

# Antarctic Ice Sheet cci

Anna Hogg



# Overview

## 1. Project Summary and Status

## 2. AIS cci Products

- Surface Elevation Change
- Gravimetry Mass Balance
- Ice Velocity
- Grounding Line Location

## 3. Climate Assessment

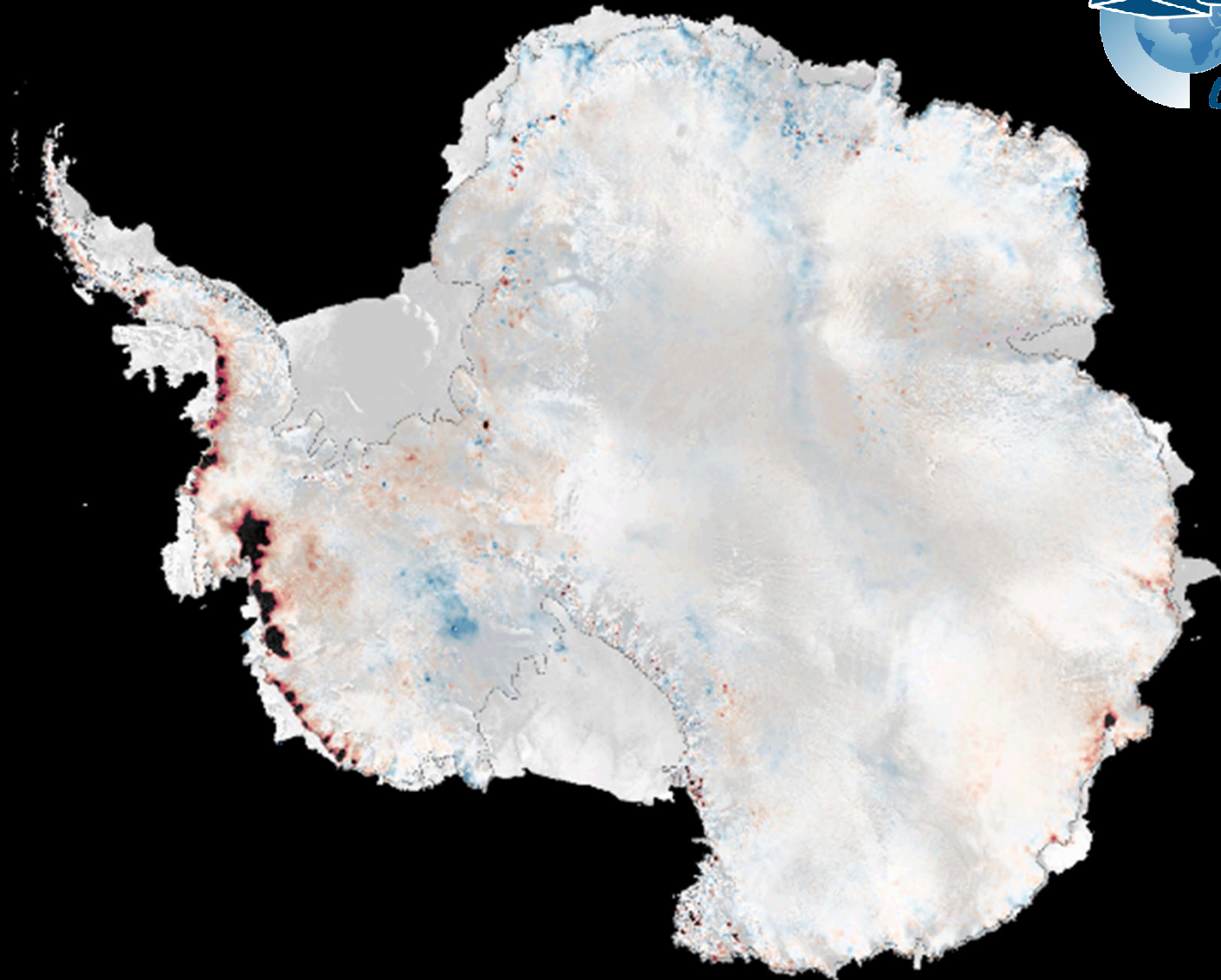
## 4. AIS cci Cross ECV interactions

- Open Data portals
- SLR budget
- NRT monitoring
- Ice sheet modelling

# Project Status

- Over 160 respondents to Antarctic user requirement survey
  - High demand for data products
