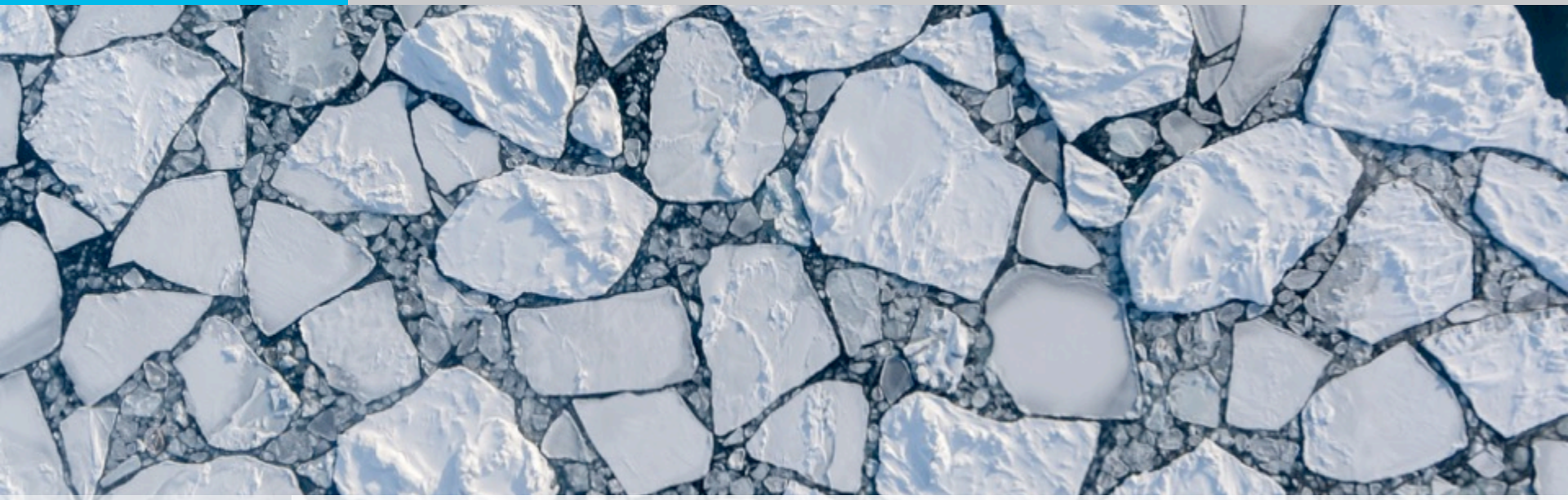
ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

