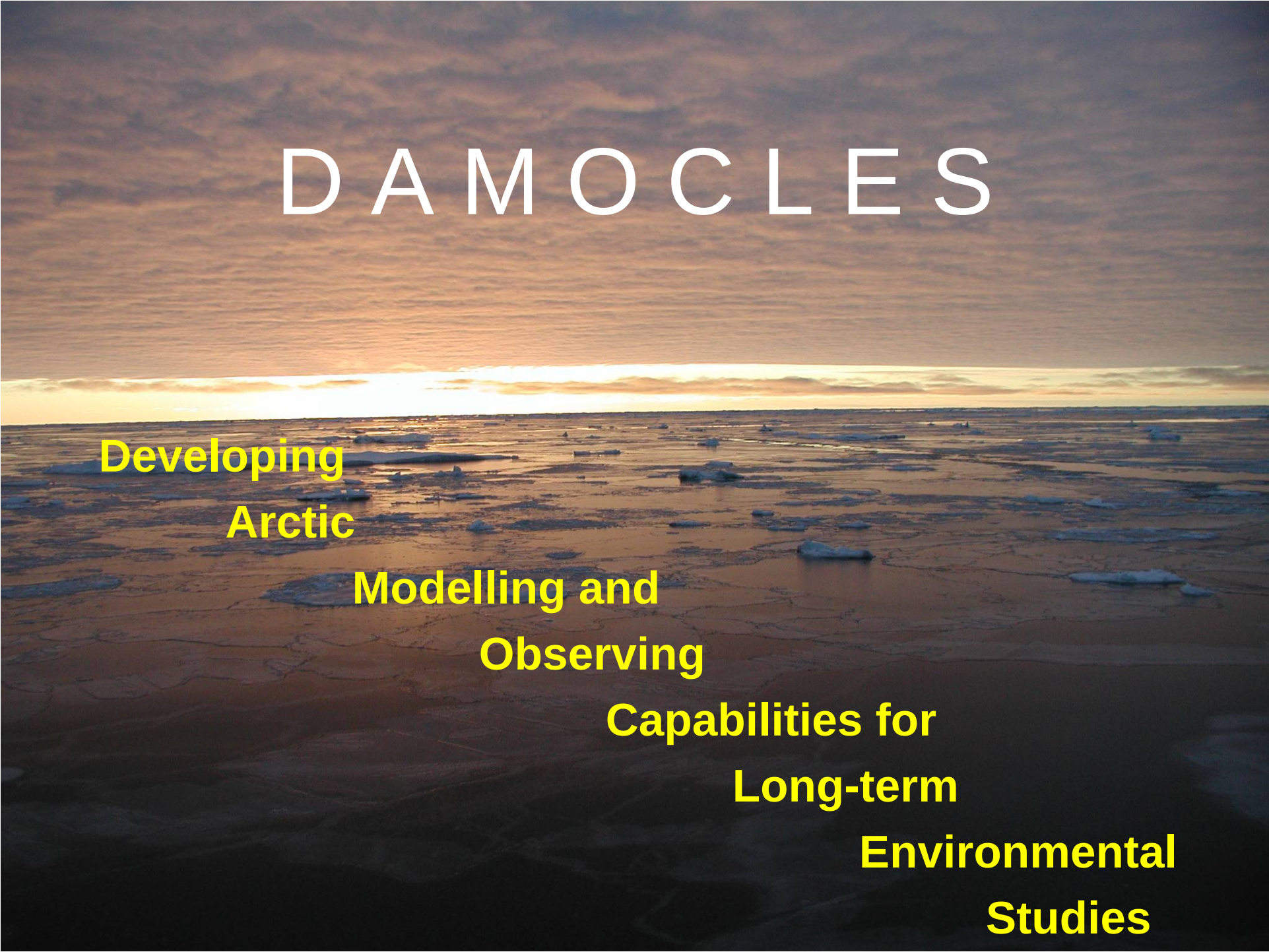


DAMOCLES

A wide-angle photograph of an Arctic sea ice landscape at sunset. The sky is filled with soft, orange and yellow clouds, with the sun's glow visible on the horizon. The sea ice consists of numerous small, irregular floes of varying sizes, some with thin layers of snow, floating on a dark, calm body of water. The overall scene is serene and expansive.

