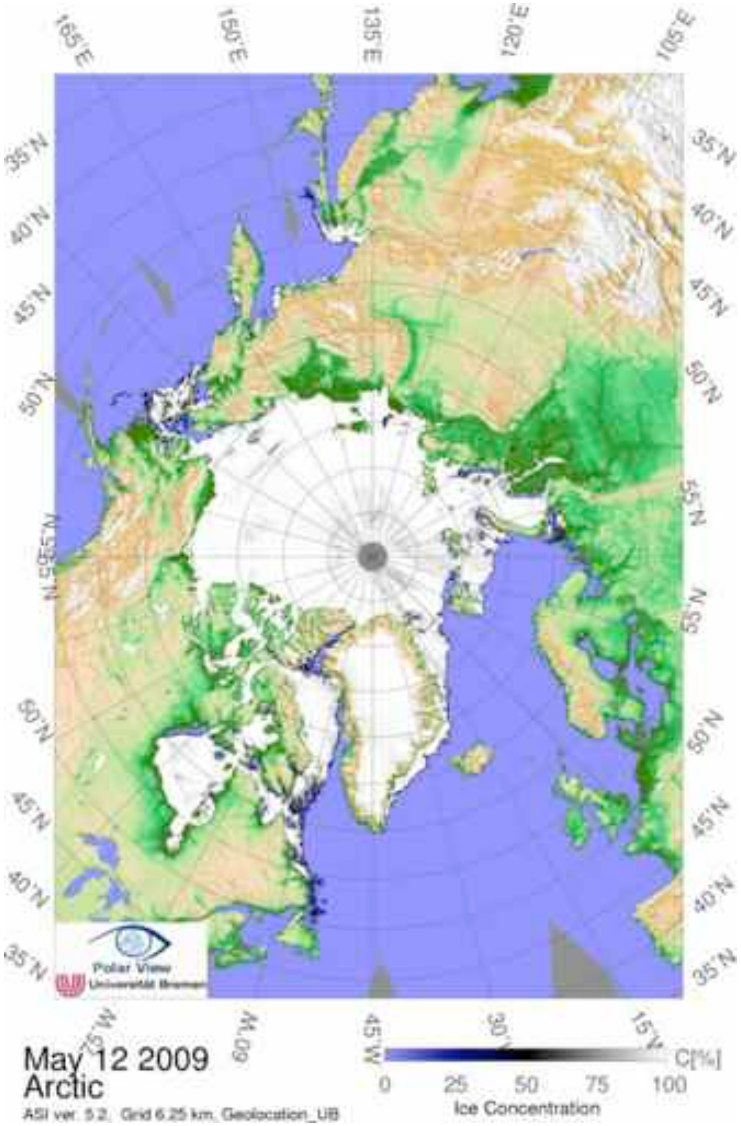
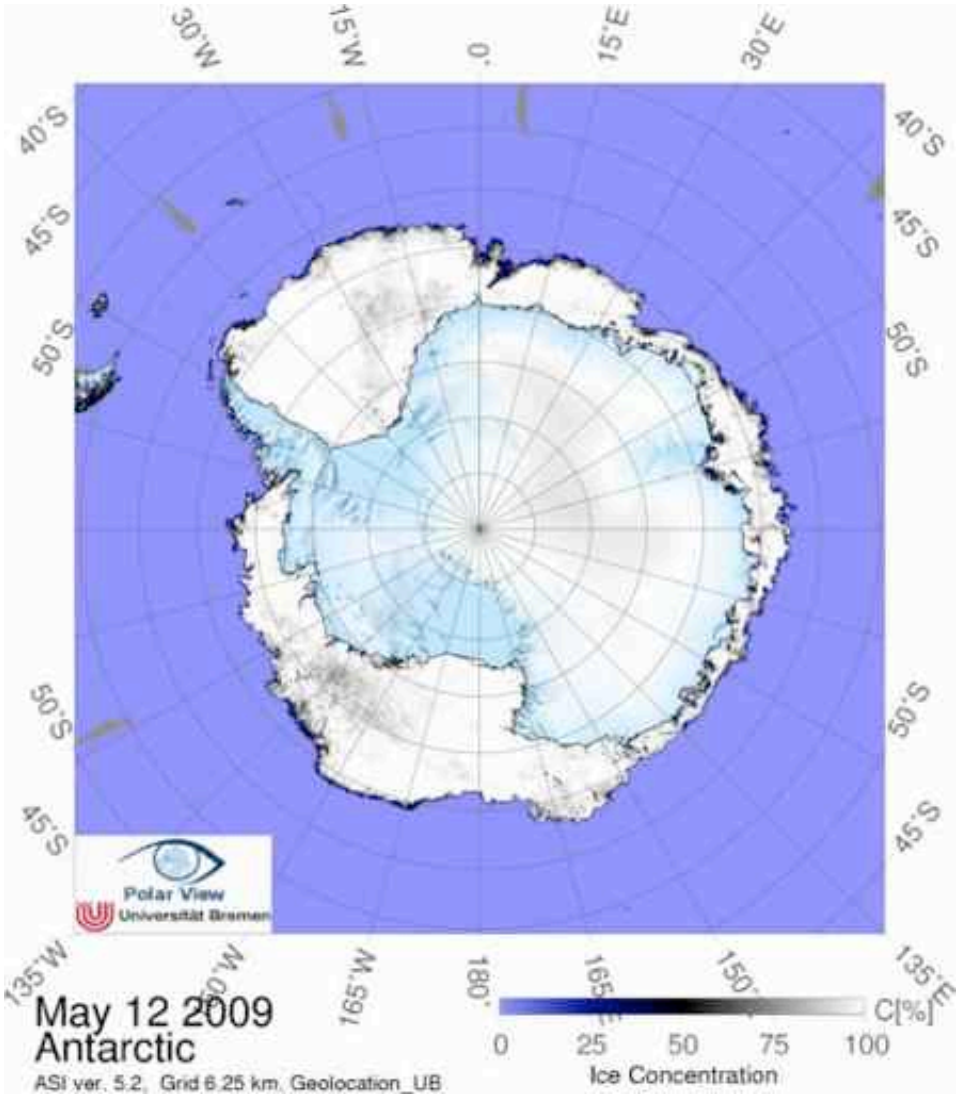
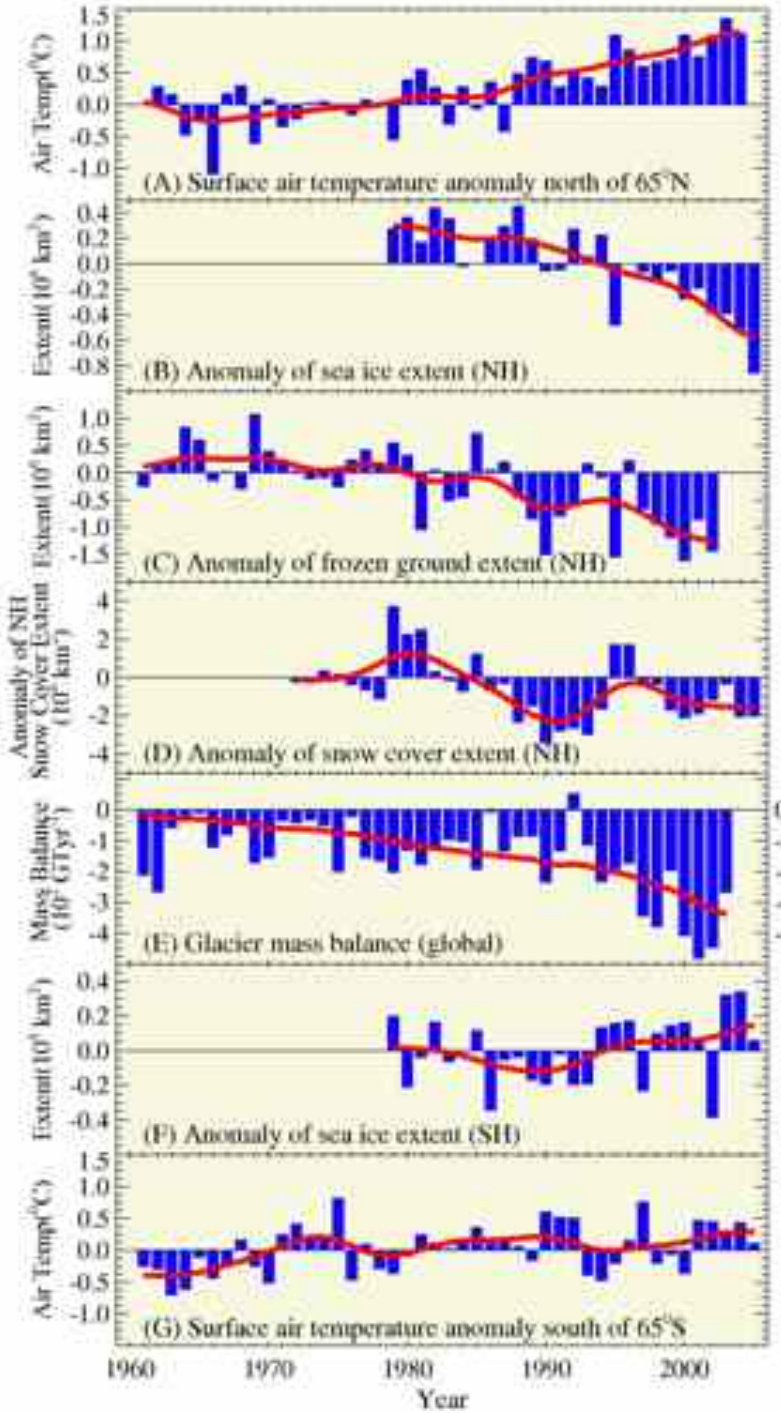

May 12 2009
Arctic
ASI ver. 5.2, Grid 6.25 km, Geolocation_UB
Polar View
Universität Bremen
C[%]
0 25 50 75 100
Ice Concentration


May 12 2009
Antarctic
ASI ver. 5.2, Grid 6.25 km, Geolocation_UB
Polar View
Universität Bremen
C[%]
0 25 50 75 100
Ice Concentration

Cryospheric Variations



SAT north of 65N

Arctic sea ice

NH frozen ground extent

NH snow cover extent

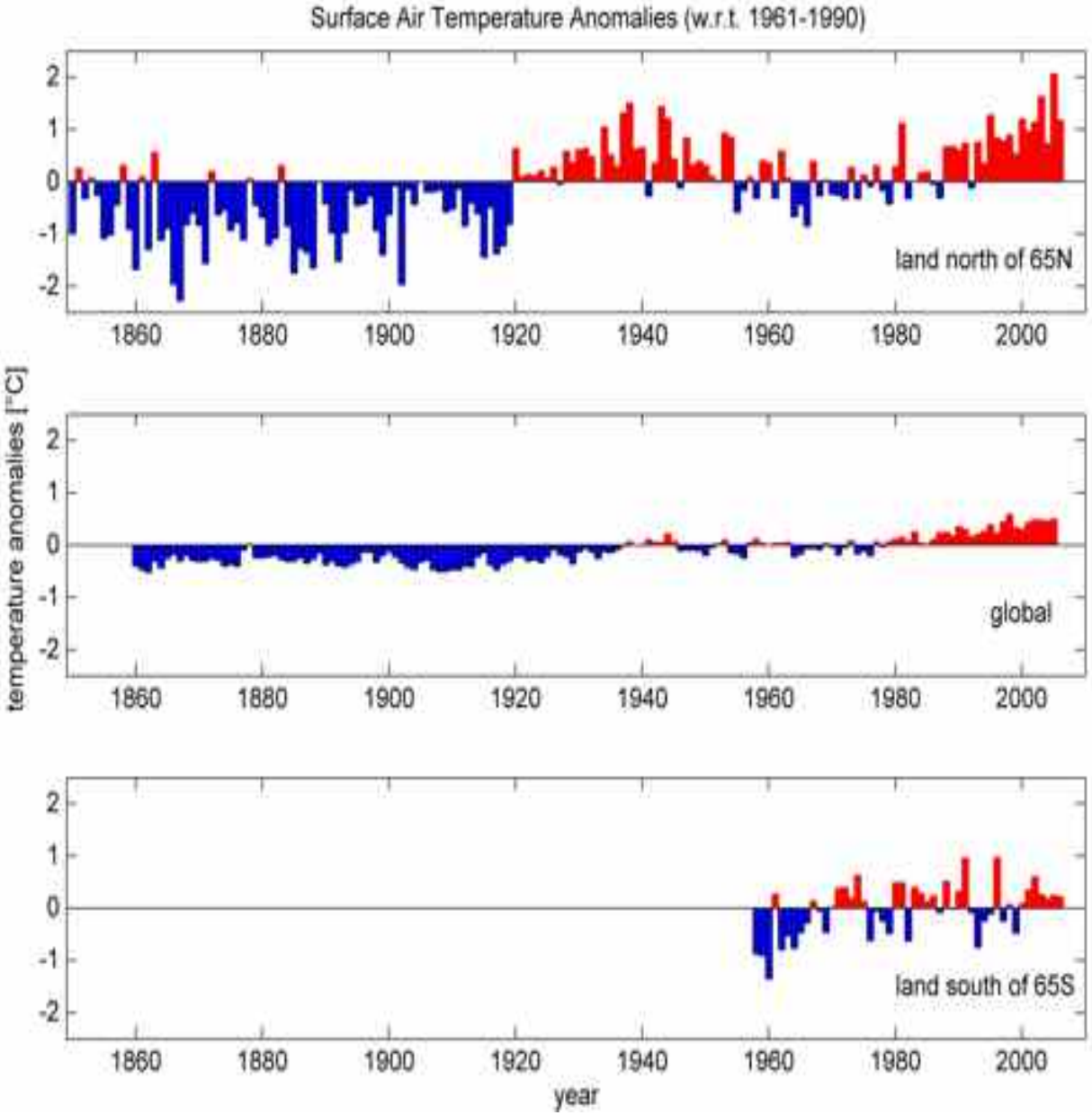
Glacier mass balance

Antarctic sea ice

SAT south of 65S

Question 4.1, Figure 1. Anomaly time series of polar surface air temperature (A, G, updated from Jones and Moberg, 2003), Arctic and Antarctic sea ice extent (B, F, updated from Comiso, 2003), Northern Hemisphere (NH) frozen ground extent (C, Zhang et al., 2003), NH snow cover extent (D, updated from Brown et al., 2000) and global glacier mass balance (E, Ohmura, 2004; Cogley, 2005; Dyurgerov and Meier, 2005). The solid red line in E denotes the cumulative global glacier mass balance; otherwise it represents the smoothed time series using a 13-point filter (see Chapter 3).