M. Nicolaus, S. Hendricks, and R. Ricker



Arctic Sea Ice Decline
Results from Winter 2015/16

21 Apr 2016

HELMHOLTZ GEMEINSCHAFT

Snow Buoy Measurements

Parameters

Snow depth
Air Temperature / Air Pressure

Deployments

40 deployments since 2012 (Arctic + Antarctic)
Co-deployment with other units

Concept

Simple and affordable instrument

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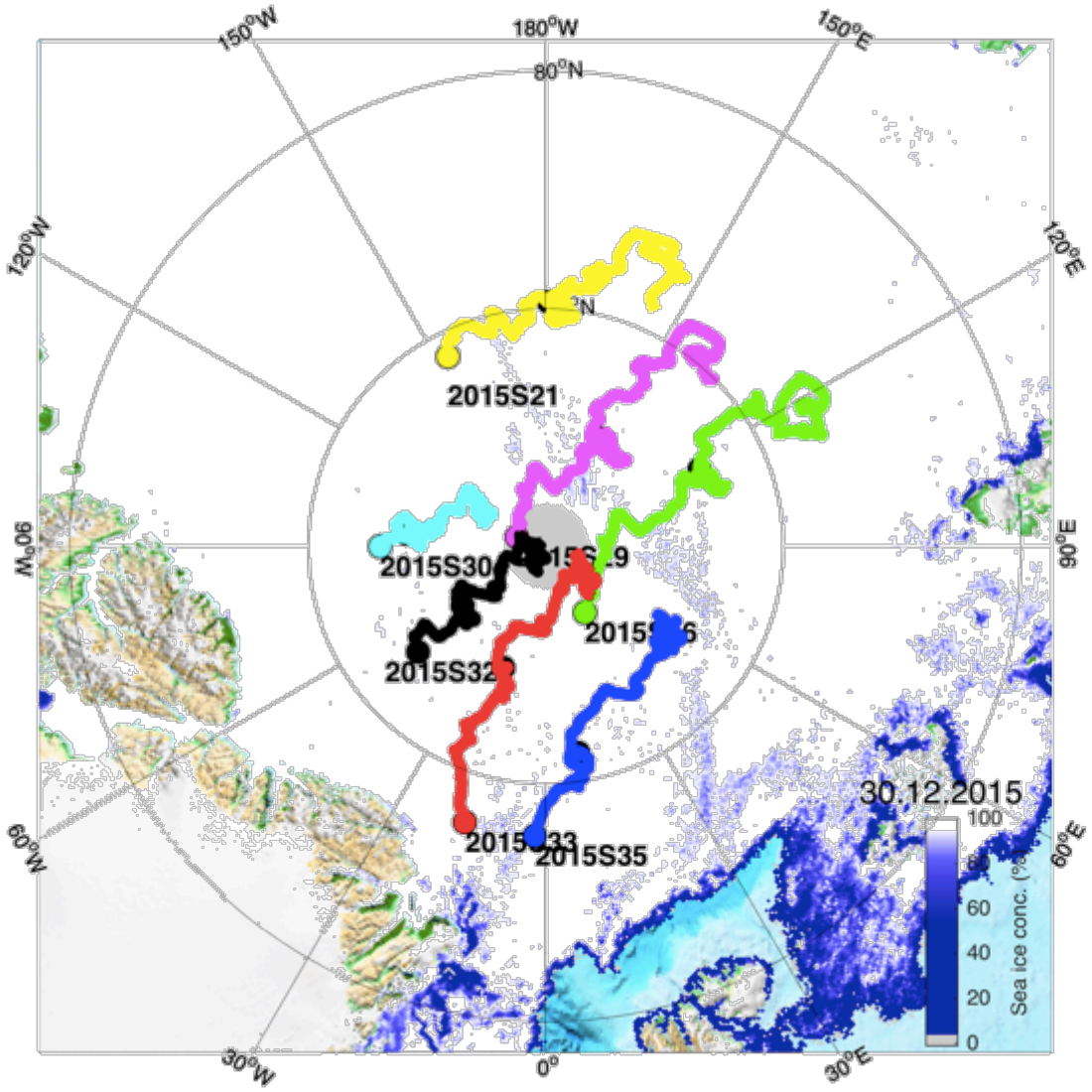
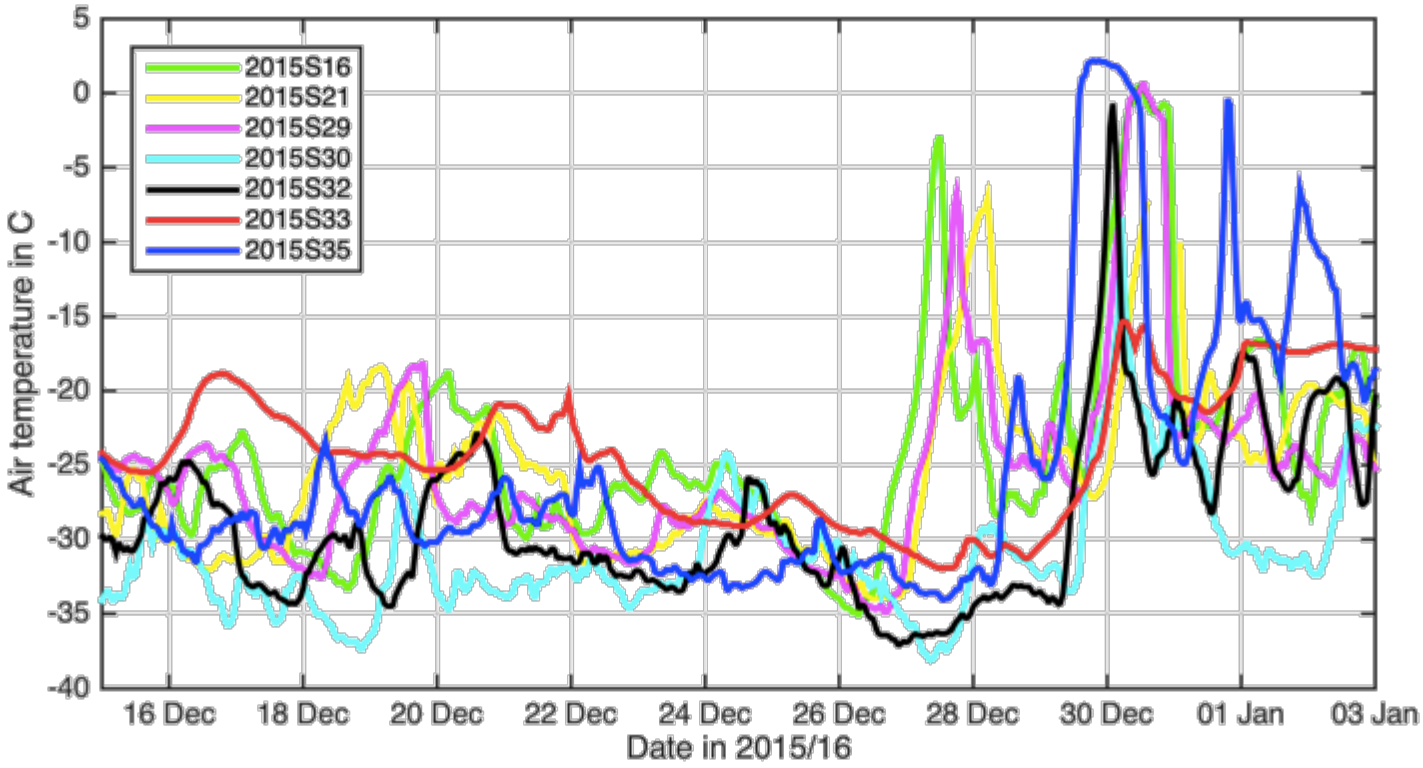
Arctic Snow Buoys in 2015/16