- Large volume of EO data available in Antarctica
  - Long term climate data record – 25 years of altimetry
  - Present day Near Real Time (NRT) monitoring – now possible with Sentinels
- Algorithm and error estimates refined and documented
- Processing systems documented and set up
- Currently producing and validating year 1 CRDP
- Year 1 Review Meeting – 13<sup>th</sup> April 2016

# Surface Elevation Change



Ice thickness change (m/yr)



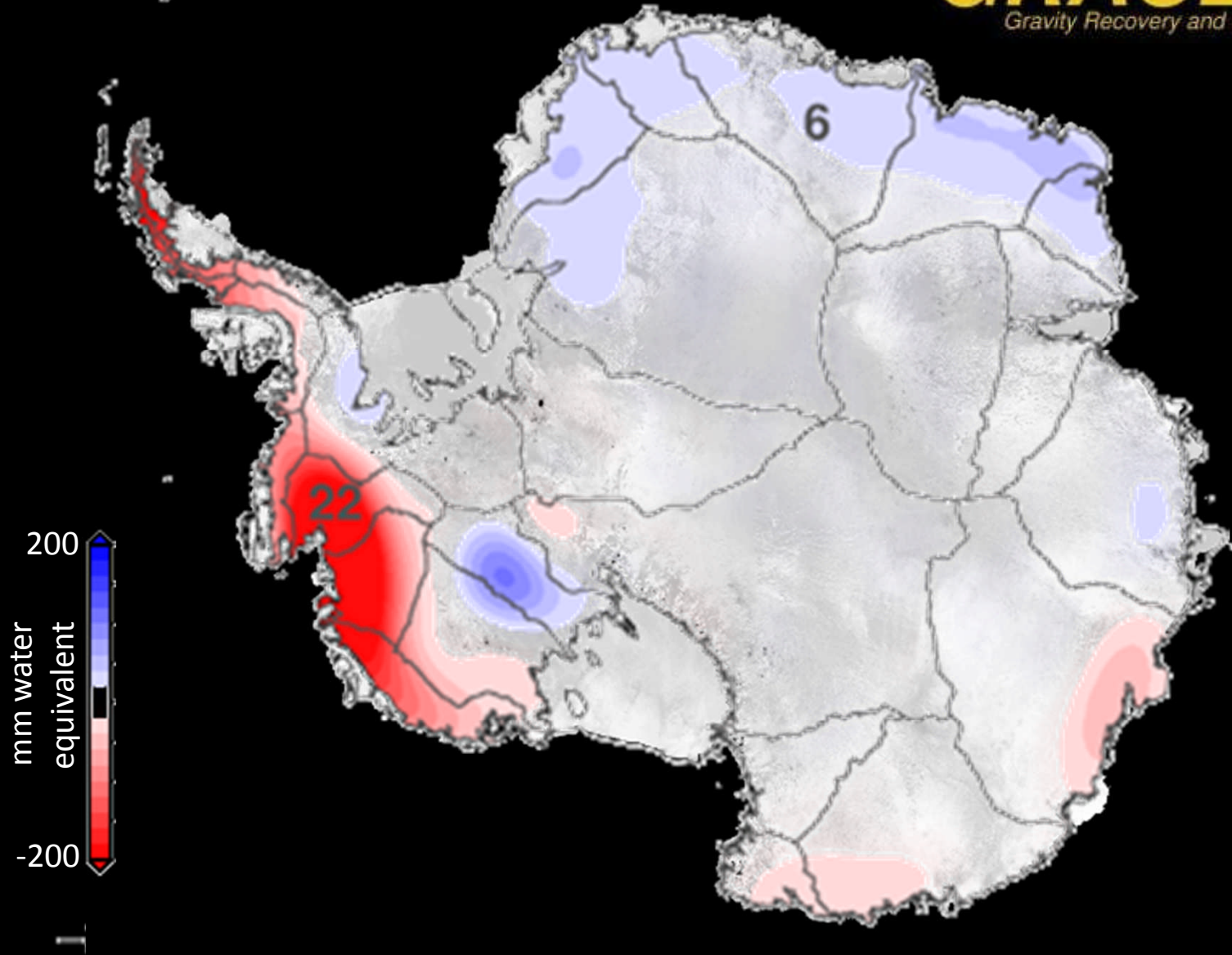
Antarctic Ice Sheet CCI - CMUG - March 2016