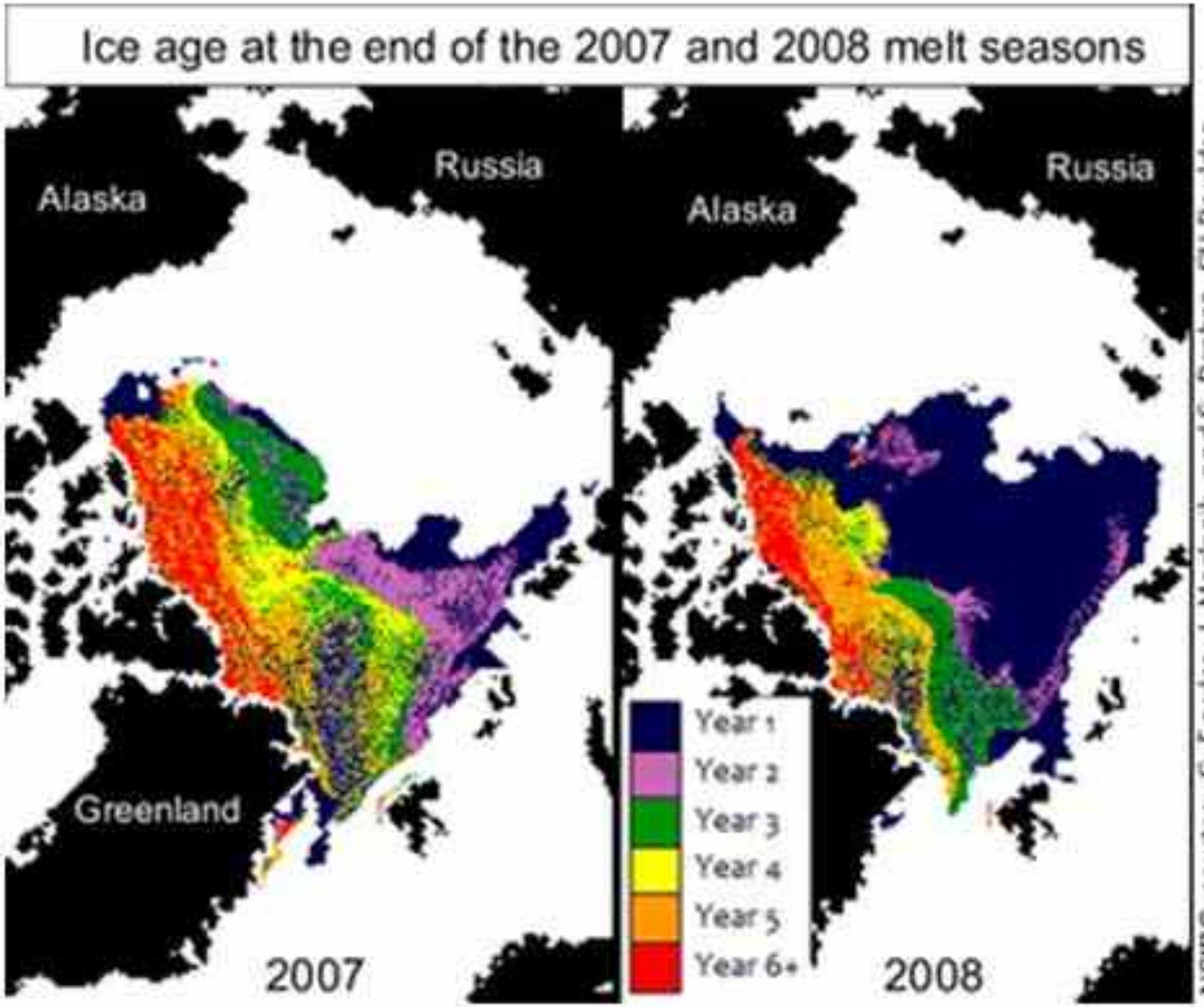
Temperatures in Polar Regions



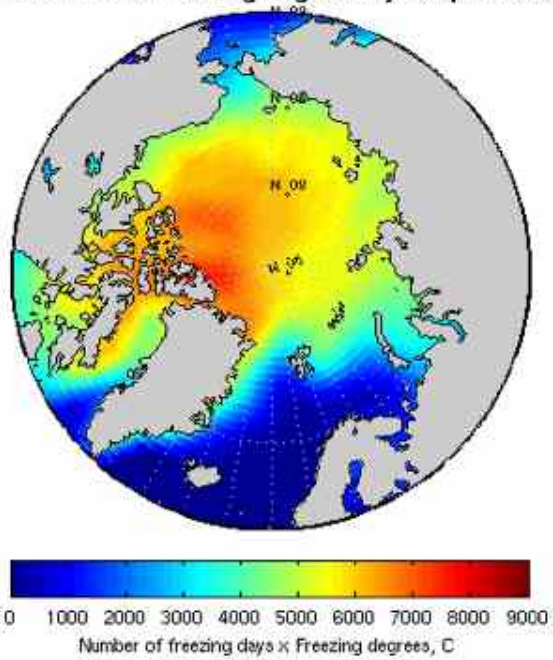
Trend (last 50 years):

$T_{Arctic} = 1{,}1°C$

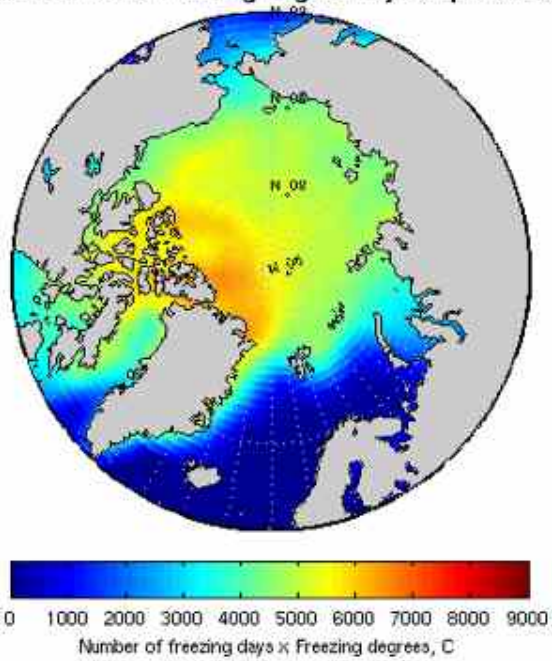
$T_{global} = 0{,}6°C$


Ice age at the end of the 2007 and 2008 melt seasons
Alaska
Russia
Greenland
Year 1
Year 2
Year 3
Year 4
Year 5
Year 6+
2007
2008
NSIDC courtesy C. Fowler, J. Maslanik, and S. Drobot, CU Boulder