Deployments during Polarstern PS94

- 7 Snow Buoys since Sep/Oct 2015
- Air temperature coverage of entire winter
- Snow depth time series = indicator of surface melt



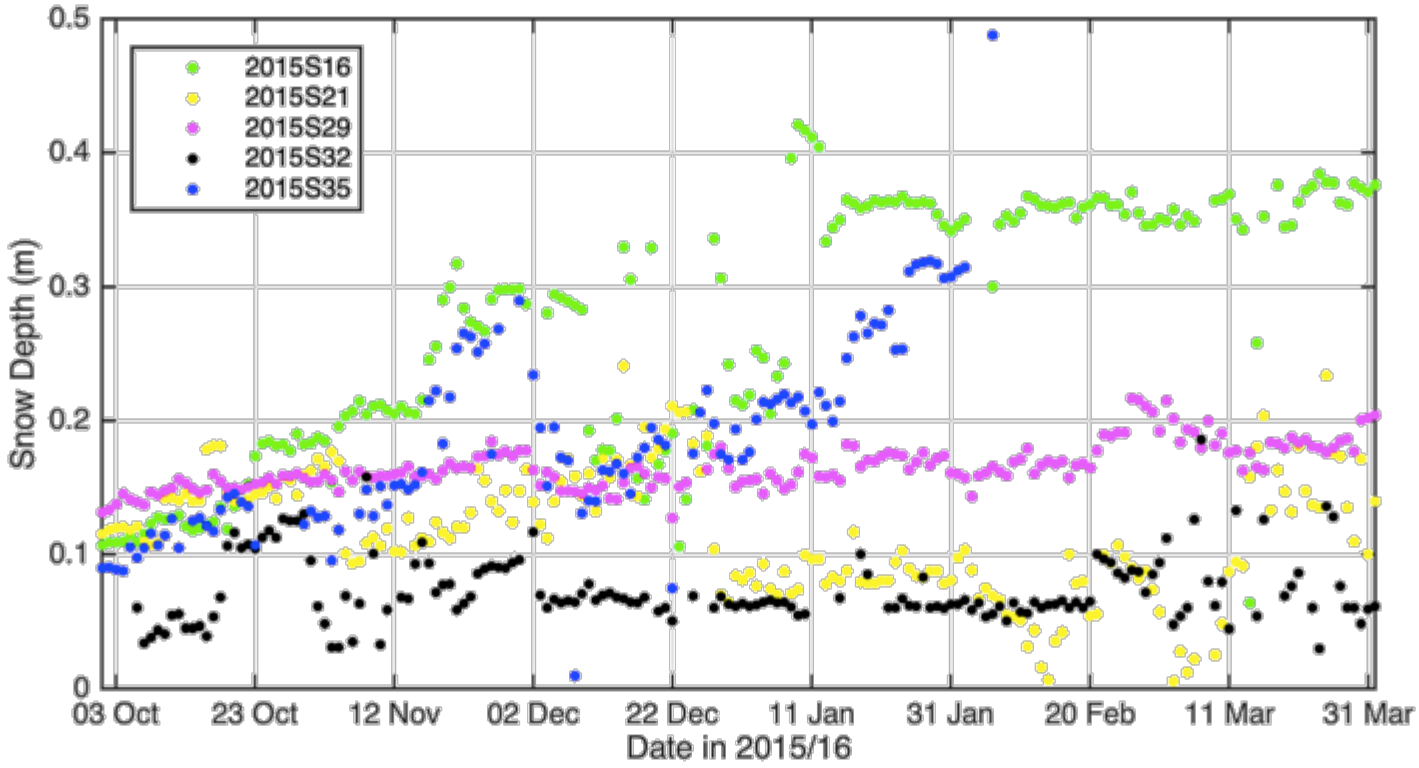
Warm Winter 2015/16



Snow Buoy Results

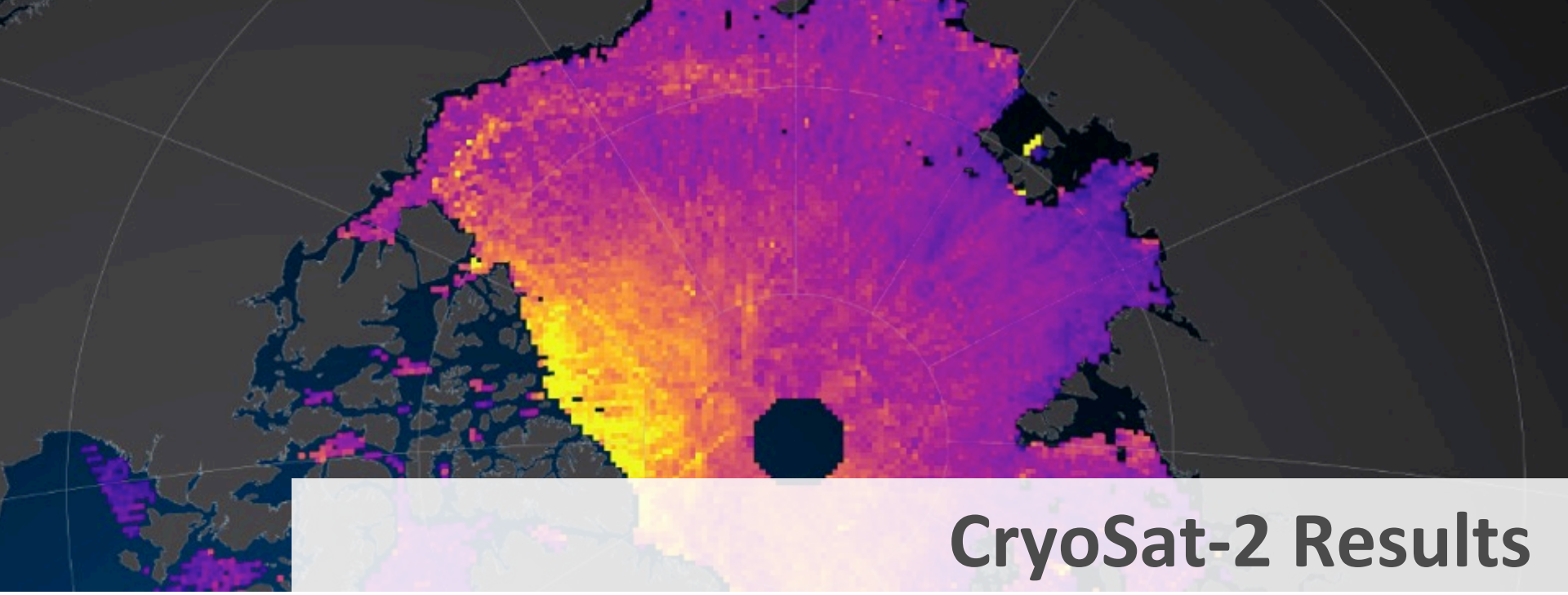
- Exceeding 0°C end of December 2015
  => NEWS (through GTS reports & Arctic Buoy Program)
- Caused by warm air advection through Fram Strait

Effects on Snow Depth



Snow Buoy Results

- No snow or sea ice melt detected
- Only buoy S21 shows decrease of 0.1m
- 4/7 buoys cover the entire time



CryoSat-2 Results

Data set

Monthly sea ice thickness (since Nov 2010)
Near real time (NRT) product for March 2016
25 km resolution
AWI processor (see data.seaiceportal.de)
📖 Ricker et al. (2014, The Cryosphere)

Parameters

Sea ice thickness (with uncertainties)
Freeboard (with uncertainties)
Additional fields