# Gravimetry Mass Balance

# GRACE

Gravity Recovery and Climate Experiment



# AIS cci Products Summary

| Parameter | Product       | EO Input Data              | Temporal Range | Temporal Frequency | Spatial Coverage | Spatial Resolution |
|-----------|---------------|----------------------------|----------------|--------------------|------------------|--------------------|
| SEC       | Gridded       | E1/E2, EV, CS2             | 1992 –         | monthly            | Antarctica       | 5km grid           |
| IV        | WAIS + APIS   | E1, E2, EV, R1,<br>TSX, S1 | 1992 –         | decadal            | WAIS             | 500m grid          |
| IV        | Ice stream    | E1, E2, EV, R1,<br>TSX, S1 | 1992 –         | annual             | 20 ice streams   | 500m grid          |
| GMB       | Gridded       | GRACE                      | 2002-          | monthly            | Antarctica       | 100km grid         |
| GMB       | Basin product | GRACE                      | 2002-          | monthly            | Antarctica       | drainage basin     |
| GLL       | GLL           | E1, E2, EV, R1,<br>TSX, S1 | 1992-          | decadal            | 5-10 ice streams | 250m line          |

# Climate Research Group

| Partner                     | Organisation             | Country     | Competence          | Role                    |
|-----------------------------|--------------------------|-------------|---------------------|-------------------------|
| <b>D. Vaughan</b>           | British Antarctic Survey | UK          | Glaciology          | CRG Lead                |
| <b>A. LeBroq</b>            | University of Exeter     | UK          | Ice Sheet Modelling | CRG Member (Antarctica) |
| <b>M. R. van den Broeke</b> | University of Utrecht    | Netherlands | Climate modelling   | CRG Member (Antarctica) |
| <b>R. Arthern</b>           | British Antarctic Survey | UK          | Ice Sheet modelling | CRG Member (Antarctica) |
| <b>E. Schrama</b>           | TU Delft                 | Netherlands | Gravimetry          | CRG Member (AIS & GrIS) |



