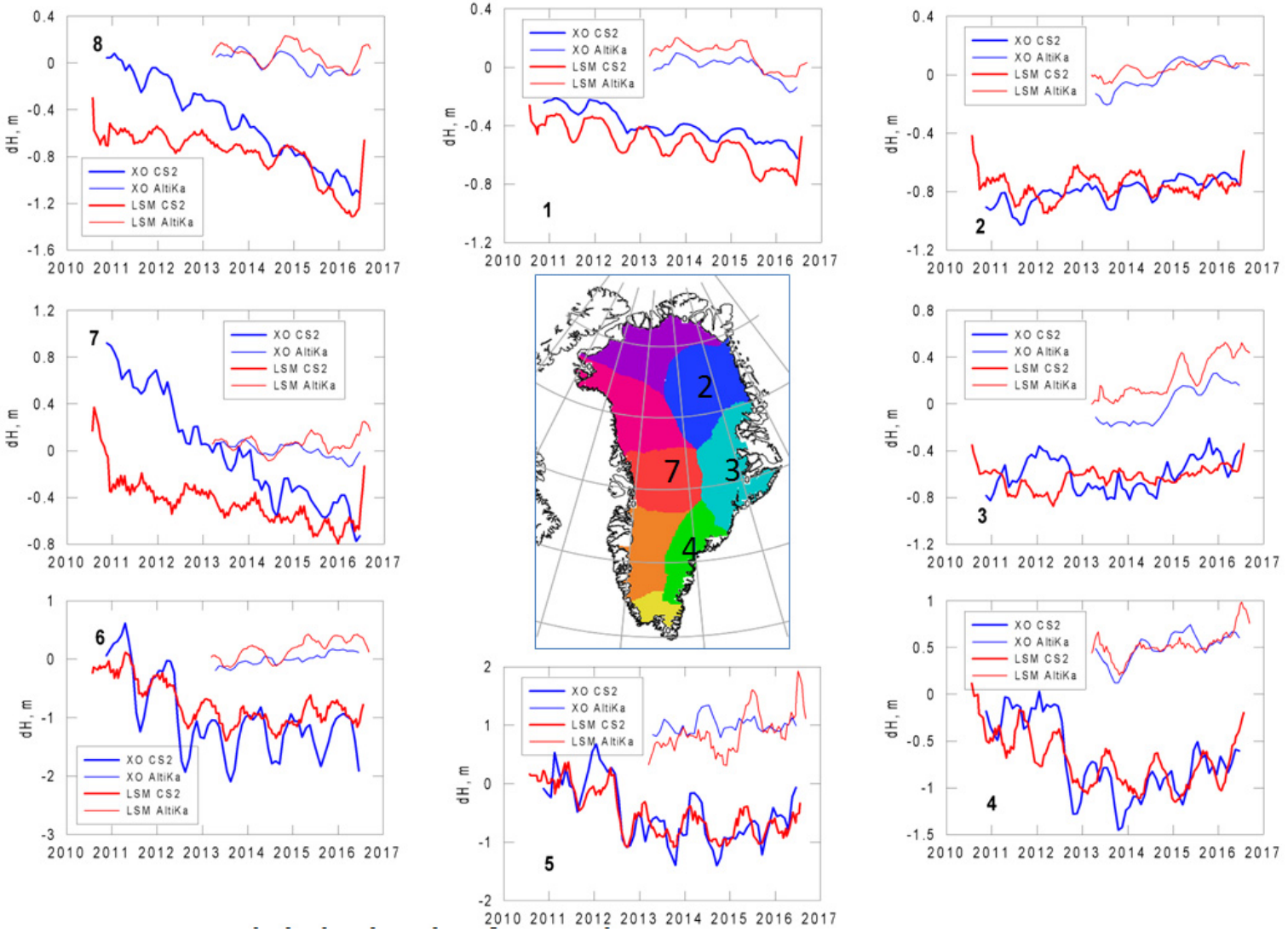


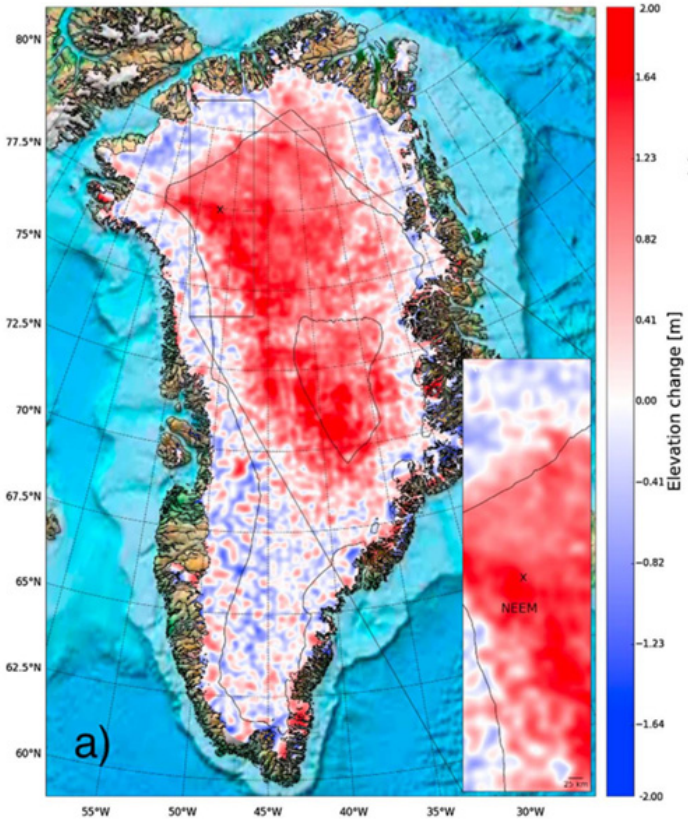
Cryosat dh/dt (left) and S-1 ice velocity (right)

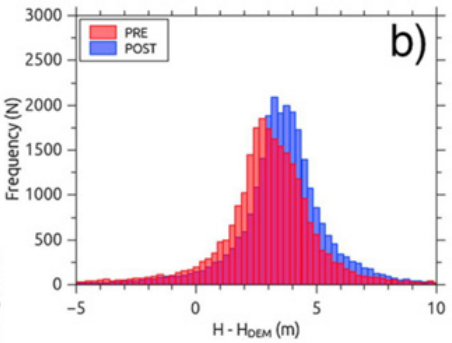


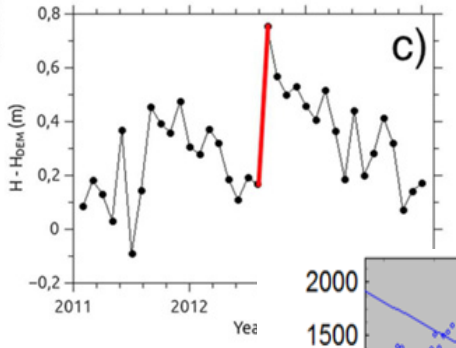


Altimetry dh/dt: CryoSat-2 (Ku-band) vs AltiKa (Ka-band)