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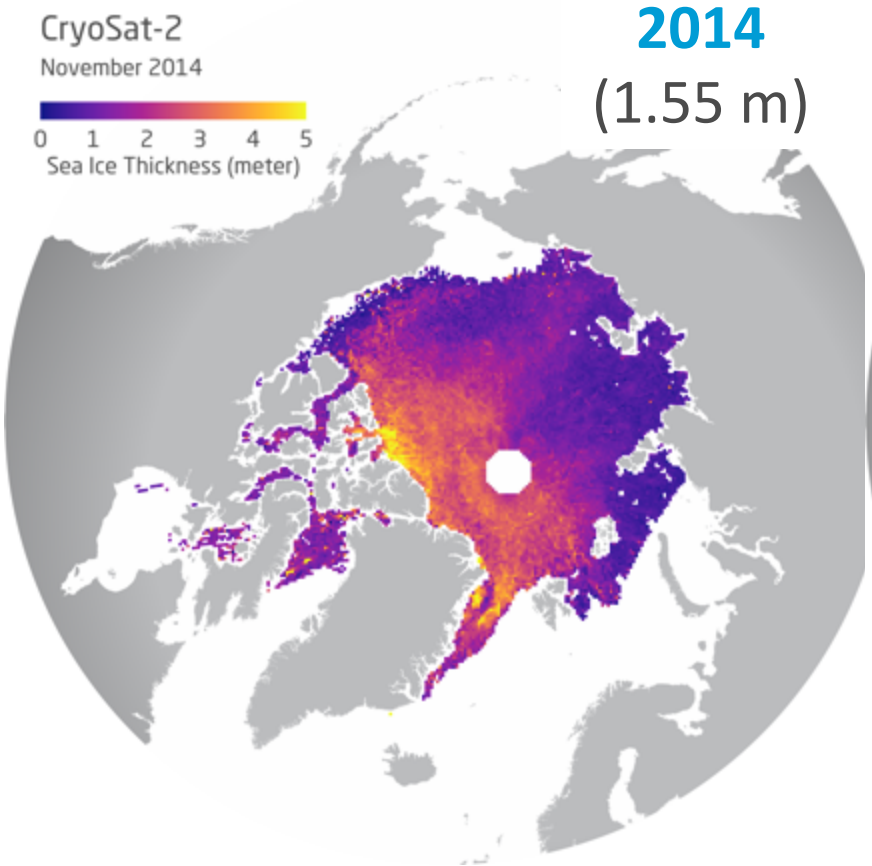
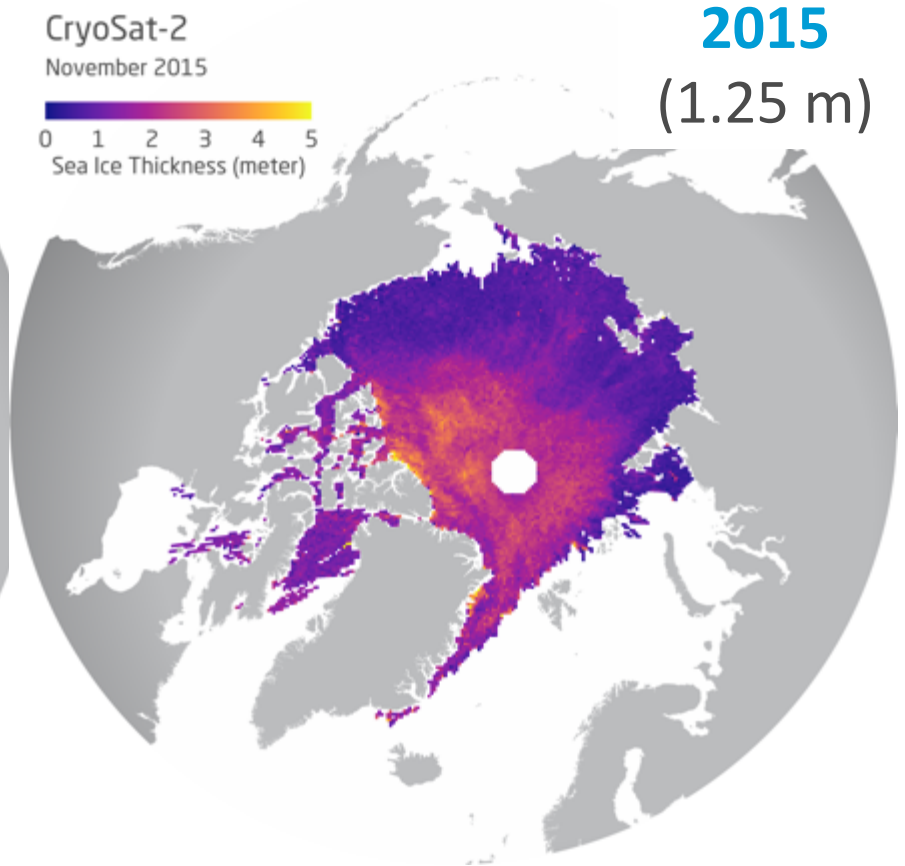
Sea Ice Thickness - November



2014
(1.55 m)

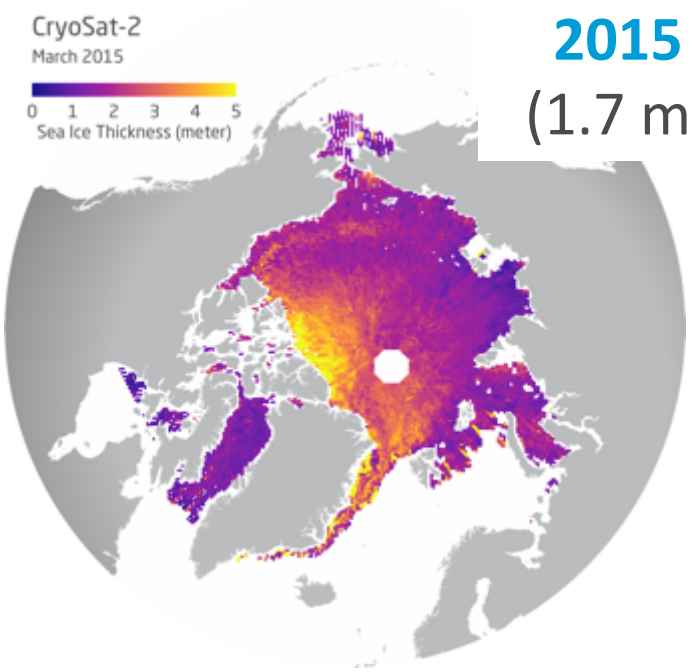


2015
(1.25 m)