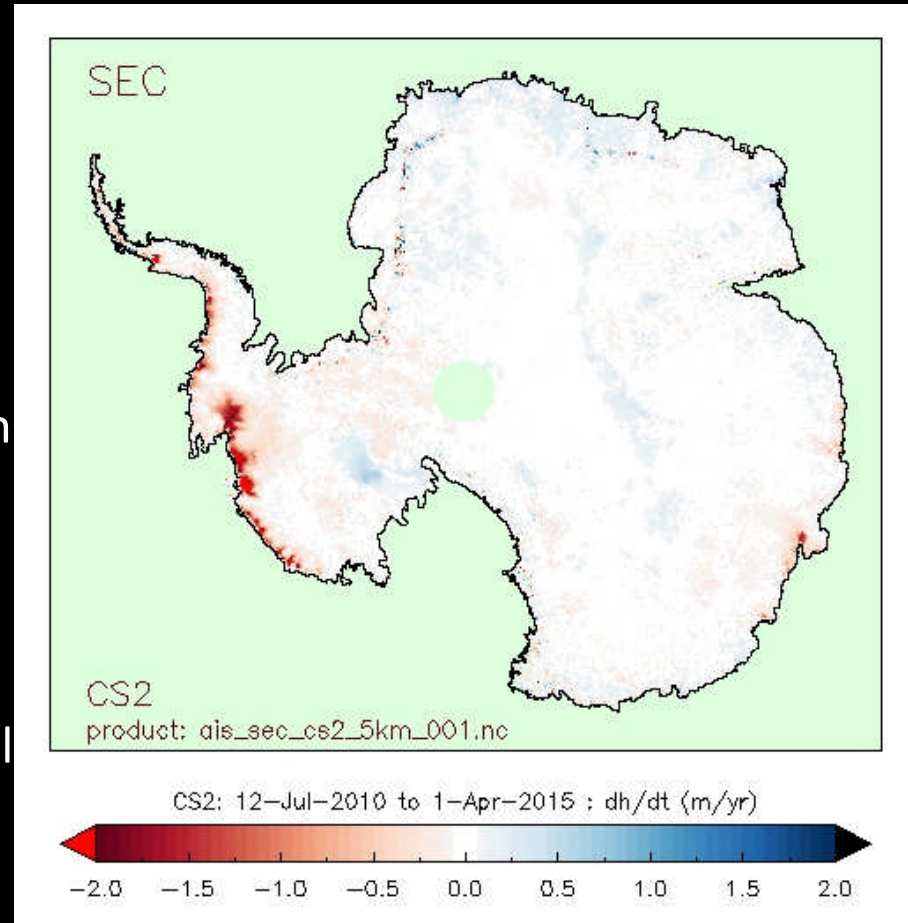
Universiteit Utrecht



# Y1 Climate Assessment

The SEC product comprises two different datasets:

- SEC gridded product:
  - Mass-change grids covering the entire AIS (5km x 5km)
  - Temporal resolution: 5 year epoch
  - Temporal range: 1991-2015
  - netcdf
- SEC basin product:
  - Mass-change time series for zwall basins 6 and 13
  - Temporal resolution: monthly
  - Temporal range: 1991-2015
  - Surface elevation change per basin
  - CSV format

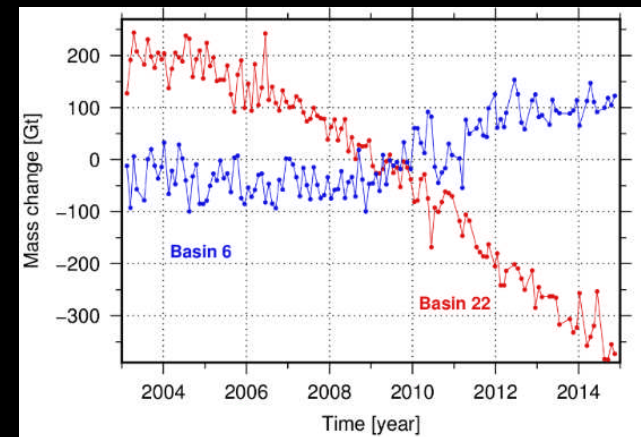
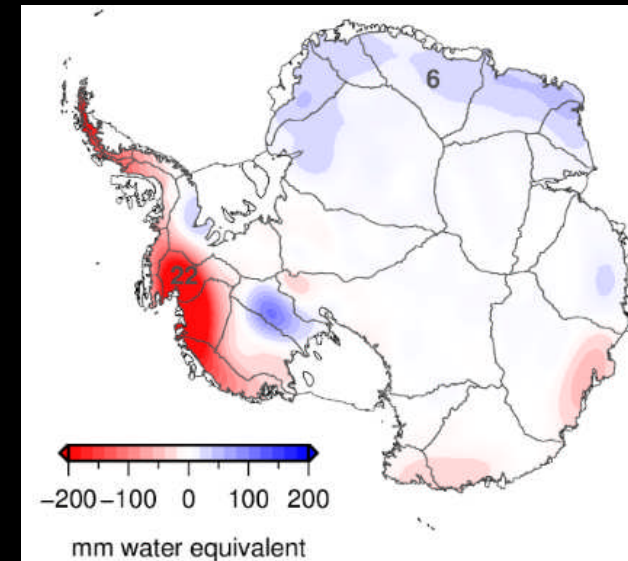




# Y1 Climate Assessment

The GMB product comprises two different datasets:

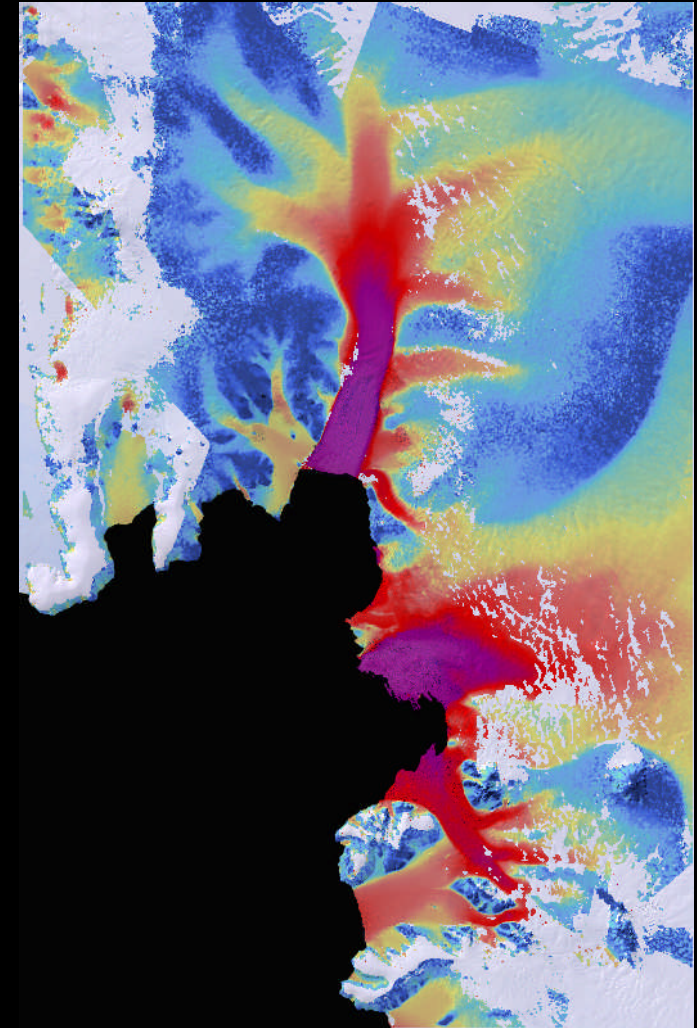
- GMB gridded product:
  - Mass-change grids covering the entire AIS (50km x 50km, EPSG3031)
  - Temporal resolution: monthly
  - Temporal range: 2003-2013
  - netcdf and ASCII format
- GMB basin product:
  - Mass-change time series per basin
  - Temporal resolution: monthly
  - Temporal range: 2003-2013
  - Mass balance estimate per basin
  - ASCII format



# Y1 Climate Assessment

The IV product comprises:

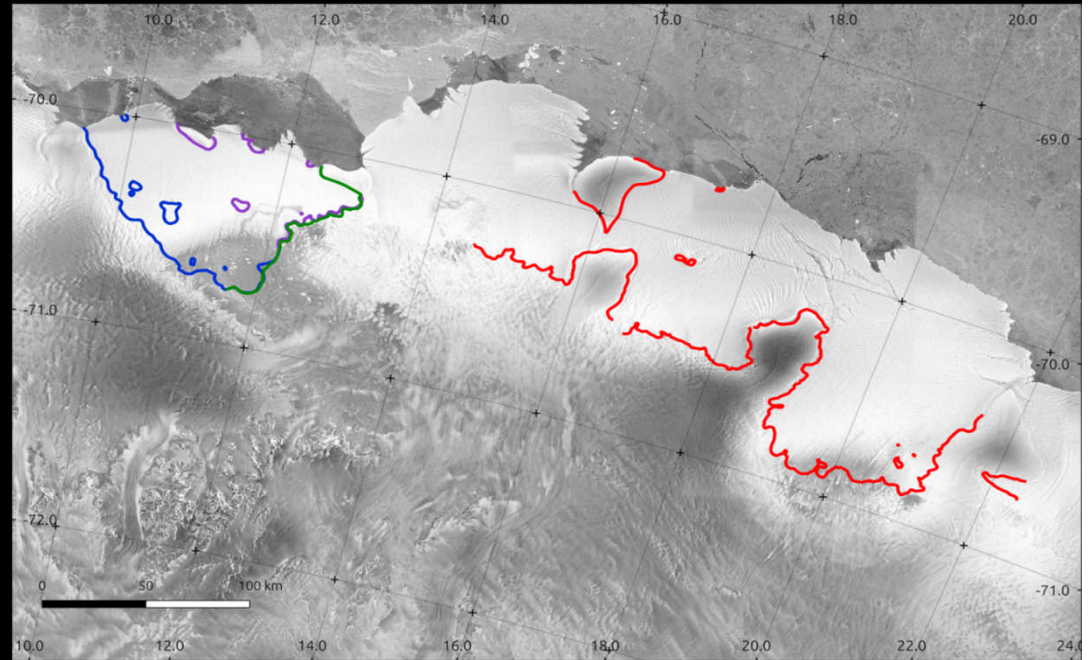
- PIG only in Y1
- \*.tiff's of ice velocity of [pine Island Glacier
- Temporal resolution: 12-day
- Temporal range: 2014-2015
- geotiff format