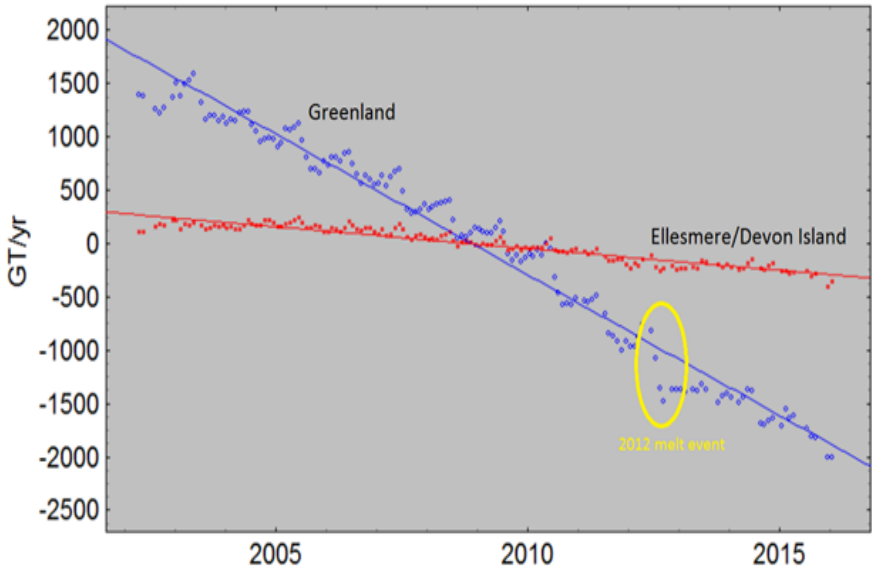




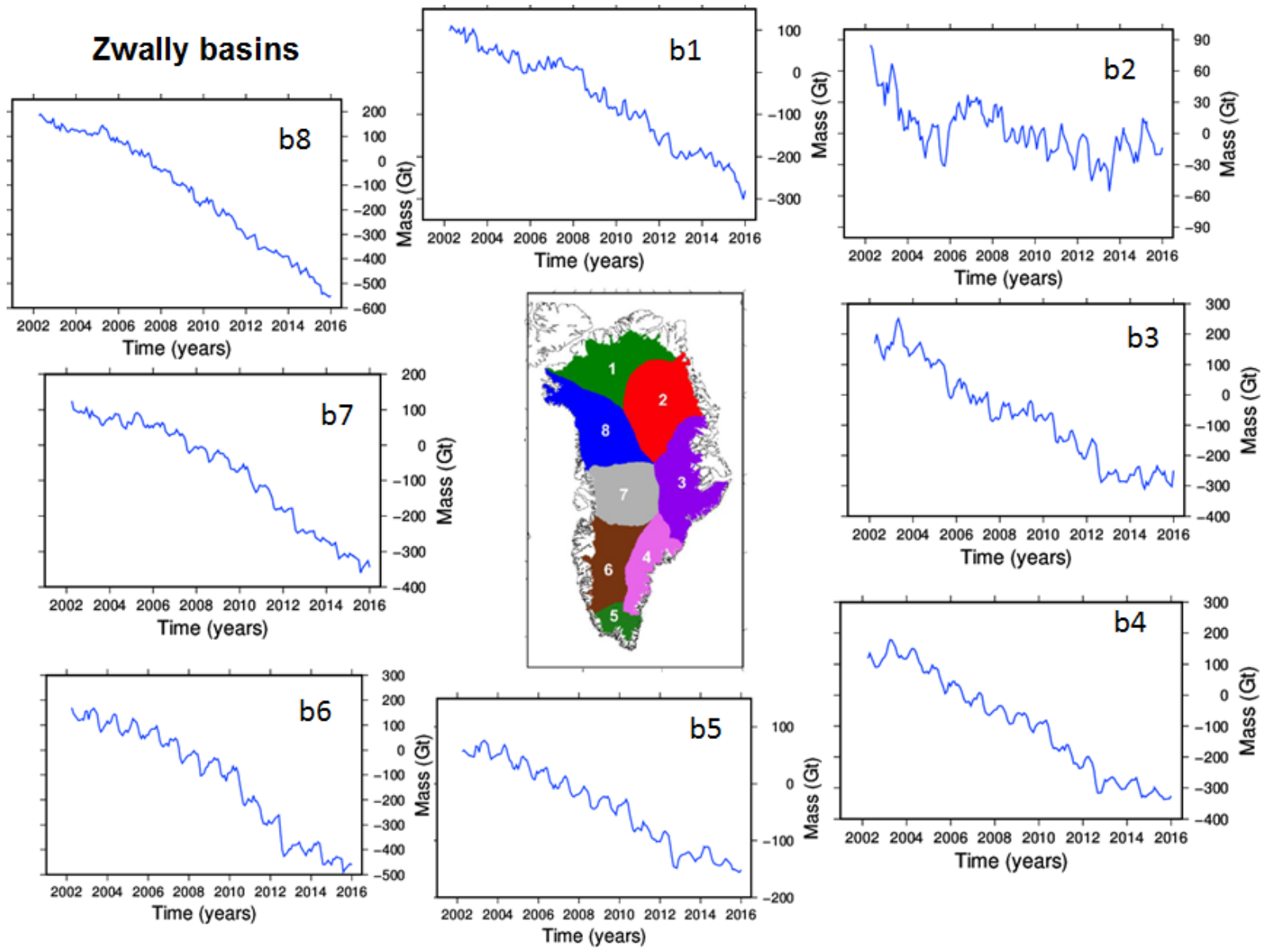


Altimetry dh/dt: 2012 melt event …

GRACE melt anomaly