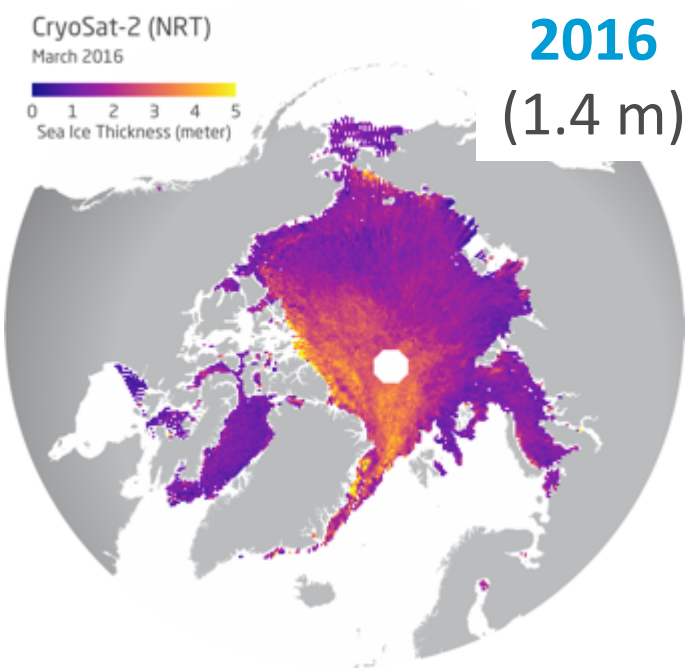
CryoSat-2 Results

- Strong summer melt in 2015
- Loss of thick sea ice
- But no extremely low extent

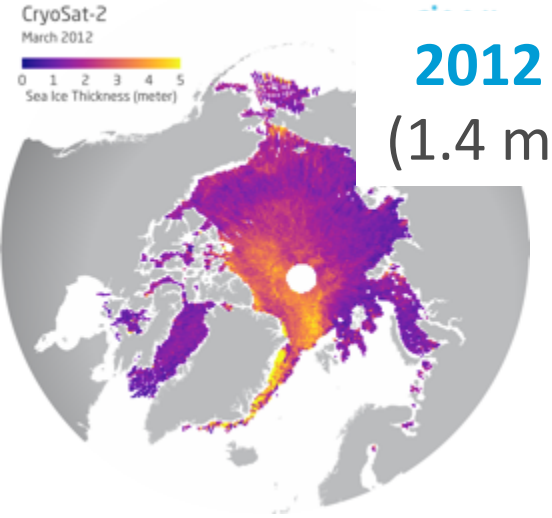
Sea Ice Thickness - March



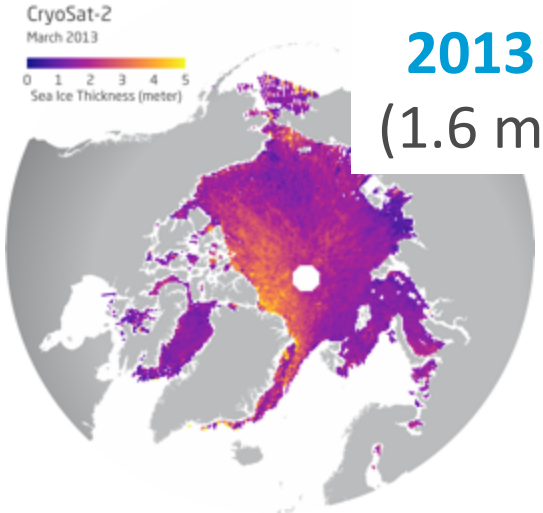
2015
(1.7 m)



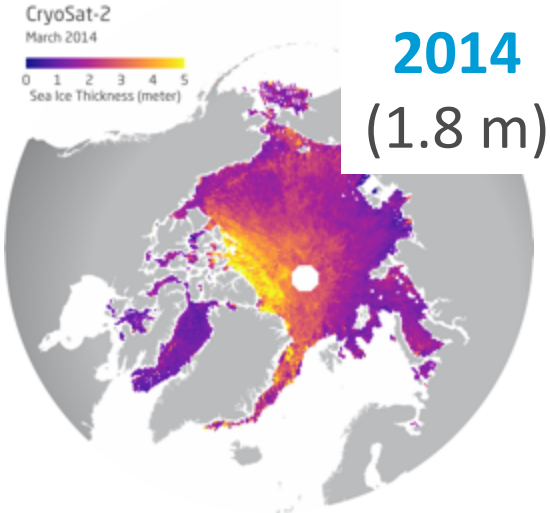
2016
(1.4 m)



2012
(1.4 m)



2013
(1.6 m)



2014
(1.8 m)