Cumulative number of freezing degree days Sept1986-May1987

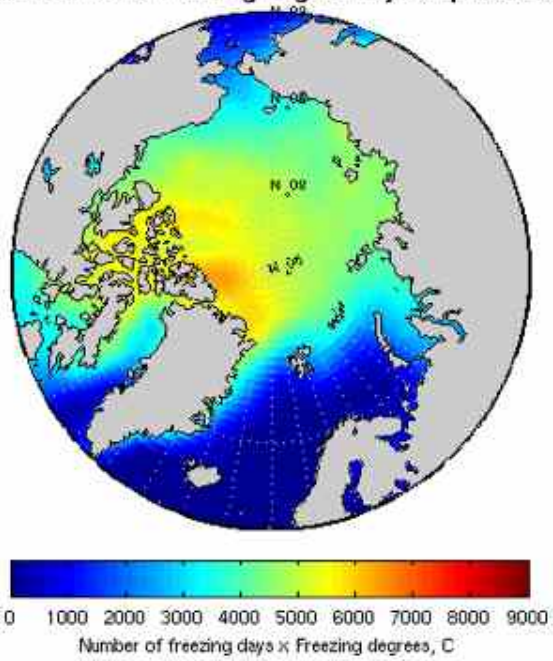


Cumulative number of freezing degree days Sept1994-May1995

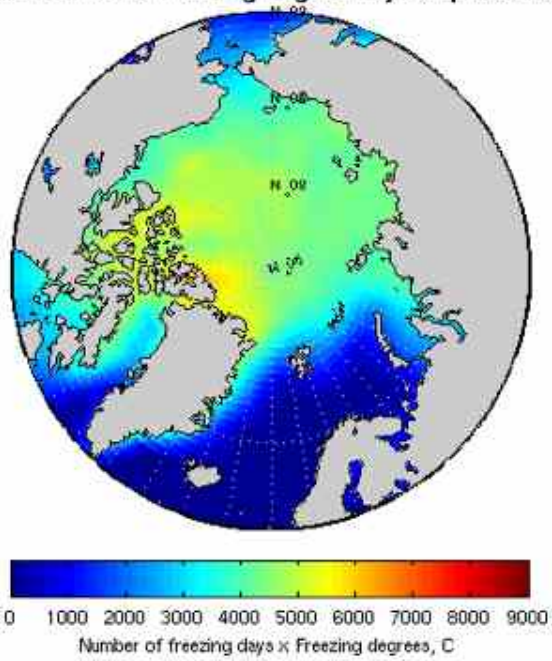


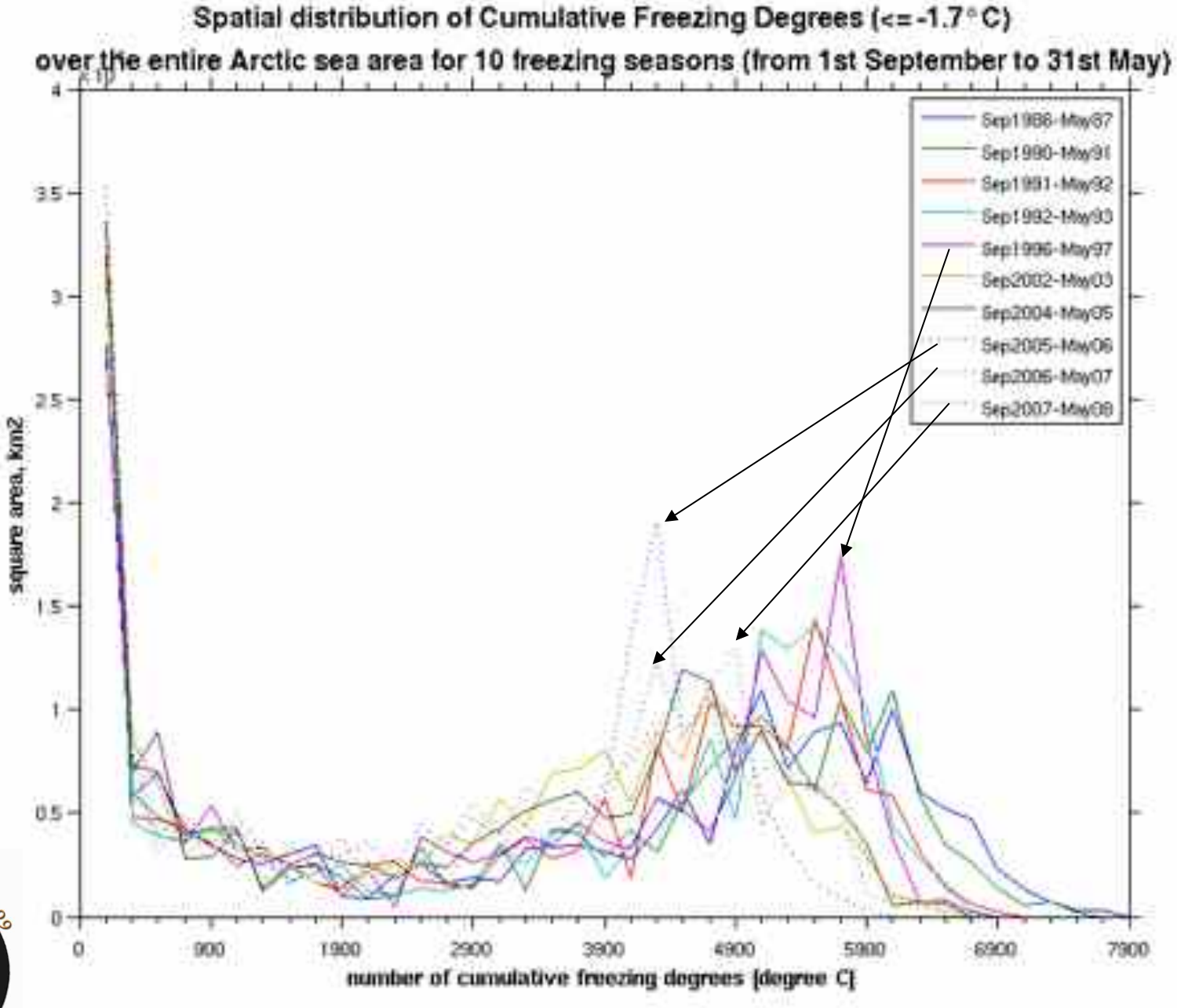
Tfreez - 1.7C

Cumulative number of freezing degree days Sept2004-May

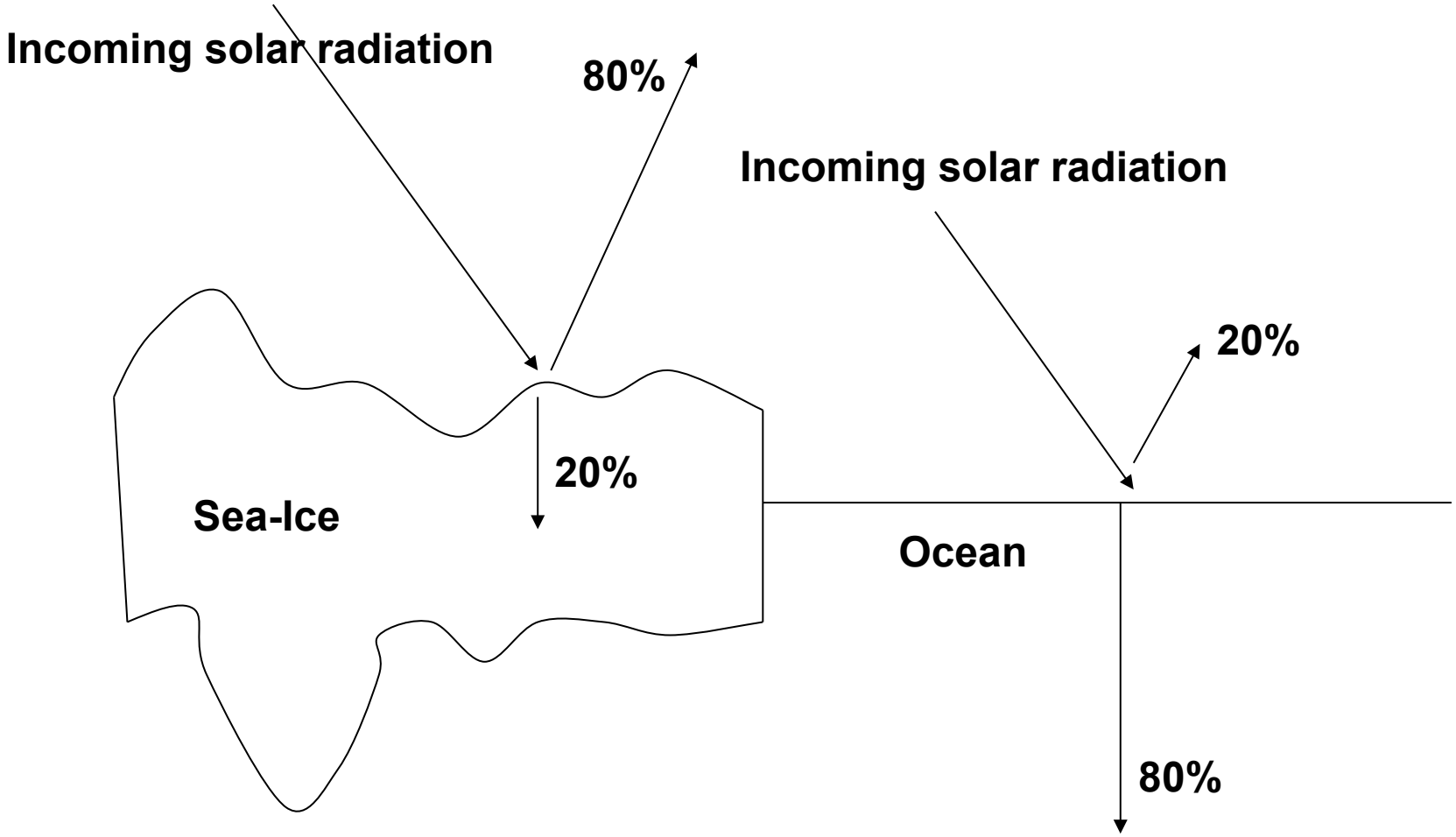


ılative number of freezing degree days Sept2005-May2006

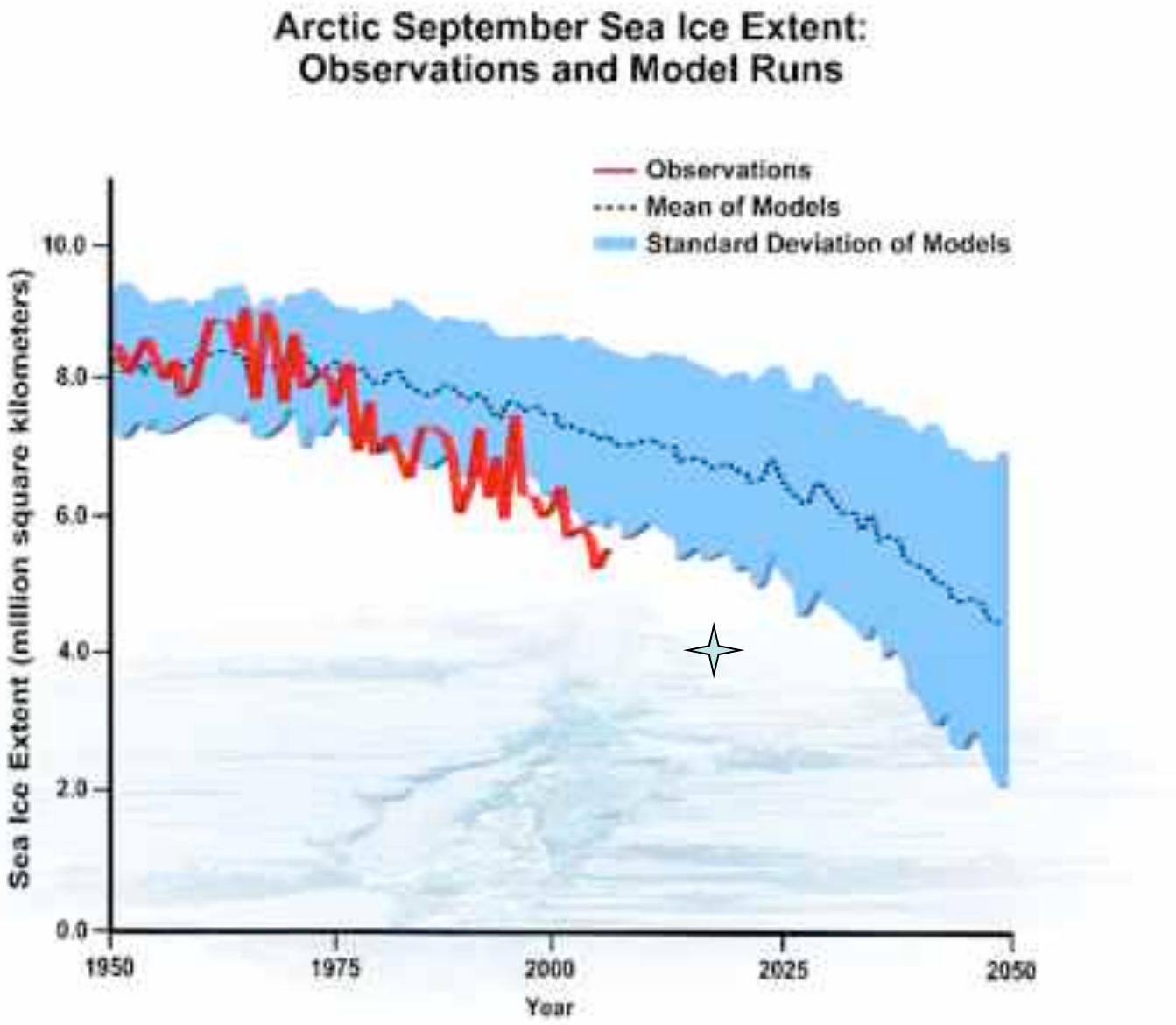




Winter index I = ∫x f(x) units : C.km2

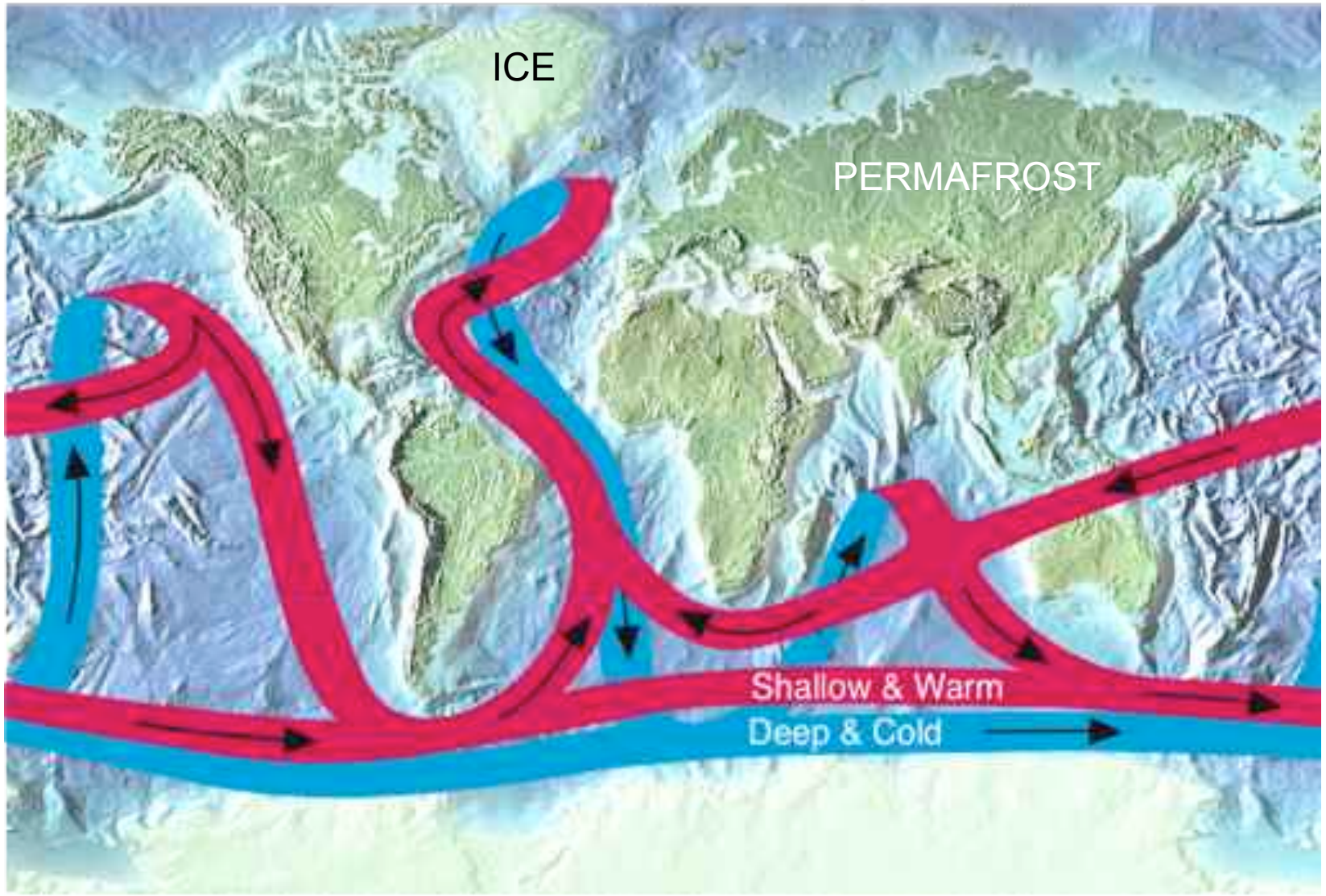


Sea Ice albedo versus Ocean albedo

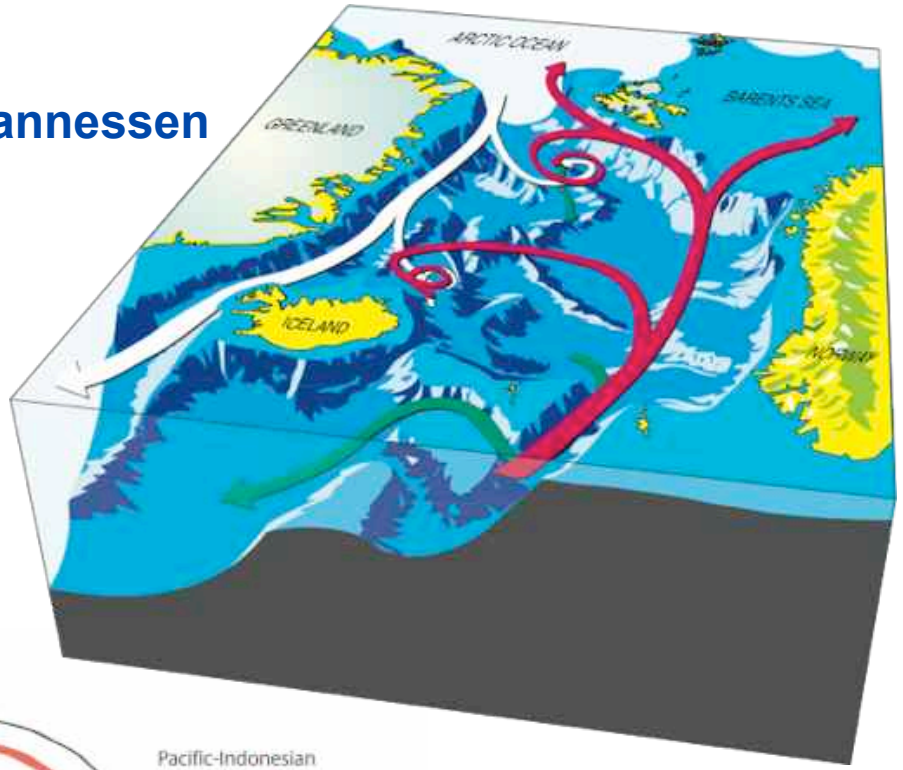


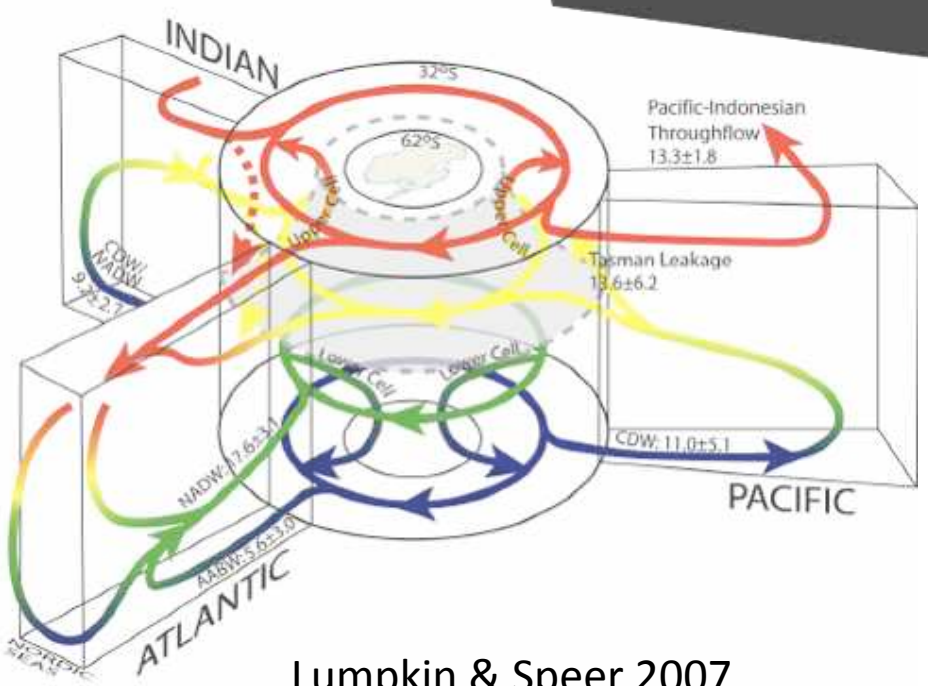
UCAR 2007, Steve Deyo

The Global Ocean Conveyor Belt



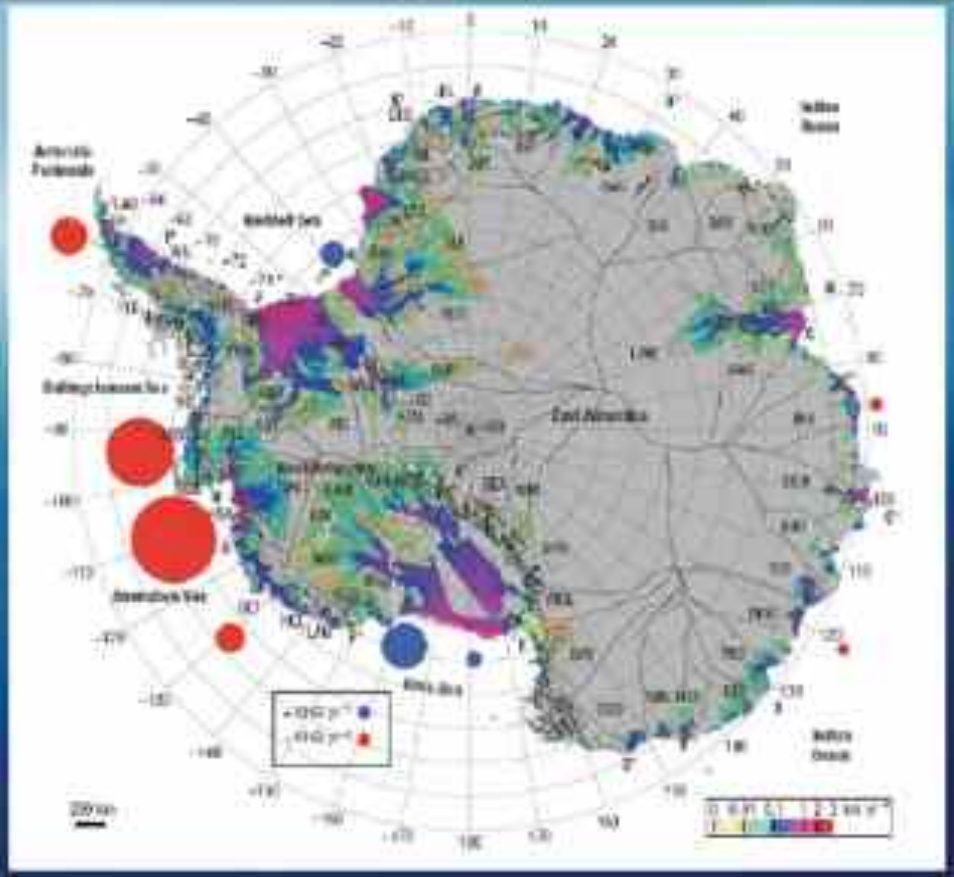