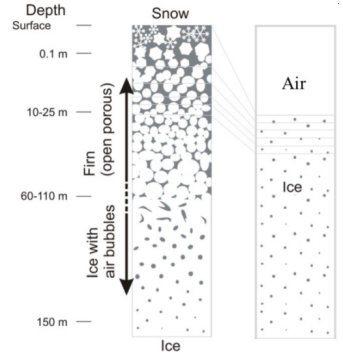


Mass changes: GRACE



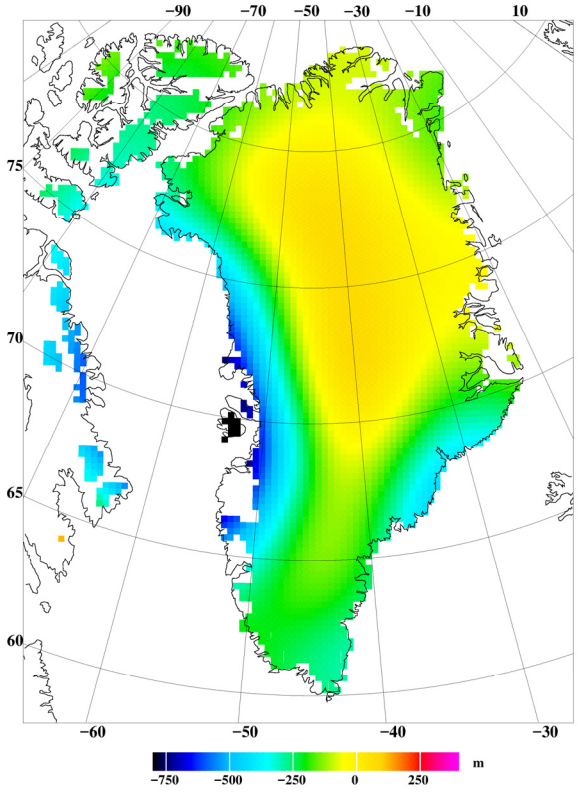
Combining altimetry + GRACE high resolution mass changes