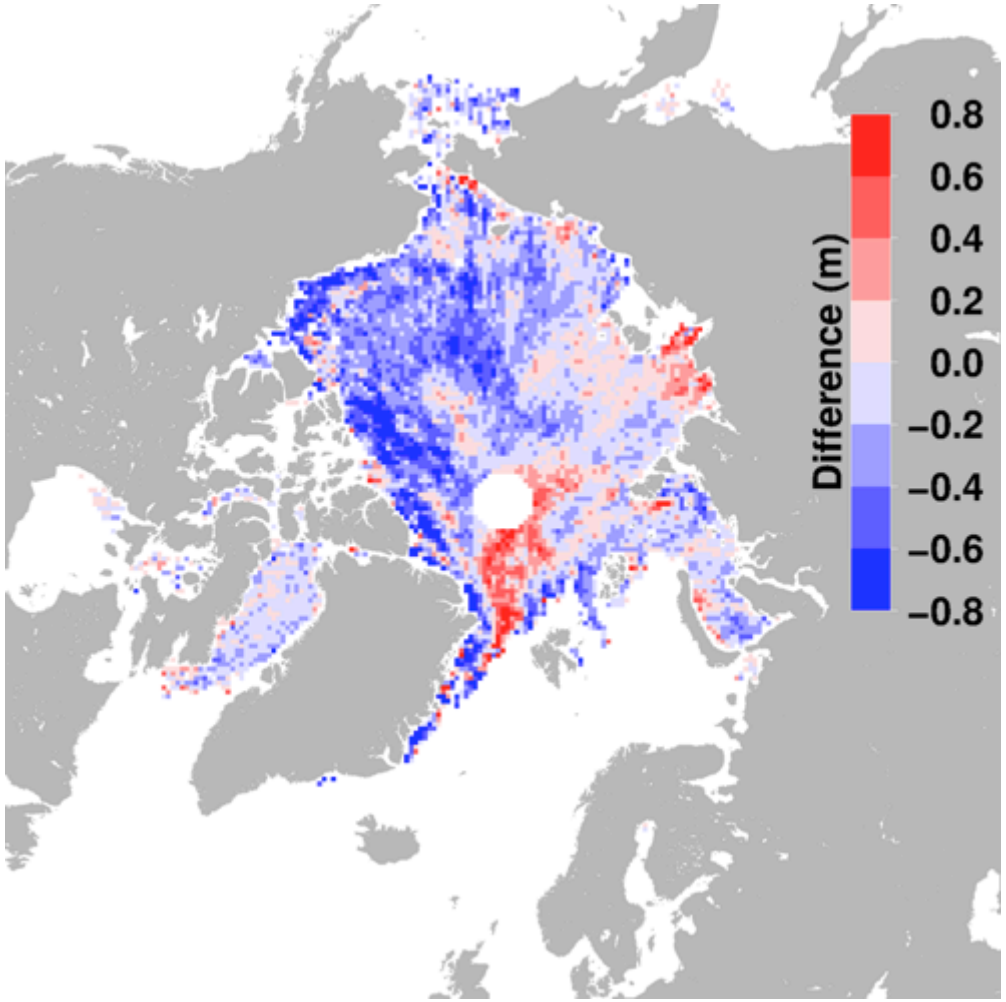
Sea Ice Thickness - Changes

Changes (2016-mean)

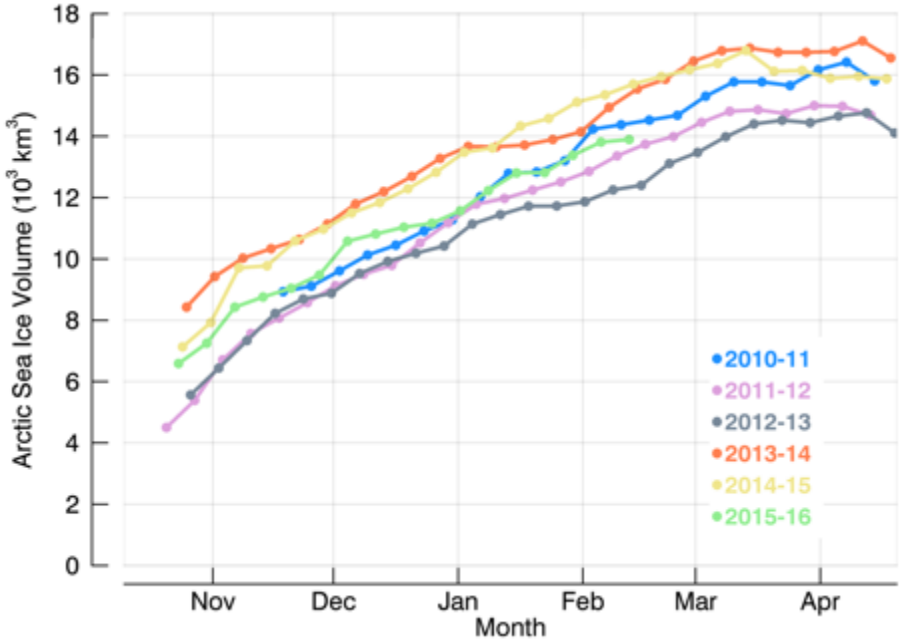
- Beaufort: -0.2 to -0.4 m
- Kara: -0.1 to -0.3 m