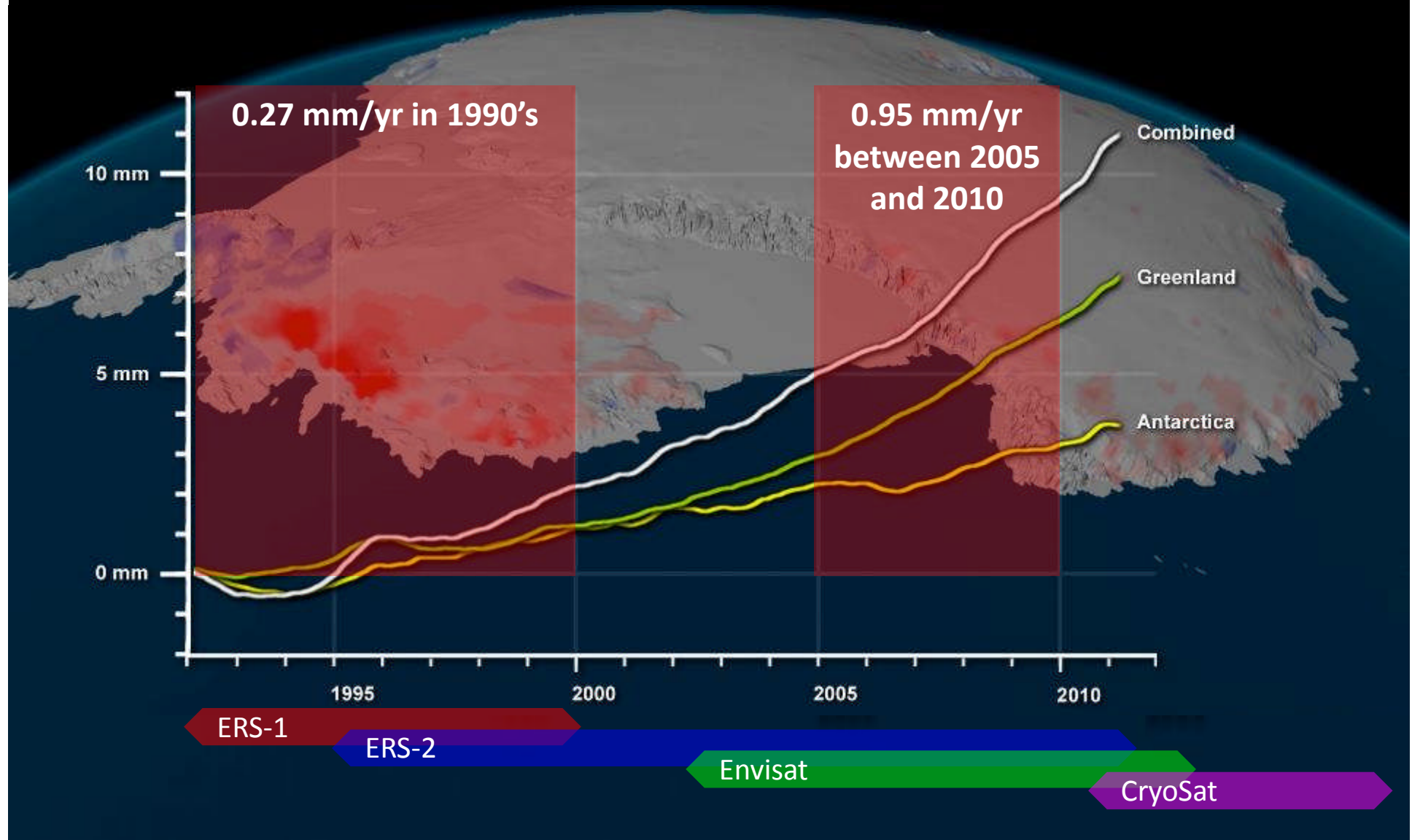
# Y1 Climate Assessment

The GLL product is delivered in three different data formats which contain exactly the same content:


- ESRI Shapefile
- WKT Textfile
- Google KML/KMZ




- Antarctic ice sheet contributed 3.7 mm to global sea level rise since 1992
- 42 % ice velocity speed up since 1992
- Altimetry is longest continuous record of change
  - in many areas observations start before present day changes began



# Operational Services – NRT Sea Ice Thickness



## CryoSat Operational Polar Monitoring



Home Sea Ice Ice Sheets Ice Caps **Sea Ice Thickness** Science Data About

### Arctic Sea Ice Thickness

Arctic sea ice thickness processed at UCL from CryoSat's SAR mode data:

Latest from Near Real Time Data