Firn compaction + density from HIRHAM

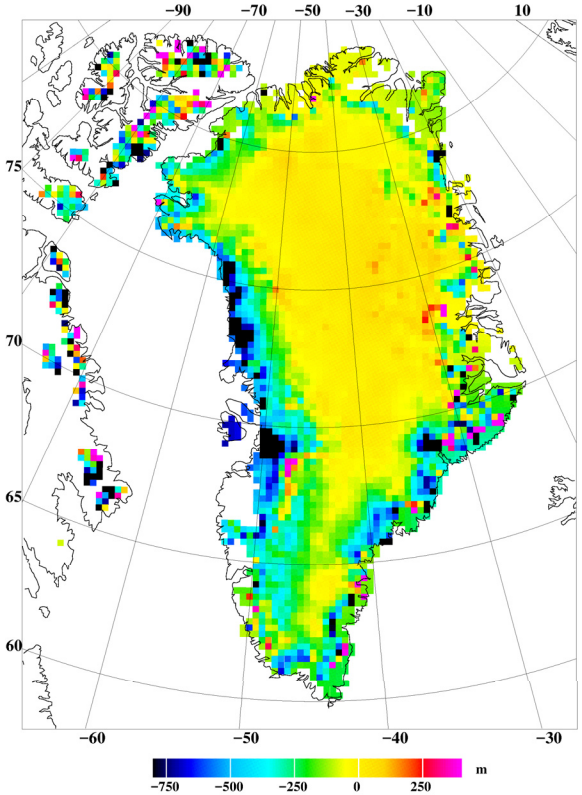


Units: GT/yr	Greenland
GRACE alone	-284
CryoSat alone	-150
Joint inversion	-285

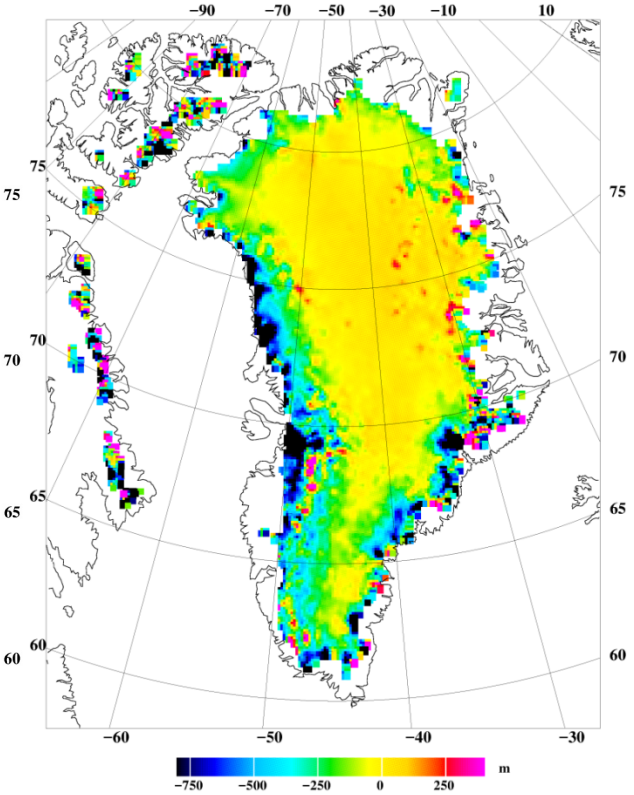
GRACE solution 2010-15



25 km grid joint inversion