**Developing
Arctic**

**Modelling and
Observing**

**Capabilities for
Long-term**

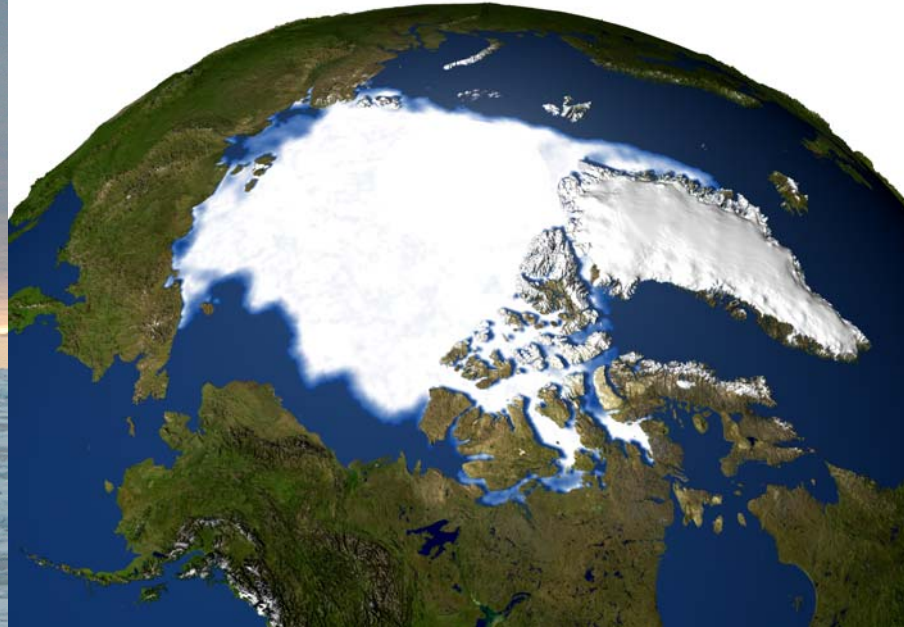
**Environmental
Studies**

What is DAMOCLES ?

- **A four years (2005-2009) European Integrated Project in response to the 3rd call of the 6th FP of the EU, focusing on the Arctic and Climate Changes, including extreme climate events**
- **It concerns**
 - **45 partners institutions in 10 European Countries**
 - **30 Tasks distributed in 8 Workpackages**
- **Official starting date December 1st, 2005**