Most recent:  2-days  14-days  28-days

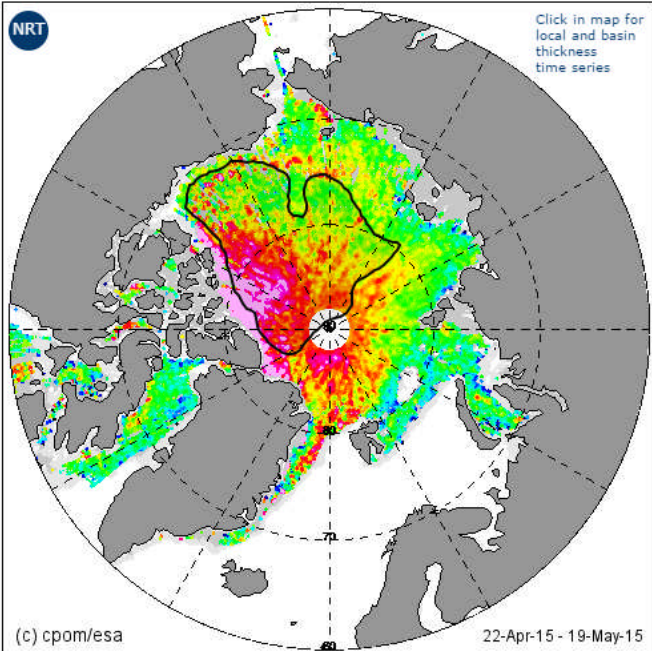
**22-May-15: NRT Service Stopped until September 2015.** Sea ice thickness cannot be accurately measured from CryoSat during the Arctic summer period, due to the formation of melt ponds on the sea ice surface. These ponds interfere with the radar signal and measurement method.

Select Location of Thickness Time Series or click on Map.  
Lat:  Lon E:    
Select by Point  All Arctic

#### Local Sea Ice Thickness at 75.42N 214.38E

Shows the **Monthly** sea ice thickness at the selected location and at the basin scale.

Latest 28-day Sea Ice Thickness : 22/4/15 - 19/5/15



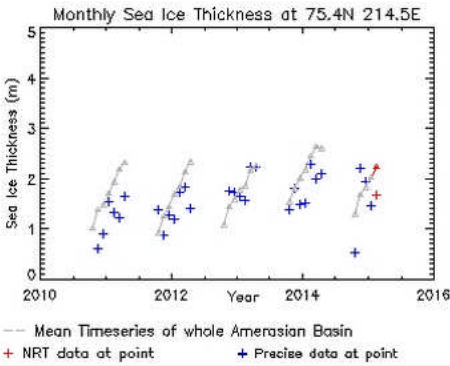
Click in map for local and basin thickness time series