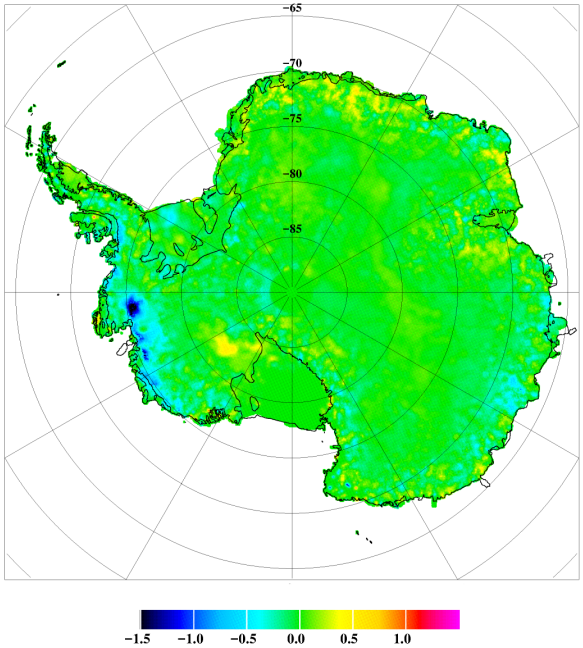
10 km joint inversion



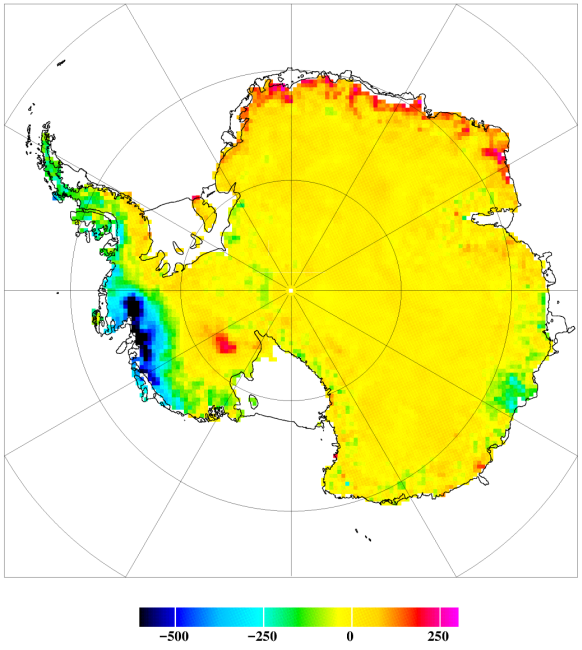
mm w.eq./yr

Antarctica: Joint estimation by GRACE and CryoSat 2010-16

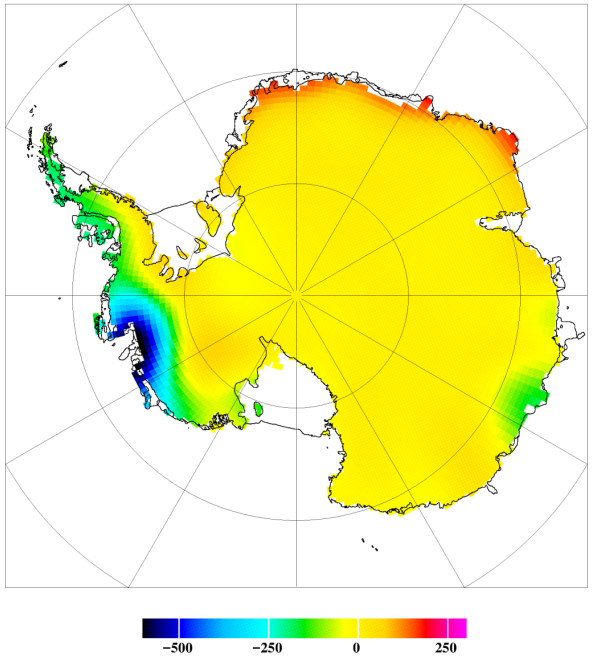
CryoSat (dh/dt m/yr)



CryoSat+GRACE (mm w.eq.)