Sea ice extent minimum

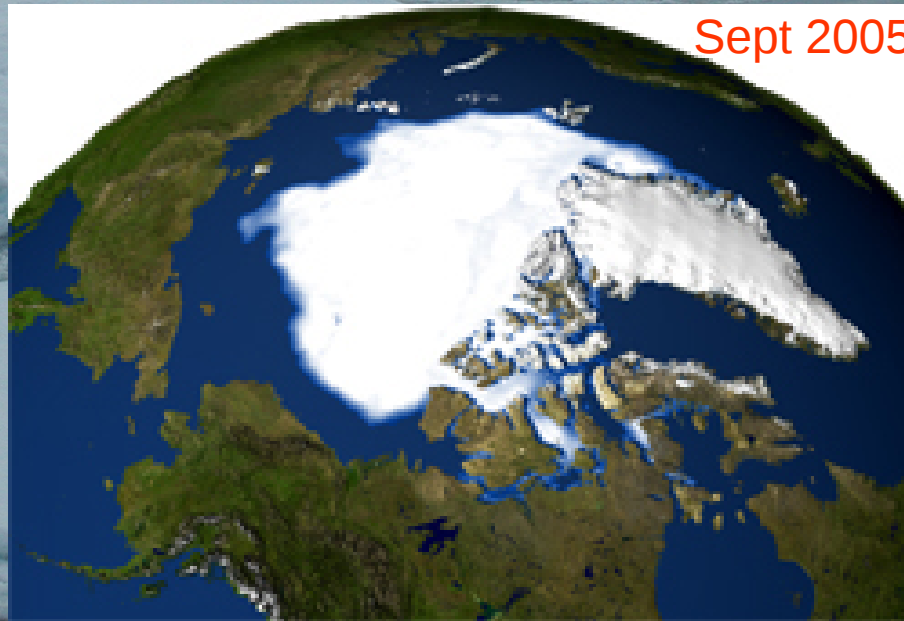
Sept 1979



it concerns
the Atmosphere

Damocles
Is Sea-Ice
centric

Sept 2005



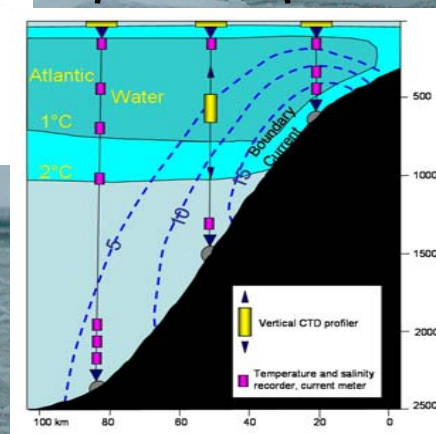
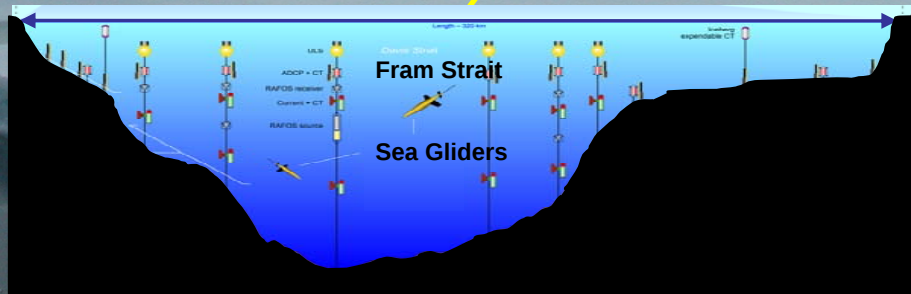
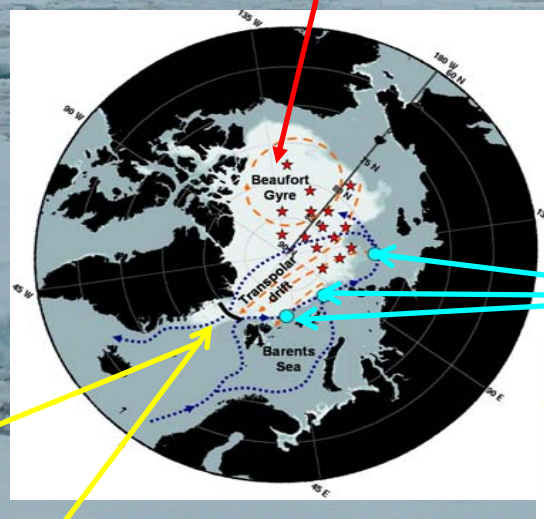
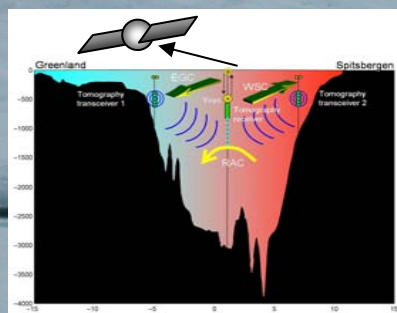
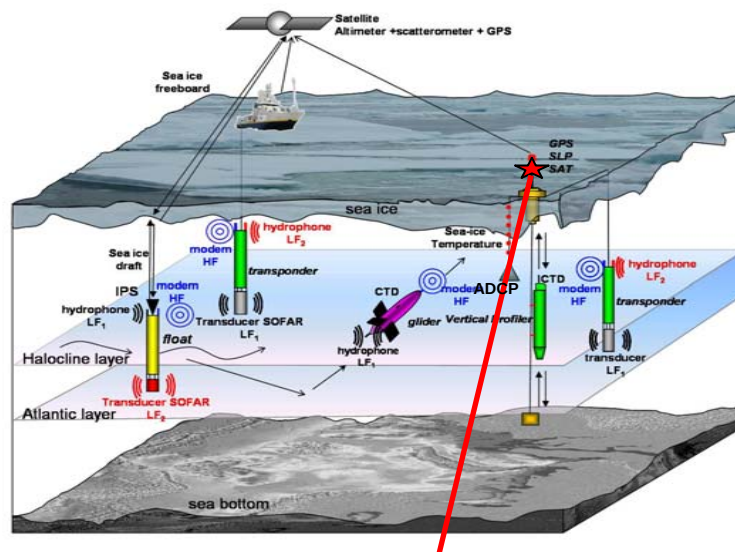
and the Ocean
as well



Durable or Sustainable ?