Courtesy: T. Johannessen





Lumpkin & Speer 2007

Origin of SO freshening: precipitations & loss of Antarctic ice

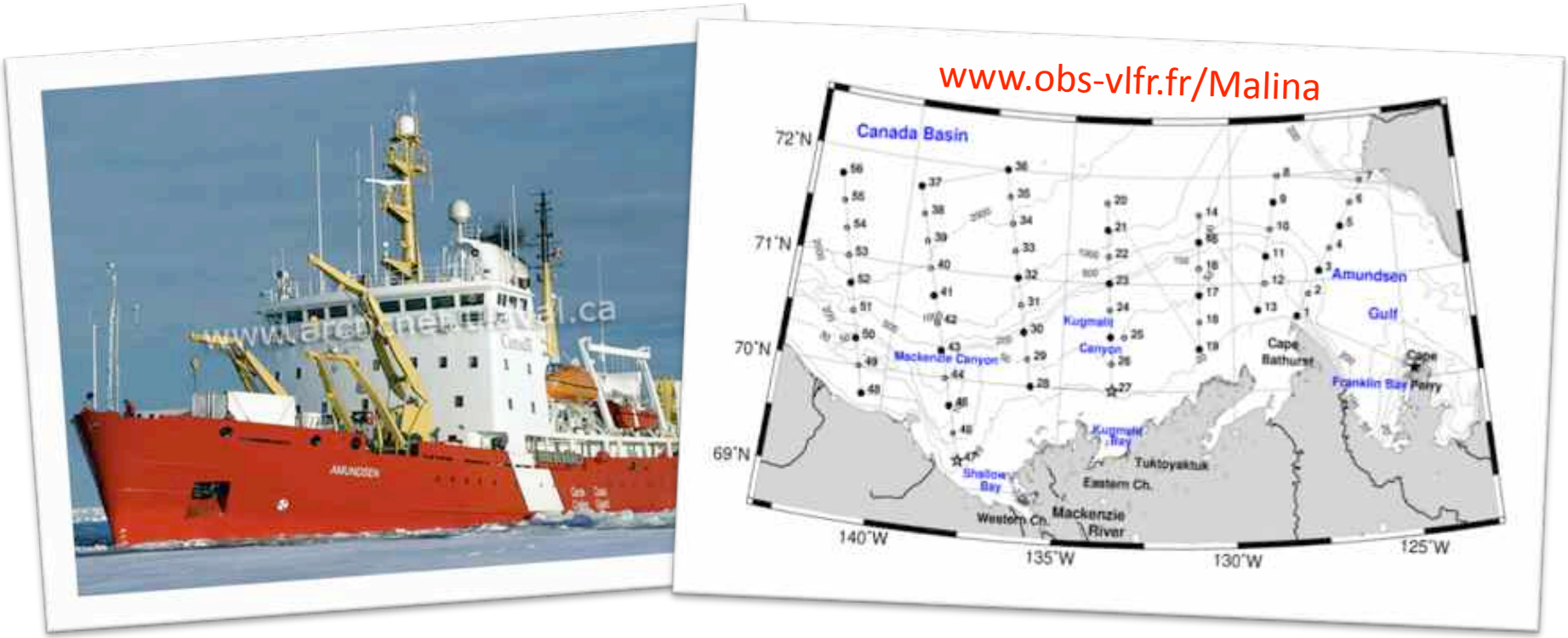


Antarctic mass loss increased by 70% in last decade, as a result of warmer air and sea temperatures

Ocean-ice shelf interaction controls ice-sheet stability

ECOSYSTEMS

SUSTAINABLE?



Projet Malina (2008-2012)

Question:

Quel est l'impact des modifications du couvert de glace, du permafrost et du rayonnement UV sur la biodiversité, et sur les flux de carbone affectés par la lumière?

Faits saillants:

- France – Canada – USA
- Campagne été 2009
- Etudes de processus
- Suivi par télédétection
- Modélisation (présent & futur)
- Paléocéanographie

Financements:

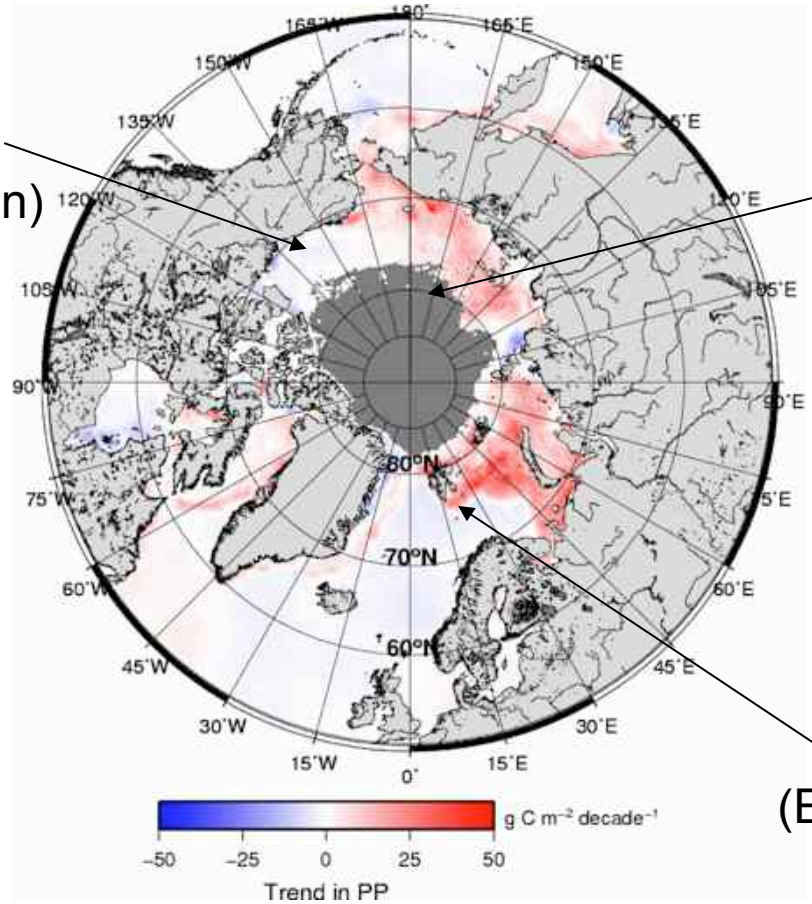
INSU, ANR, CNES, ESA

NSF, Nasa

CRSNG

Production phytoplanctonique

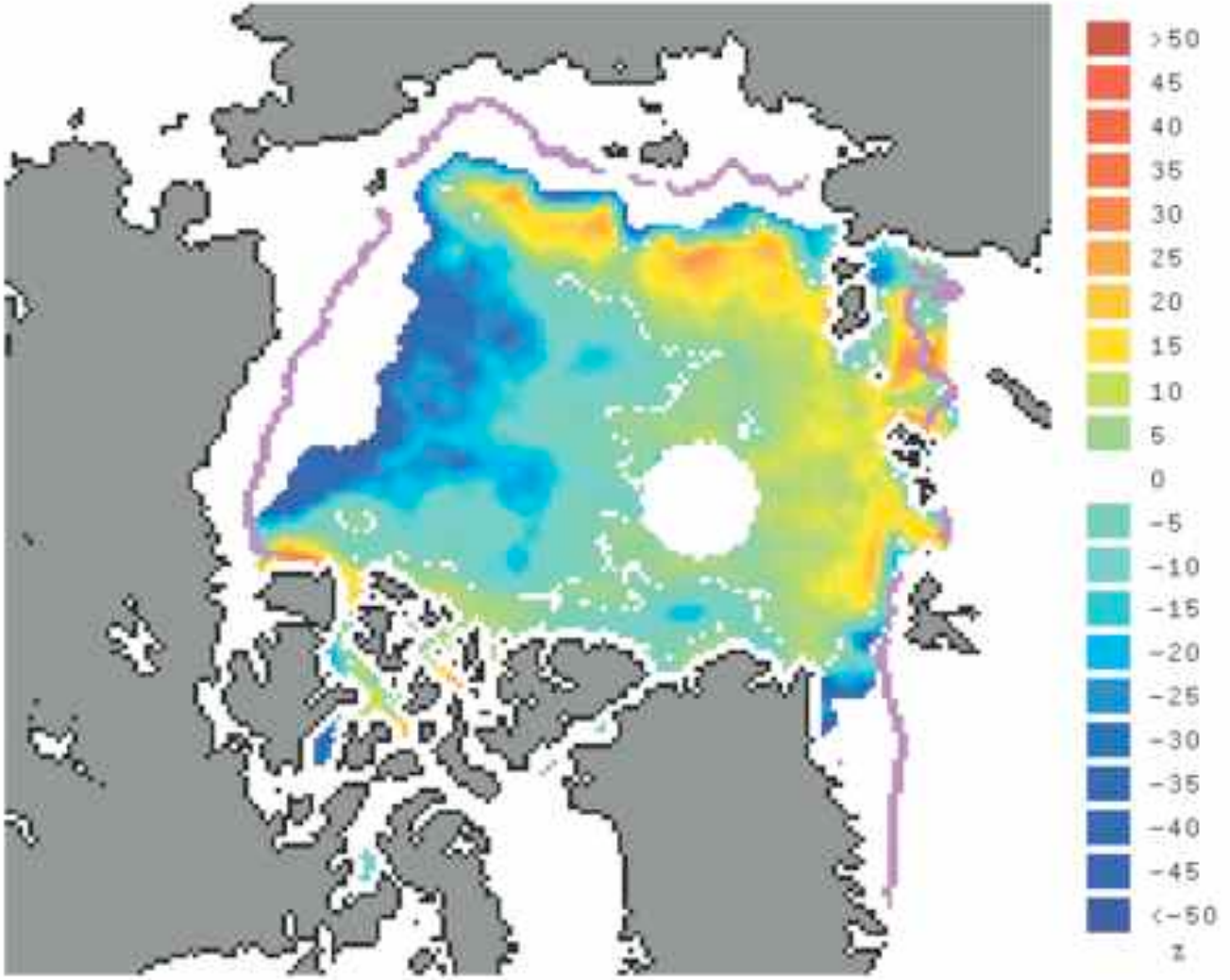
Malina
(franco-canadien)



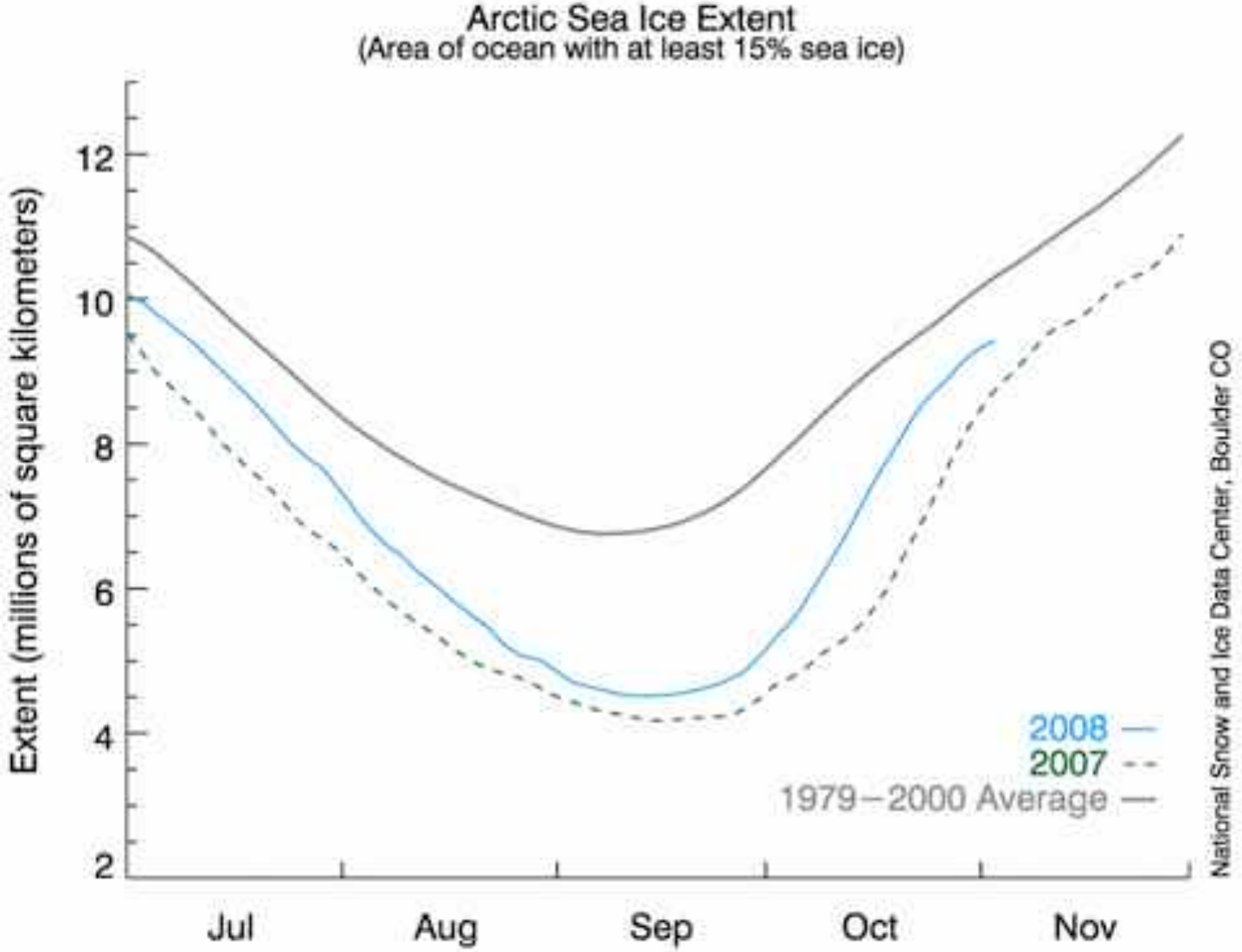
Rusalca
Russo-Américain

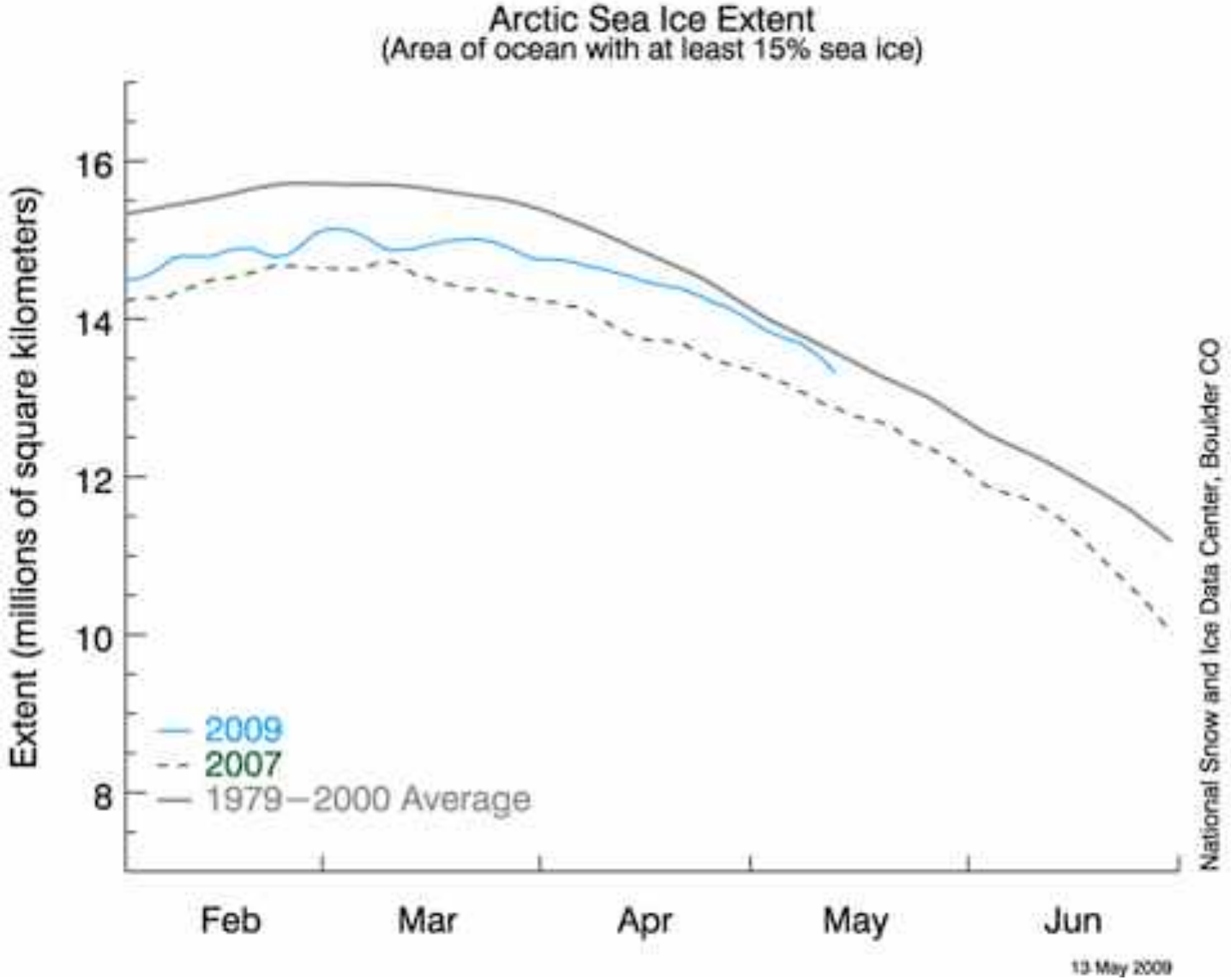
ATP
(Européen)