GRACE only



GRACE alone (ICE-5G)	-193 GT/yr
CryoSat alone, density snow 0.40, ice 0.92 g/cm3	(-220 GT/yr)
Joint inversion	-189 GT/yr

Coming – Greenland CCI:

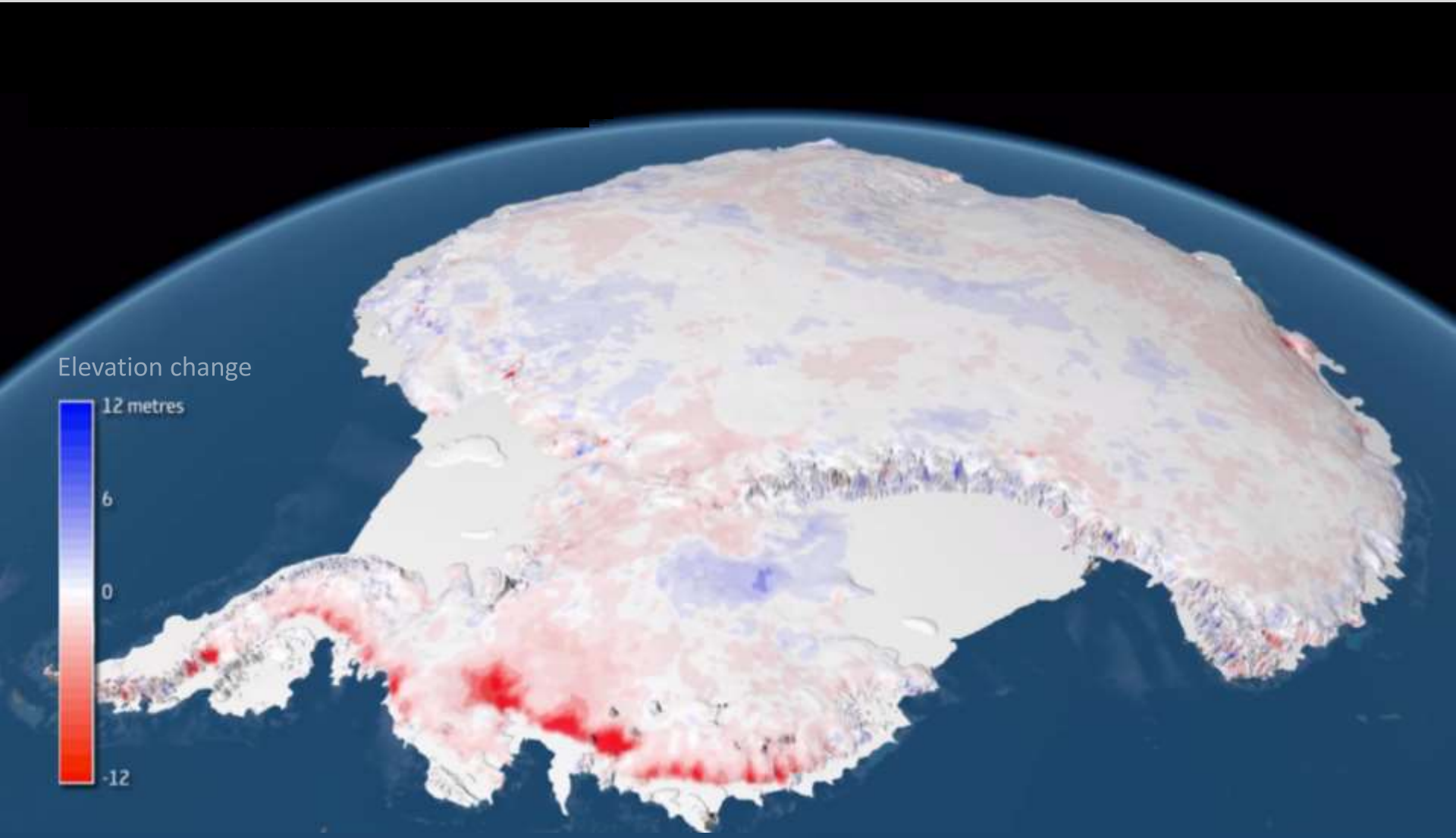
- AltiKa (Greenland)
- DOI's on data
- OBS4MIPS data sets