Climate: an oscillation or a trend?

- Is the Arctic system moving to a new state?
- To what extent is the Arctic system predictable ?
- Is the Arctic Climate as sensitive to global changes as models suggest and what is the predictive capability for the Arctic ?
- To what degree are recent changes in the Arctic Climate of natural or anthropogenic origin?



WHERE IS BELARUS ???

GERMANY

AWI – C. Lüpkes
E. Fahrbach
U.Schauer
R. Gerdes
A. Beszczynska-Moller
C. Haas
M. Rutgers van der Loeff

UB – G. Heygster
C. Melsheimer
L. Kaleschke

UNIHAM- B. Brümmer & J. Meincke

OASYS – F. Kauker
M. Karcher

FastOpt – T. Kaminski
R. Giering

UNITED KINGDOM

CEFAS- S. Dye
R.R. Dickson
UCAM-DAMTP – P. Wadhams
UCL- S. Laxon
POL- C. Hughes
UREADES – K. Haines
SAMS- J. Wilkinson
ATL – A. Smerdon
S. Caine

DENMARK

DMI- S. Andersen
R. Tonboe
R. S.Gill
DTU- P. L. Toudal
DNSC- R. Forsberg

BELGIUM

IPF- A. Huber
N.Johnson-Amin

FINLAND

FIMR- J. Haapala
J. Launianen
B. Rudels
T. Stipa
UoL- P. Kankaanpää
FMI- T. Vihma
C. Fortelius
HUT- M. Vainio

POLAND

IOPAN – J. Piechura
W. Walczowski
P. Schlichtholz

NORWAY

NERSC – O. Johannessen
S. Sandven
H. Drange
H. Sagen
K. A. Lisaeter
Met.no – H.Schyberg
C. Mauritzen
O. Godoy
J.Debernard

NPI- E. Hansen
S. Gerland

IMR – H.Loeng

UiB – P. M. Haugan
K. Arild Orvik
I. Fer

UNIS – F. Nilsen

CICERO – G. Eskeland
A. Aaheim

NAXYS – J. Abrahamson
Aanderaa – K. G. Frøysa

GREECE

FORTH- E. Skarsoulis

ESTONIA

UT- J. Jaagus

RUSSIA

SRC AARI- S.Priamikov
Sokolov
Ashik
SIO – S. Pisarev
Y. Egorov
D. Darbinian
S. Vavilov
N. Dikareva

FRANCE

UPMC – J. C. Gascard
P. Bouruet-Aubertot
F. Vivier
H.Lemoine
E.Billi

IFREMER – R. Ezraty & G.Loaec

CNRS/LGGE – J. Weiss

UdS- D. Marsan
J.P. Metaxian

MSI- P. Brault

CPX – C. de Marliave

IPEV – A. Desautez

ENSIETA – N. Seube
& I. Probst

External partners Cooperation EU-US

“SEARCH for DAMOCLES”

LDEO – P. Schlosser

IARC – J. Walsh

UAF – H.Eicken

WHOI - A.Proshutinsky & J. Toole

APL – C. Lee & J.Morison

CRREL - J.Richter-Menge & D.Perovich

JAMSTEC – T. Kikuchi (J. CAD)

IOS – H. Melling (IPS)

SWEDEN

SMHI – R. Döscher
H. E. M. Meier
K. Wyser
K. Borenäs
J. Söderkvist
N. Gustafsson
S. Gollvik
V. Perov
L. Axell
L. Funkquist

SU- M. Tjernström

UGOT – L. Anderson
G. Björk

DAMOCLES

Arctic modeling MUST include snow as an important constituent of the Arctic environment

Snow covers most of Arctic area. Just snow

- *determines*
 - *the reflection of sunlight*
 - *temperature regime of underlying ice*
- *regulates melting*
- *Snow albedo strongly depends on pollution amount*
- *Soot contamination in many Arctic region increases*