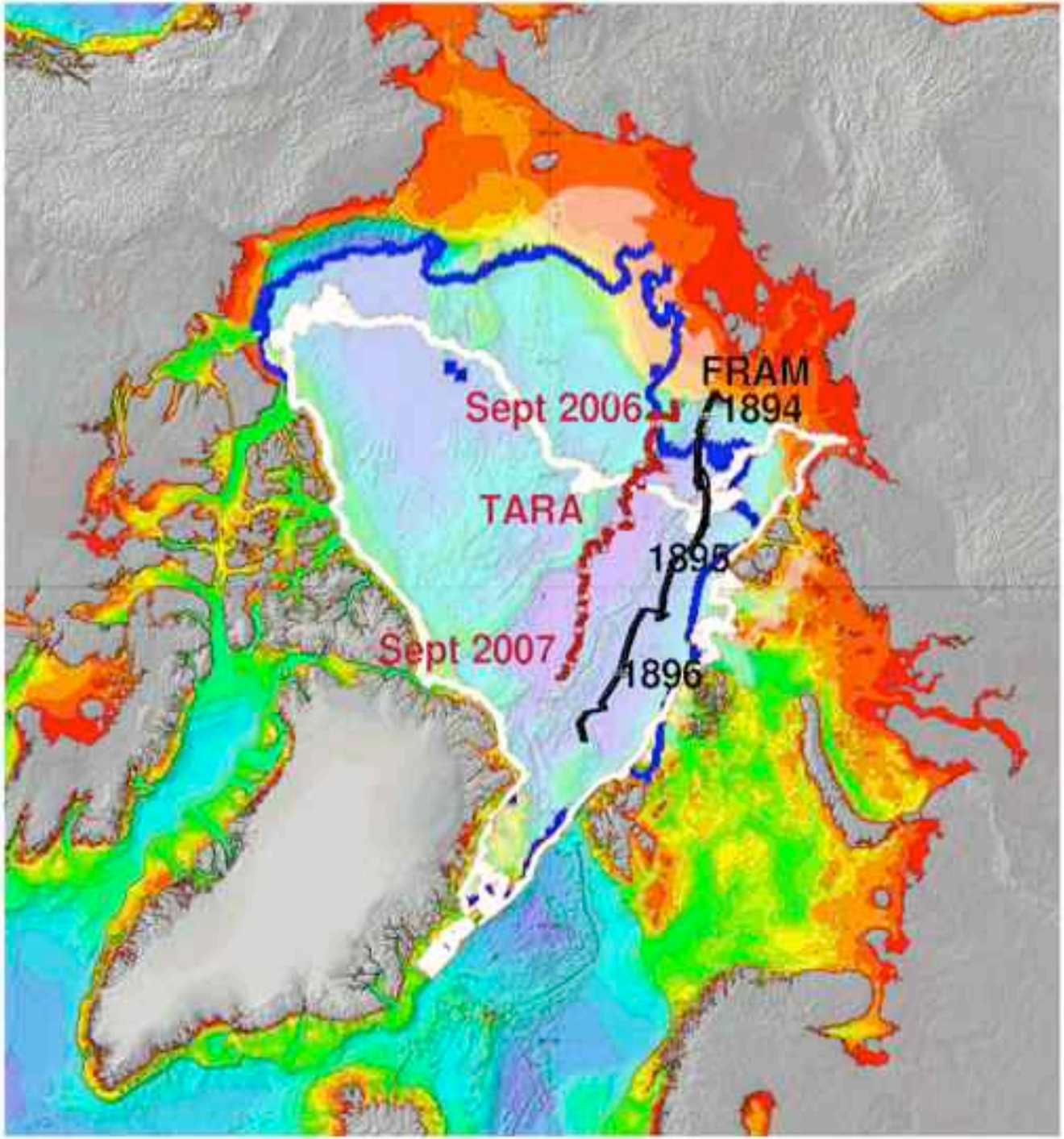
Bélanger & Babin 2008



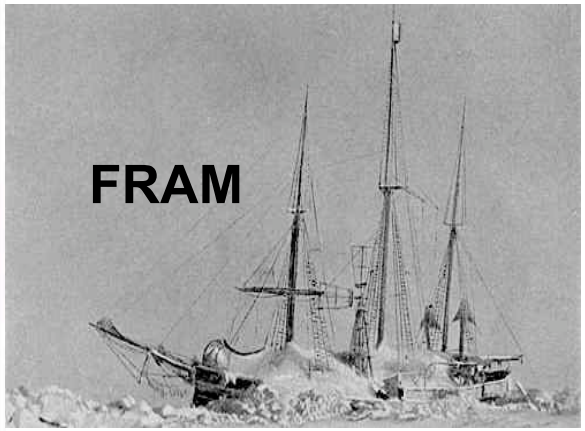
By September 2002, the Arctic sea-ice concn. anomaly cf 1988-2000 had reached a minimum *'unprecedented in 24 years of passive microwave obs and almost certainly unmatched in 50 years of charting Arctic sea-ice'* (Serreze 2003; Fetterer & Knowles, 2004).


Arctic Sea Ice Extent
(Area of ocean with at least 15% sea ice)
Extent (millions of square kilometers)
12
10
8
6
4
2
Jul
Aug
Sep
Oct
Nov
2008
2007
1979–2000 Average
National Snow and Ice Data Center, Boulder CO

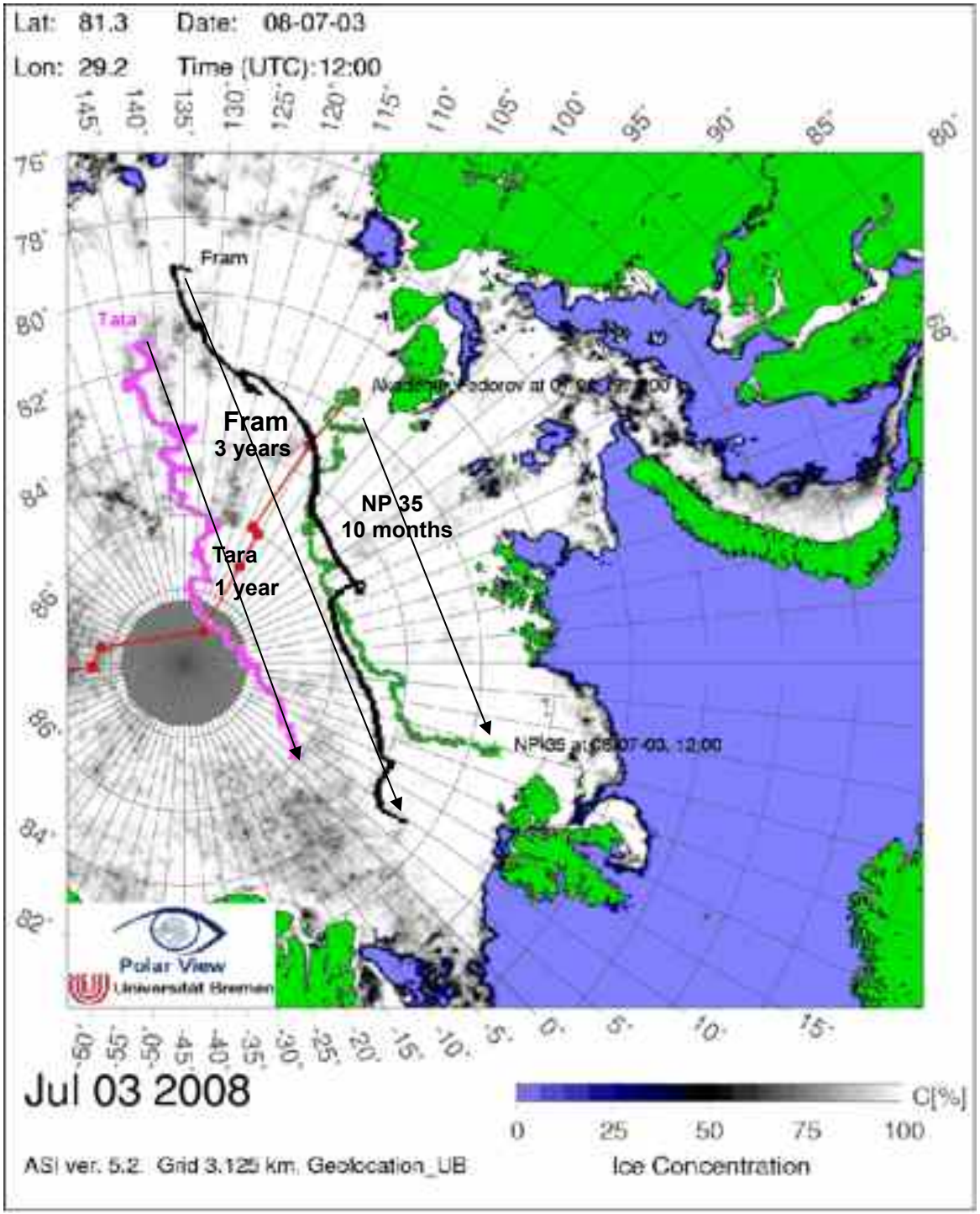

Arctic Sea Ice Extent
(Area of ocean with at least 15% sea ice)
Extent (millions of square kilometers)
16
14
12
10
8
2009
2007
1979–2000 Average
Feb
Mar
Apr
May
Jun
National Snow and Ice Data Center, Boulder CO
13 May 2009