CCI+ suggestions …

Greenland:

- Continue time series SEC, IV, CFL + SMB (Hirham)
- High resolution mass changes (velocity+GRACE+SEC)
- Melt onset (from active radar)
- Icebergs (via PolarTEP

Ice Sheets CCI Antarctica



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British Antarctic Survey
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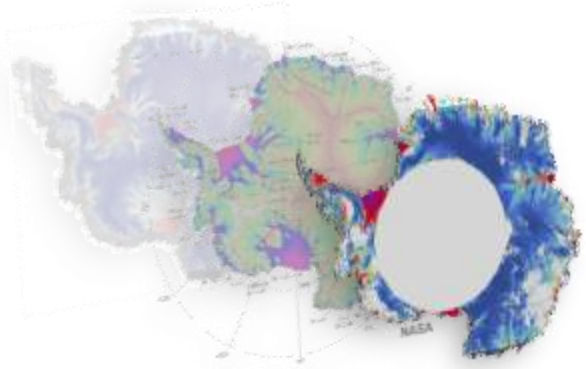
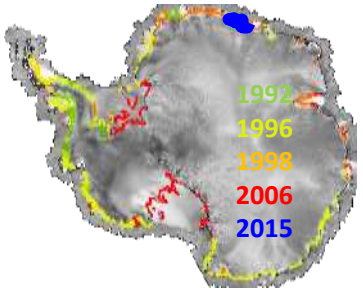
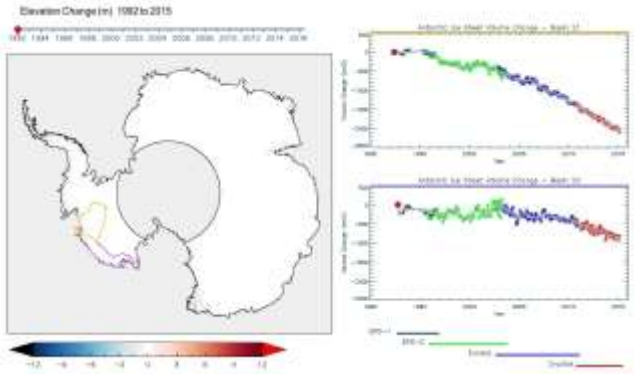
CCI Antarctica: Data



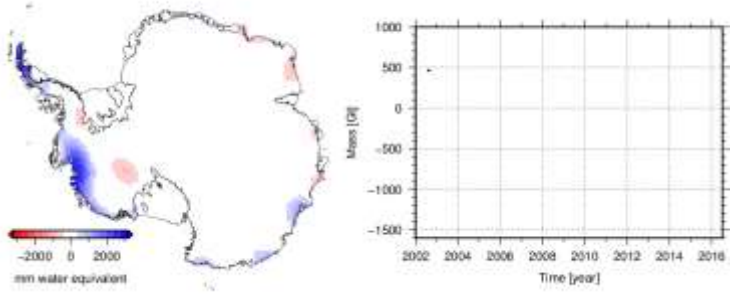
First ice velocity map since 2008 from S1a,b