(c) cpom/esa 22-Apr-15 - 19-May-15

Ice Thickness (m)  
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50

#### Nearest Thickness to 75.42N 214.38E

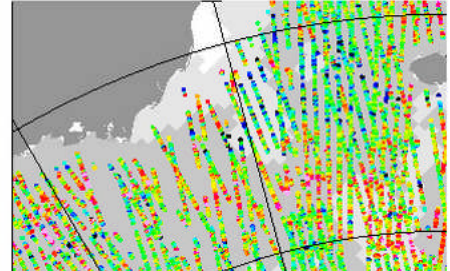
Monthly Sea Ice Thickness at 75.4N 214.5E



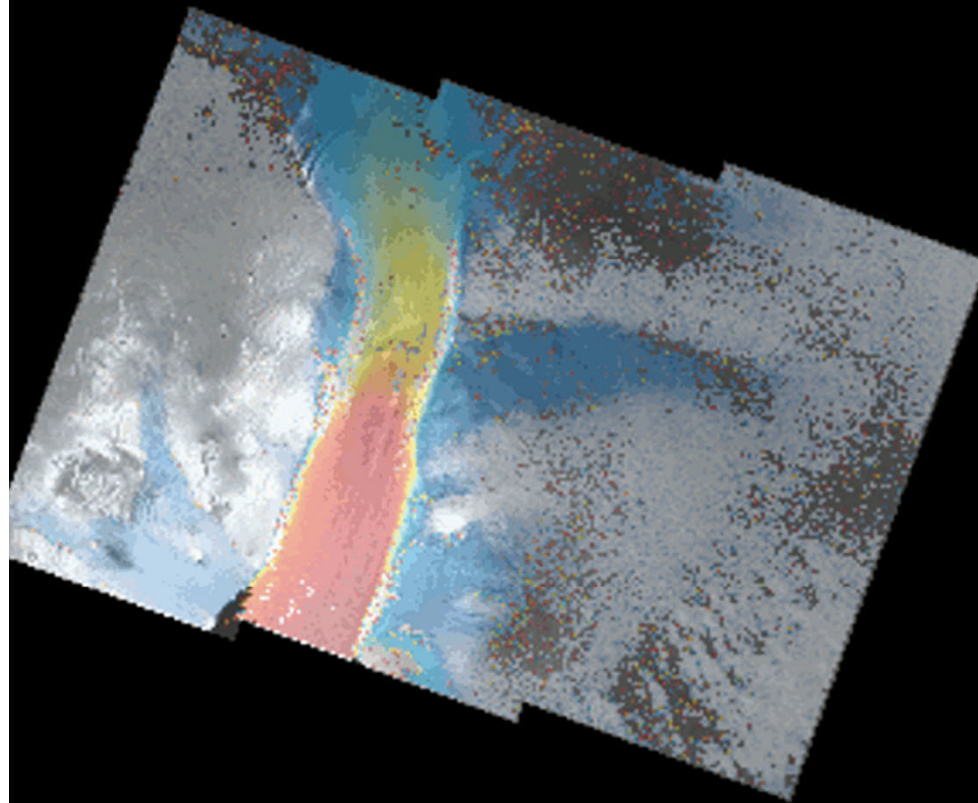
Sea Ice Thickness (m)  
Year  
2010 2012 2014 2016

— Mean Timeseries of whole Amerasian Basin  
+ NRT data at point

#### Area Map of Latest 28-day Thickness



# Operational Services – NRT Ice Velocity



# Science: Community Assessments



- HOME
- ABOUT IMBIE
- IMBIE 2012
- DATA DOWNLOADS
- PARTICIPATE
- NEWS
- LINKS

IMBIE is an international collaboration of polar scientists, providing improved estimates of the ice sheet contribution to sea level rise.



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Site last updated  
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# Science: Ice – Ocean – Atmosphere Interactions

- Ice sheets
  - Antarctica
  - Greenland
- Glaciers
- Sea level rise
- Sea ice
- Sea surface temperature
- Clouds