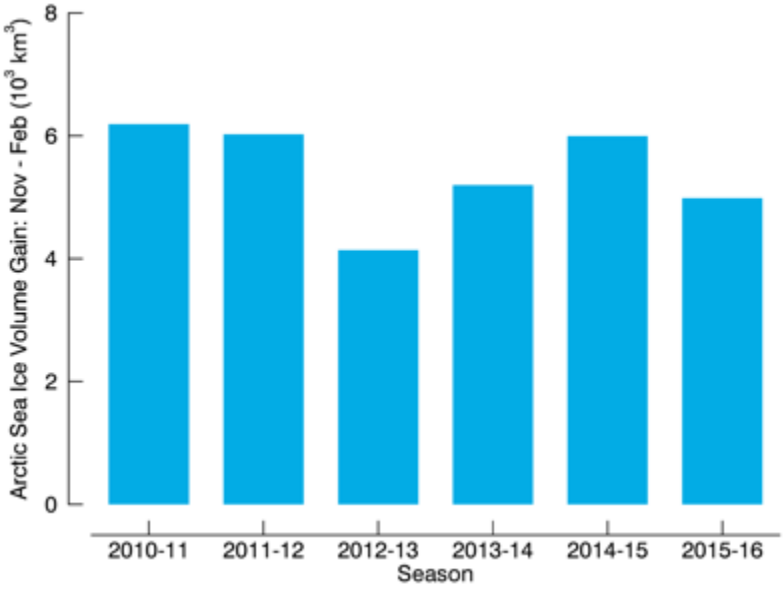
Thickness distribution

- Thinner sea ice
  - Beaufort
  - North Canada
  - North Greenland
- Thicker sea ice
  - north of Fram Strait (likely export, likely dynamic effect)



Sea Ice Volume – Winter Growth





Combined results (concentration * thickness)

Includes SMOS data for thin sea ice

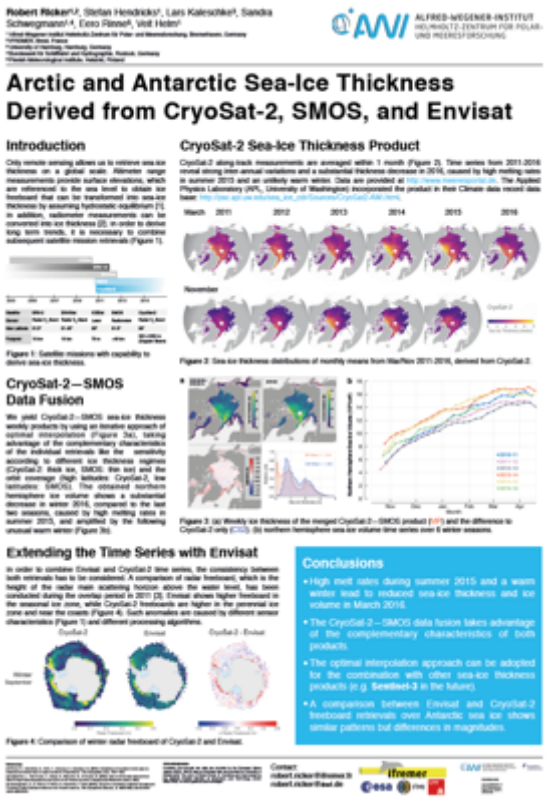
- Low sea ice growth
- Starting the summer 2016 with similar conditions as 2012

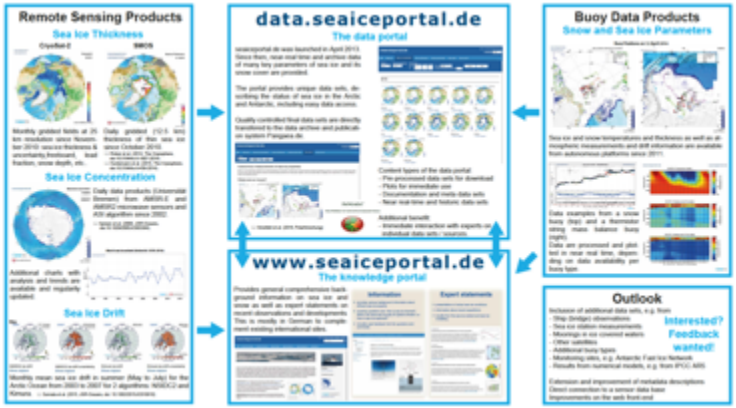
More details here at EGU 2016

Posters today 17:30

Sea ice thickness results

Data portal





Oral today 14:30

Snow buoy data and details

Summary Statements

Thinner sea ice cover than in previous years

- ~15% less sea ice than in 2015 (volume estimate)
- Strong summer melt 2015
- Low sea ice growth rates in winter 2015/16
- But no surface melt during winter

Projection: low sea ice volume (and extent) in summer 2016

- Thin sea ice in spring
- Strong export through Fram Strait (thick ice piled up)
- Similar ice conditions as in 2012
- However: Unknown atmospheric and oceanographic conditions during the coming spring and summer
  => will determine the outcome