First update to grounding line since 2006 from S1a,b



First 25-year map of elevation change from E1, E2, EV, CS2



First mass balance time series from GRACE

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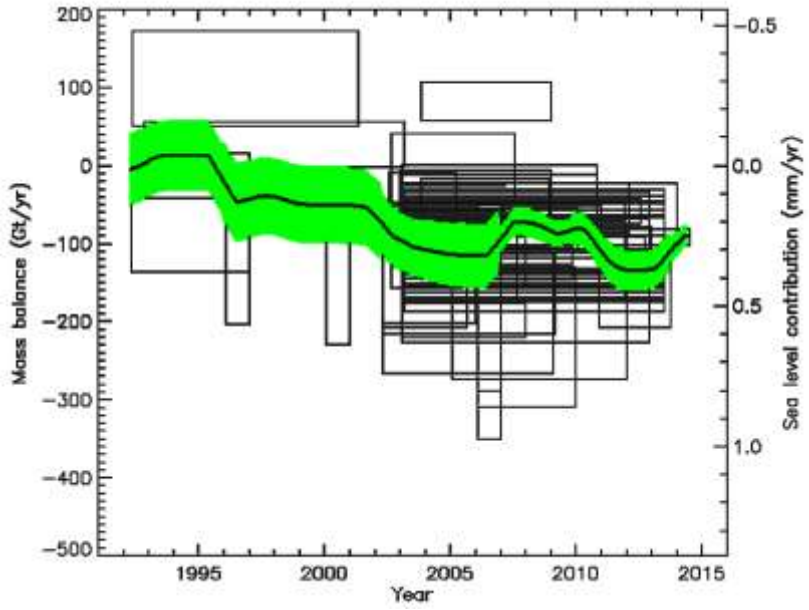
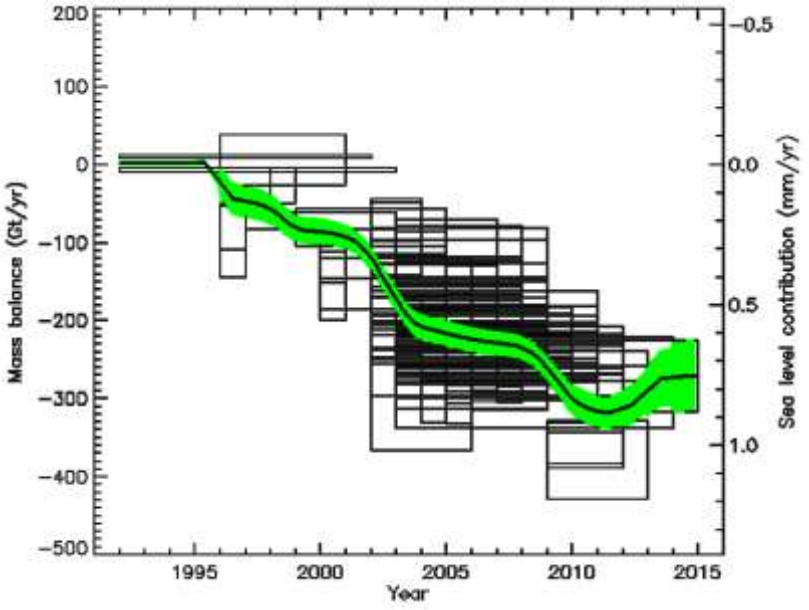
CCI Antarctica: Consistency

Greenland



Antarctica



CCI Antarctica: Applications

- Ice sheet sea level contribution (IV, GMB, SEC)
- Ice sheet modelling (IV, GLL)
- Ice sheet stability (GLL, IV, SEC)
- Subglacial lake hydrology (SEC)
- Iceberg calving (IV)

CCI Antarctica: Future

- Continuation of IV, SEC, GLL time series with Sentinels
- Reconciled mass balance product from multiple techniques
- Automated grounding line detection
- Ice velocity from optical imagery (e.g. S2)
- Melt area from passive microwave
- Ice shelf thickness and melting
- Iceberg calving