Copyright G. Redvers/taraexpeditions

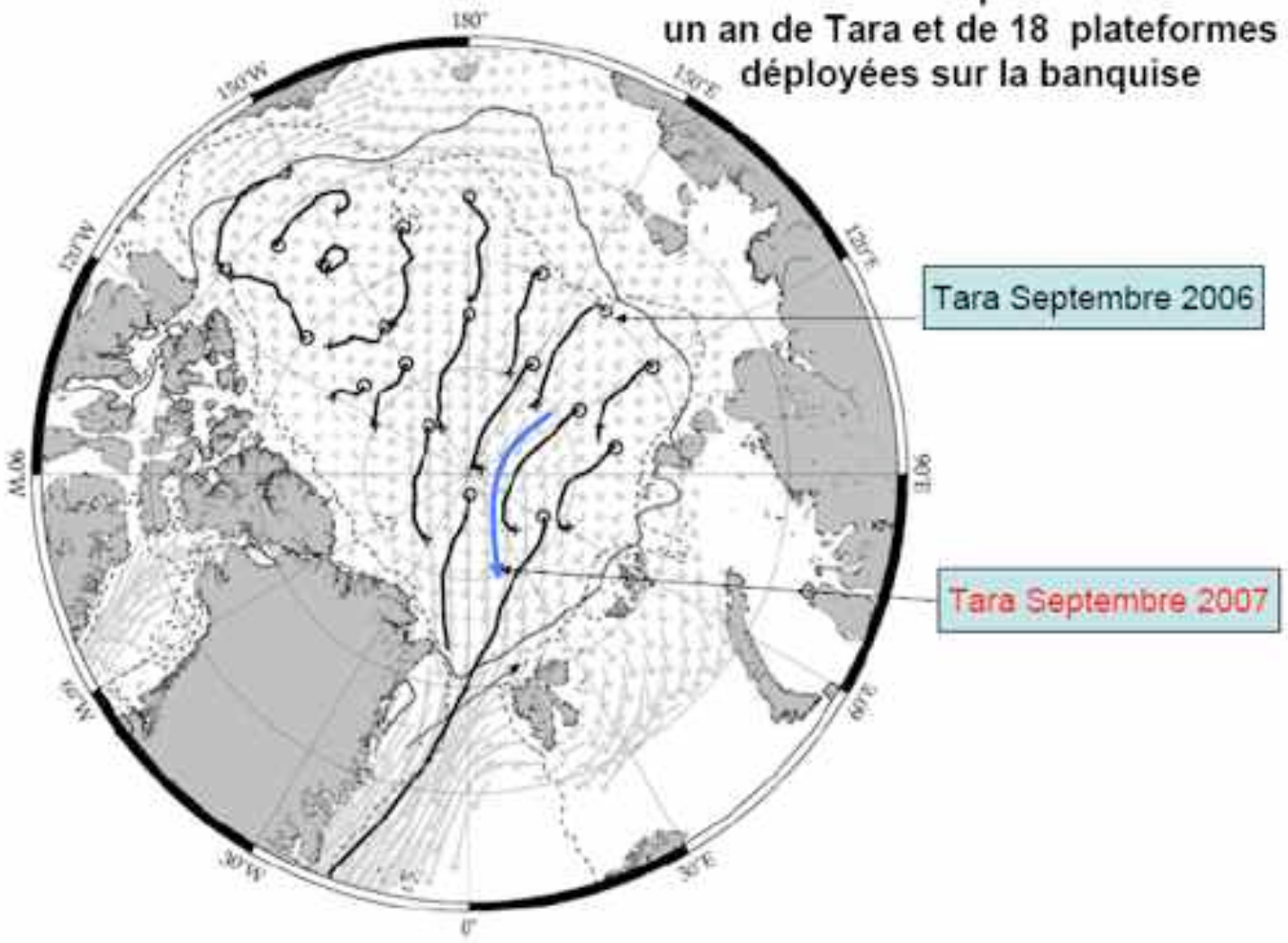


2005 DAMOCLES 2009
E.U. Research Project

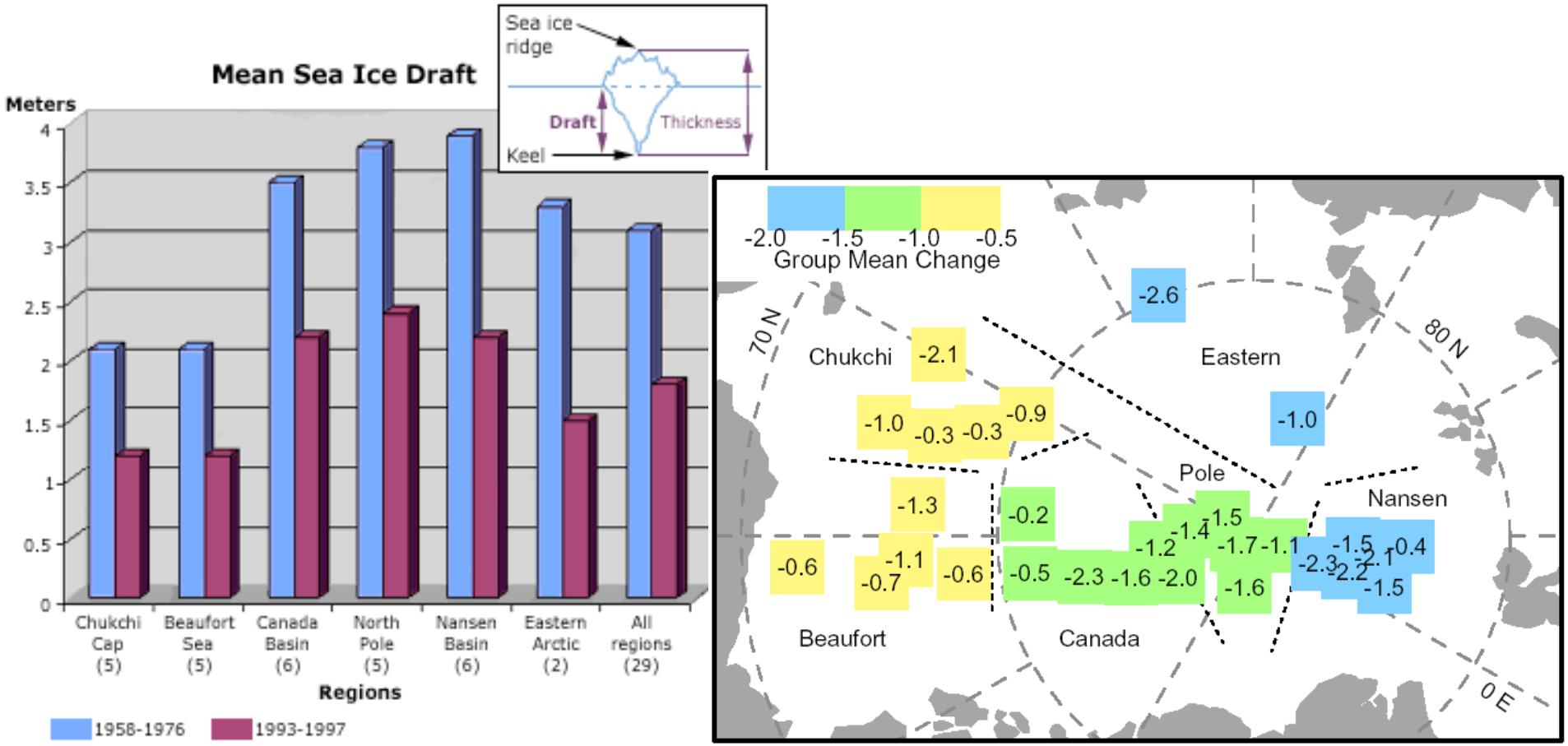

Lat: 81.3
Date: 06-07-03
Lon: 29.2
Time (UTC):12:00
Fram
Tara
Fram
3 years
NP 35
10 months
Tara
1 year
Polar View
Universität Bremen
Jul 03 2008
C[%]
0
25
50
75
100
Ice Concentration
ASI ver. 5.2 Grid 3.125 km Geolocation_UB

2005 DAMOCLES 2009
E.U. Research Project

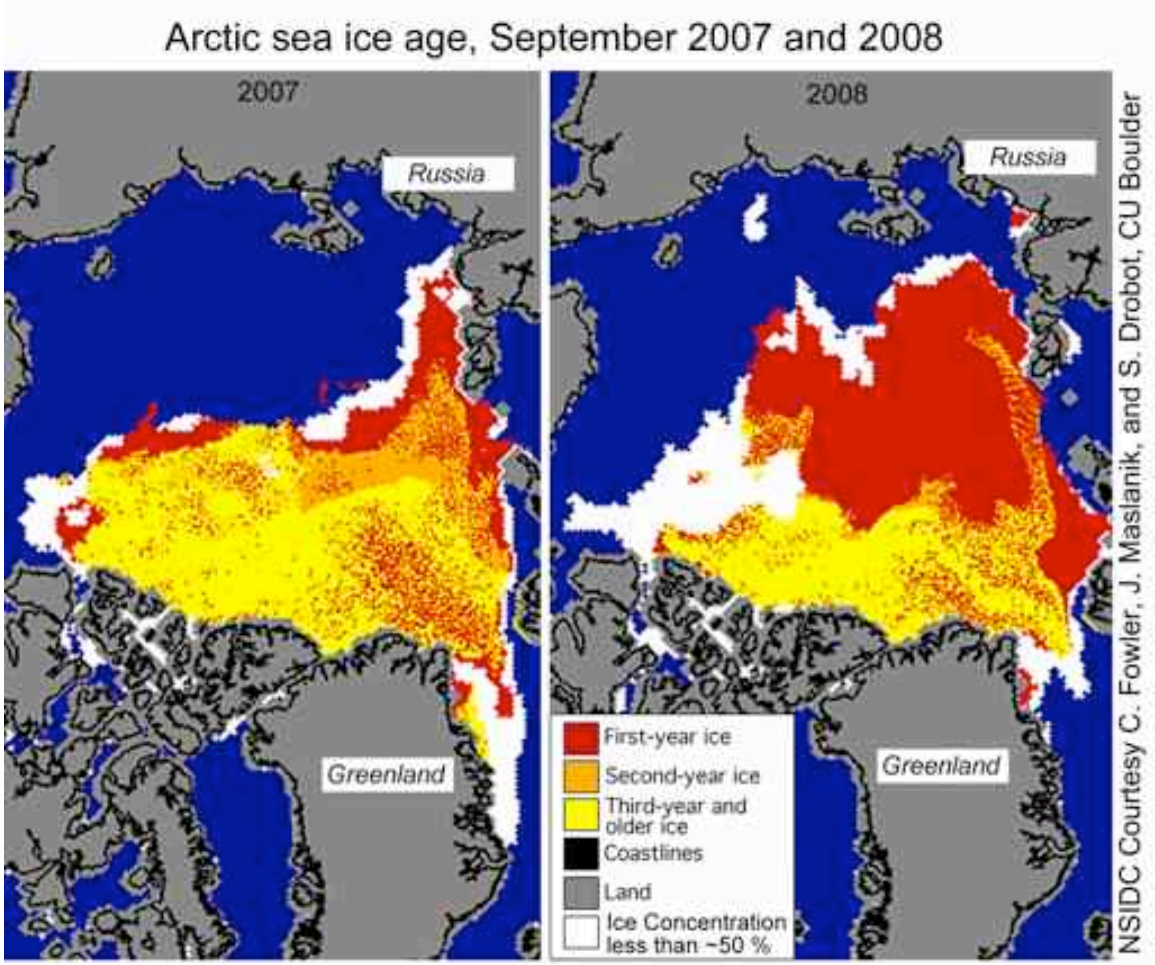
Simulation numérique de la dérive en un an de Tara et de 18 plateformes déployées sur la banquise

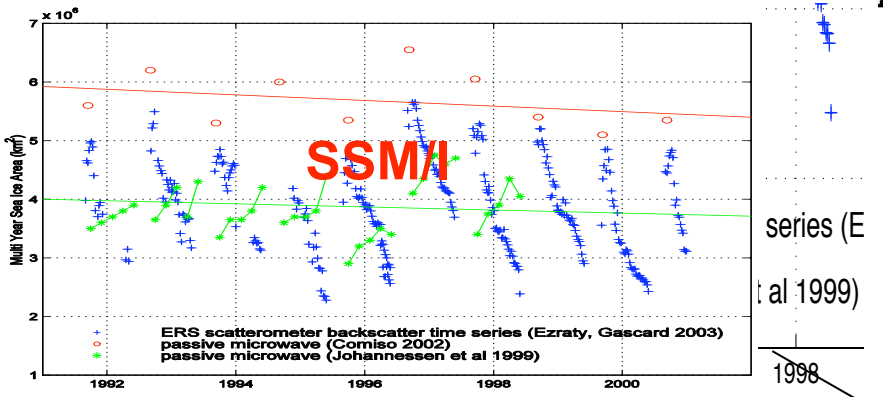


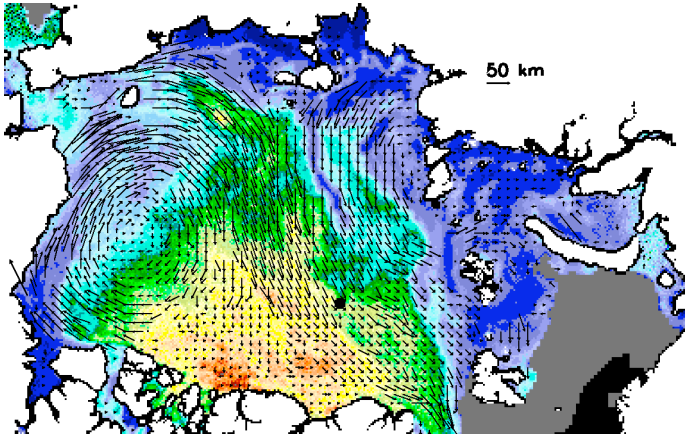
Ice thickness changes



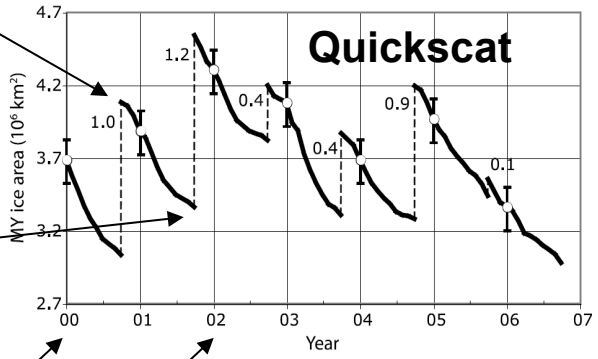
(Rothrock et al. ,1999)


Arctic sea ice age, September 2007 and 2008
2007
Russia
Greenland
2008
Russia
Greenland
First-year ice
Second-year ice
Third-year and older ice
Coastlines
Land
Ice Concentration less than ~50 %
NSIDC Courtesy C. Fowler, J. Maslanik, and S. Drobot, CU Boulder





Four days Sea-ice drift (April 30-May 3, 2002)

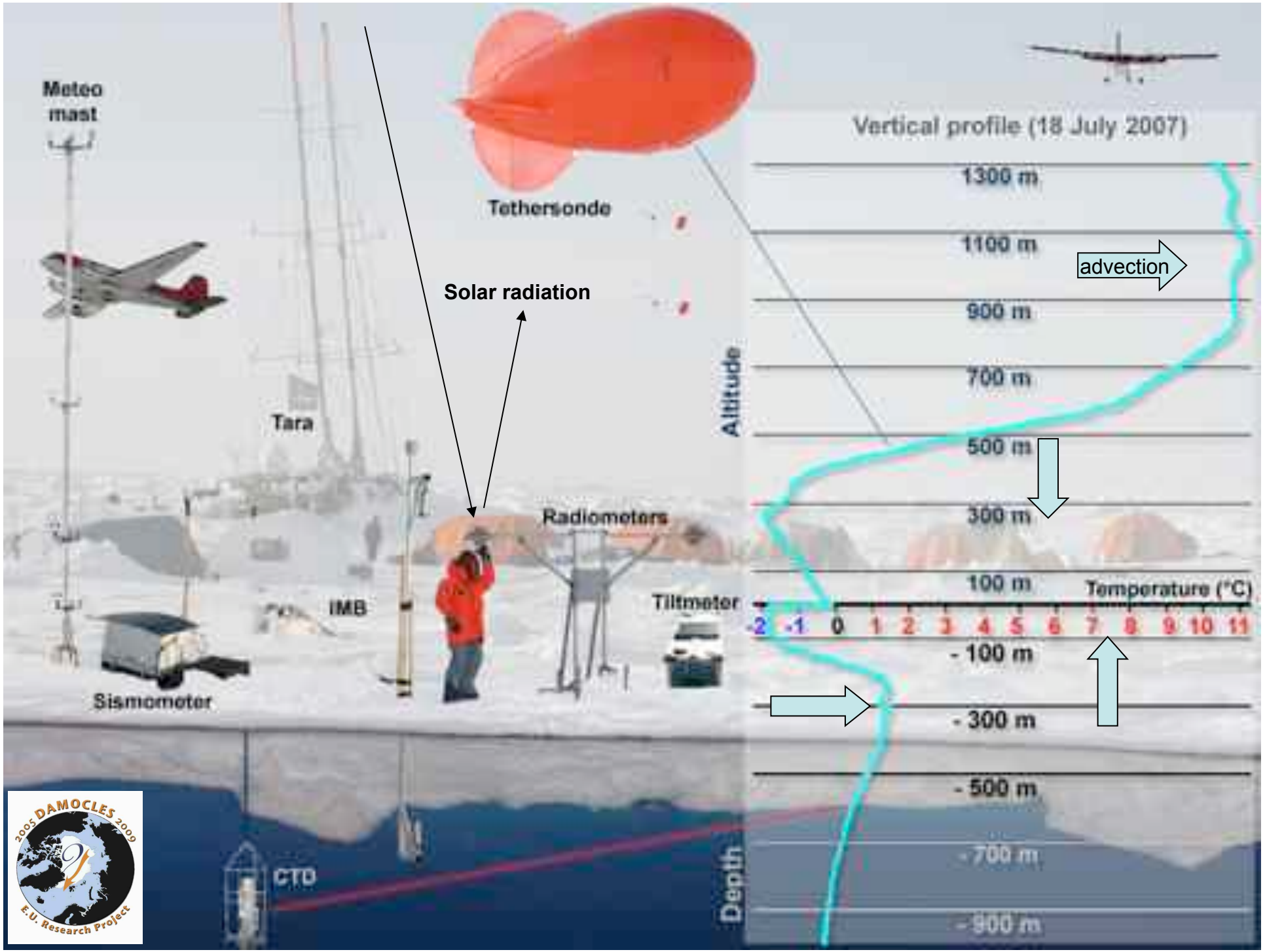


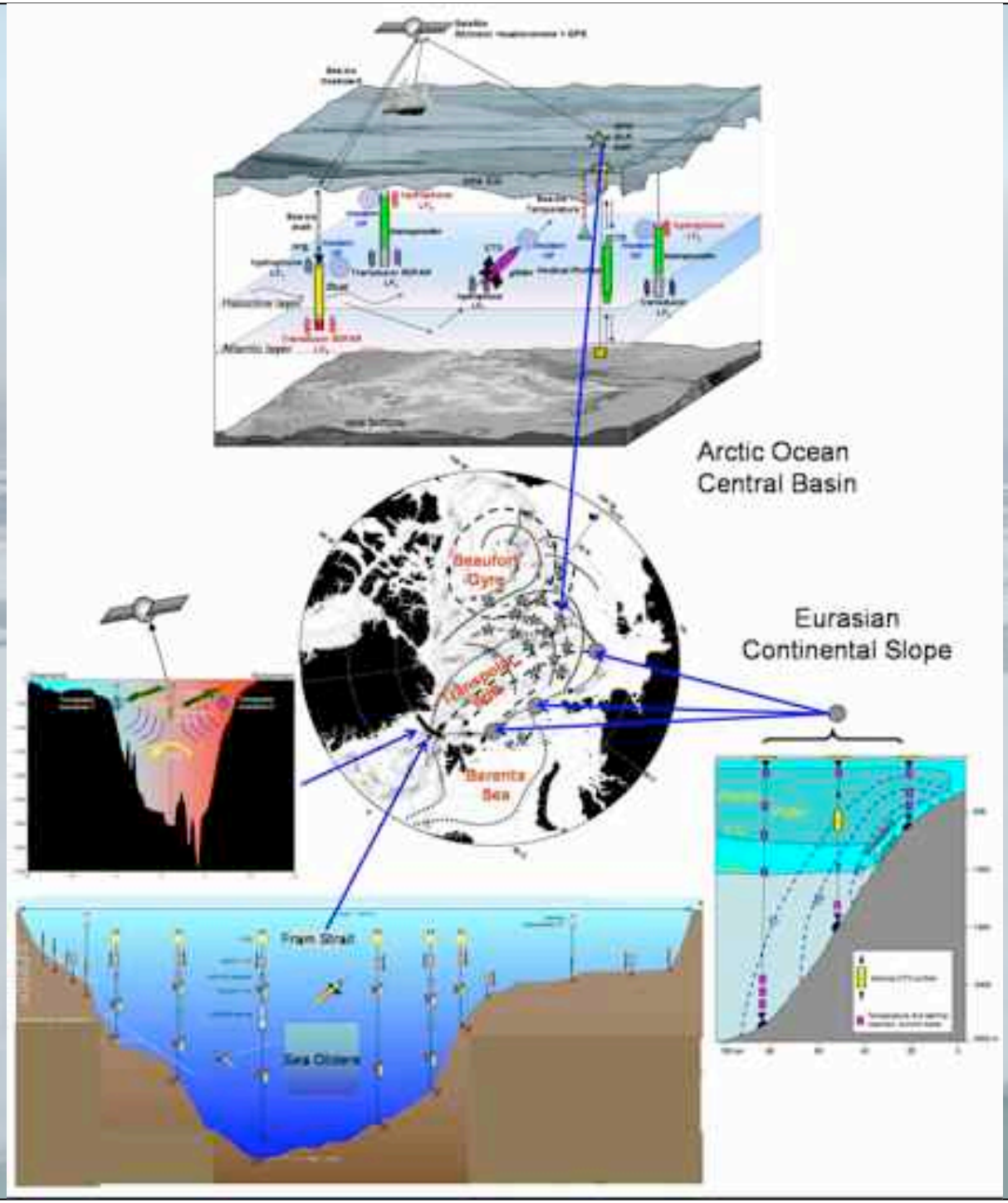
ERS

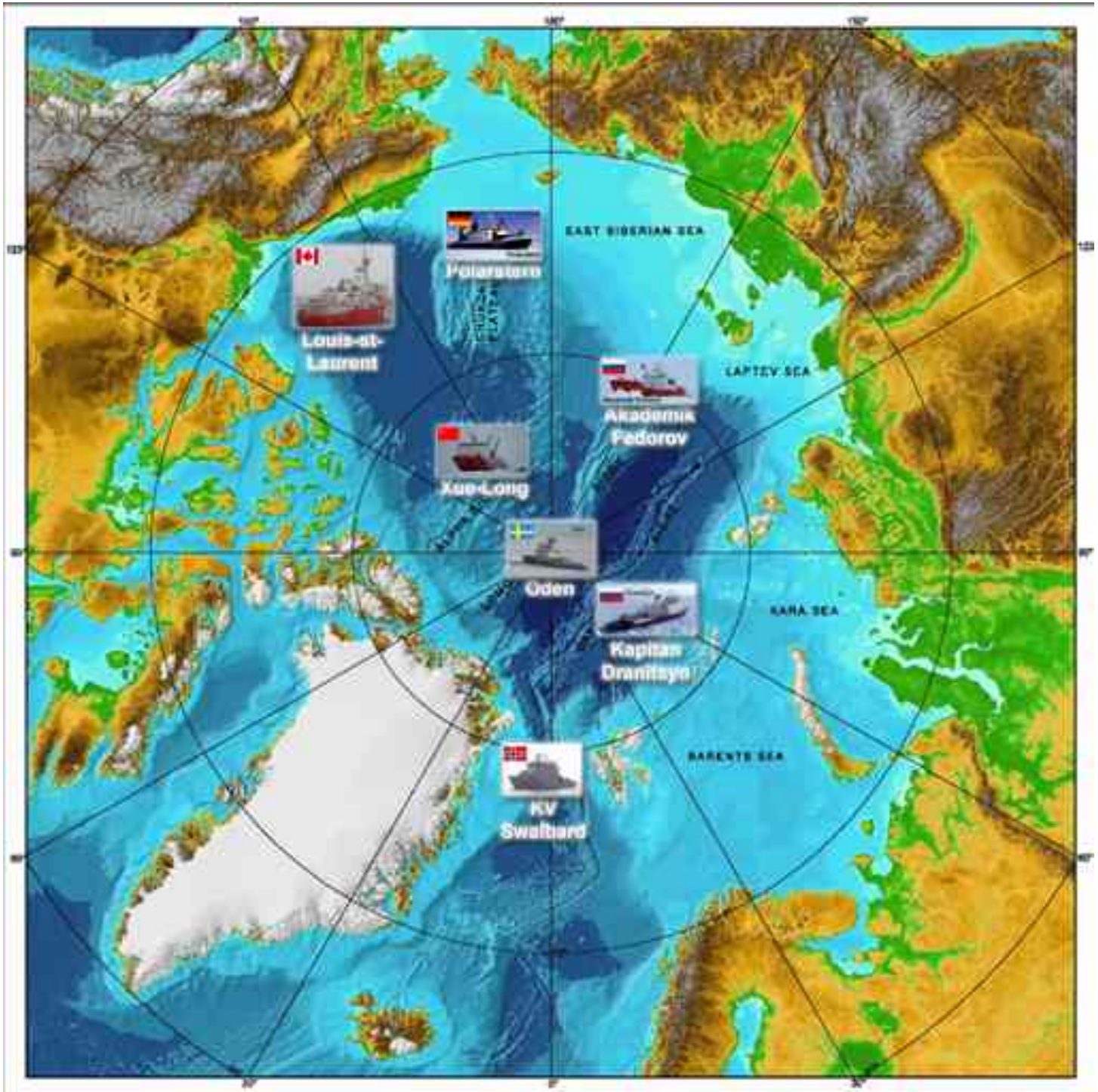
2002

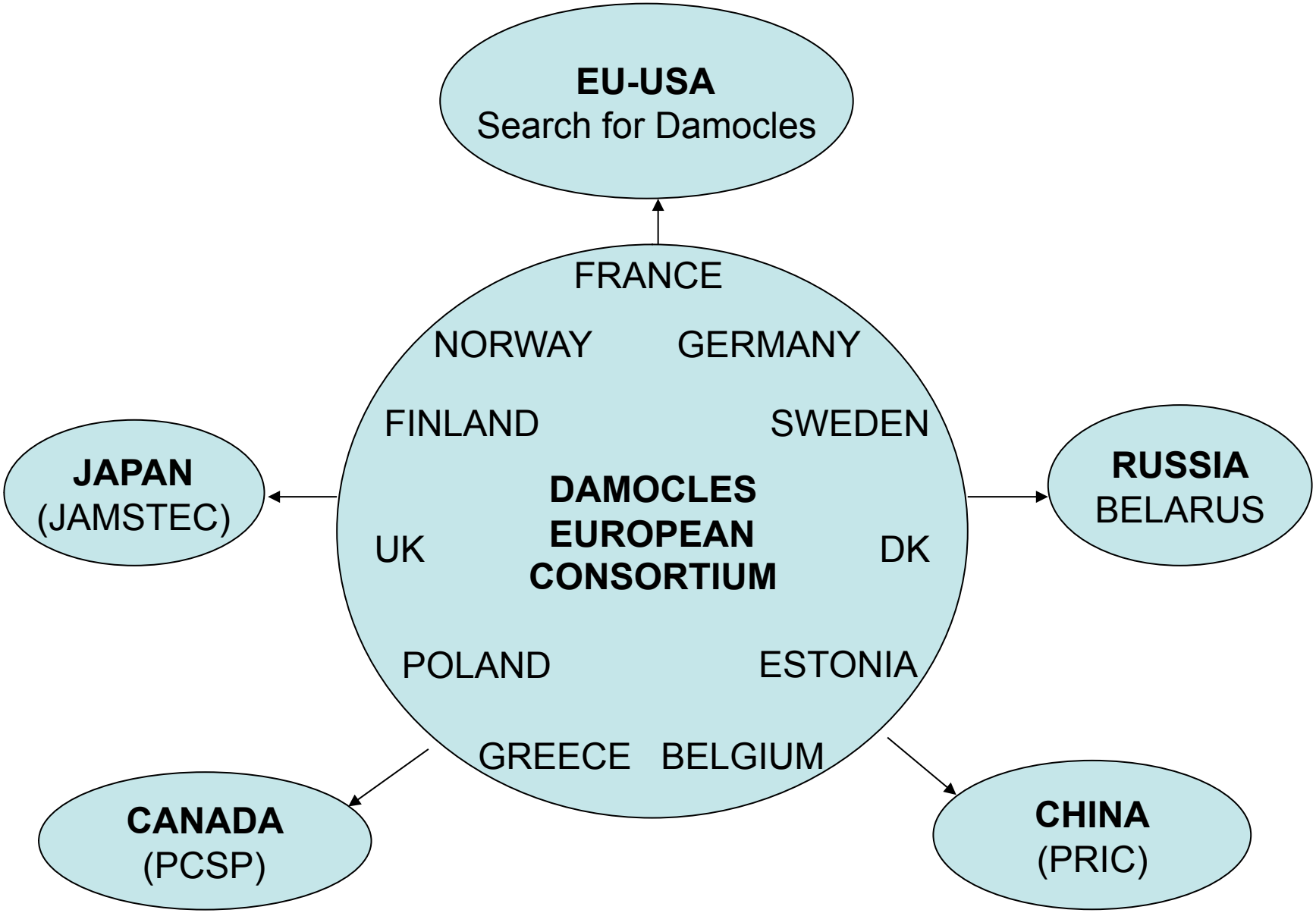
Year

Time series of arctic perennial sea-ice from ERS and Quickscat scatterometer. Backscatter maps and intercomparison with passive microwave data


Meteo mast
Tethersonde
Solar radiation
Tara
Radiometers
IMB
Tiltmeter
Sismometer
CTD
Vertical profile (18 July 2007)
Altitude
1300 m
1100 m
advection
900 m
700 m
500 m
300 m
100 m
Temperature (°C)
-2 -1 0 1 2 3 4 5 6 7 8 9 10 11
- 100 m
- 300 m
- 500 m
- 700 m
- 900 m
Depth
DAMOCLES
2005 2009
E.U. Research Project


Arctic Ocean
Central Basin
Eurasian
Continental Slope
Beaufort
Gyre
Transpolar
Drift
Barents
Sea
Fram Strait
Sea Ozeana


EAST SIBERIAN SEA
Polarstern
Louis-St-Laurent
LAPTEV SEA
Akademik Fedorov
Xue-Long
Oden
KARA SEA
Kapitan Dranitsyn
BARENTS SEA
KV Svalbard



iAOOS & IPY and the International cooperation