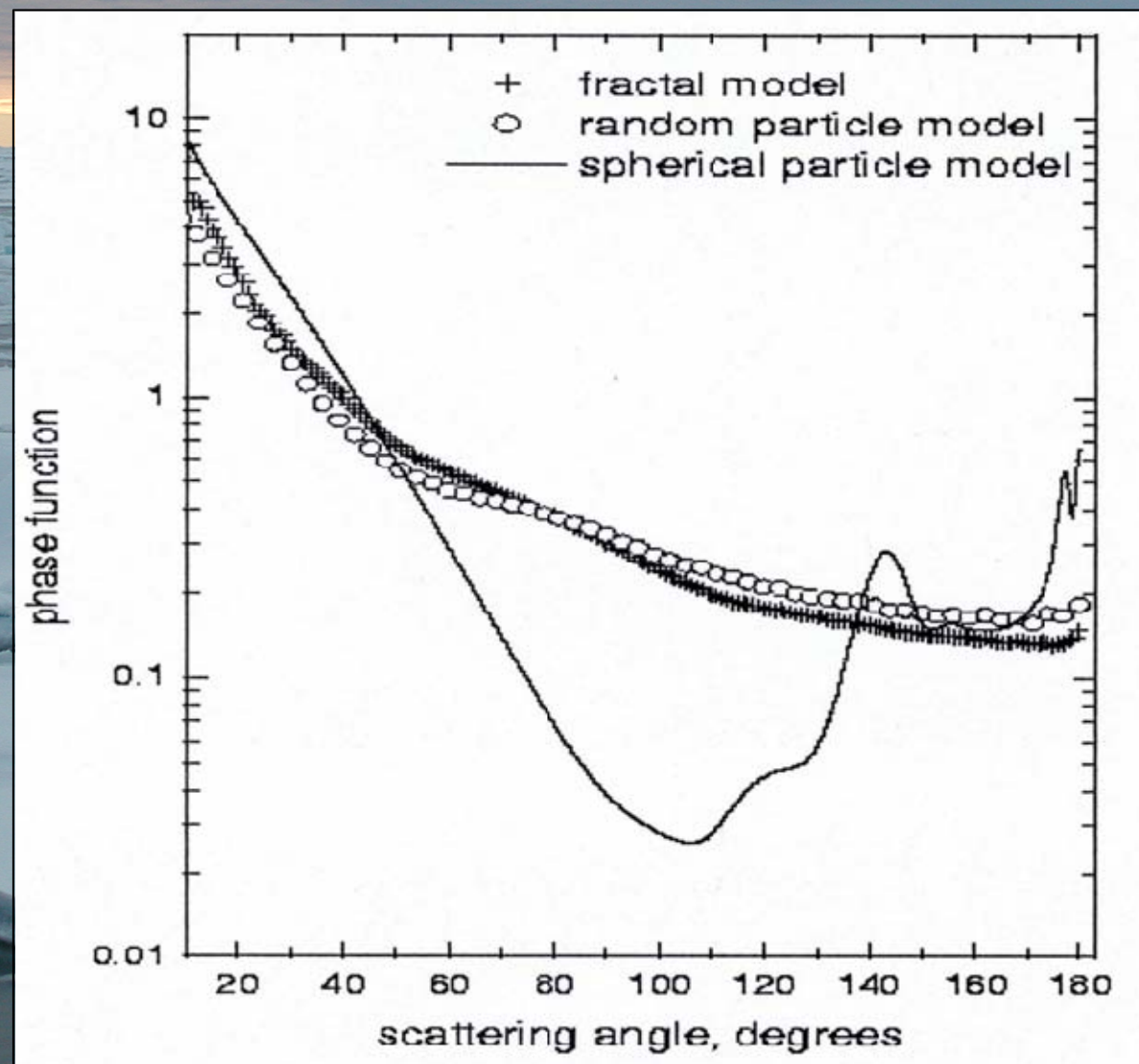
Climate change model should include snow

APPROACHES IN SNOW OPTICS

	Habitual approach	Ours
Model	Spherical independent particles	Irregularly shaped close packed particles
Extinction, absorption, phase function	Mie Computations	Analytical solution: geometrical optics + Fraunhofer diffraction
Reflection, transmission	Radiative transfer equation (RTE)	Analytical asymptotic solution of the RTE

A.A.Kokhanovsky, E.P. Zege "Snow Optics", Appl. Optics, 2004

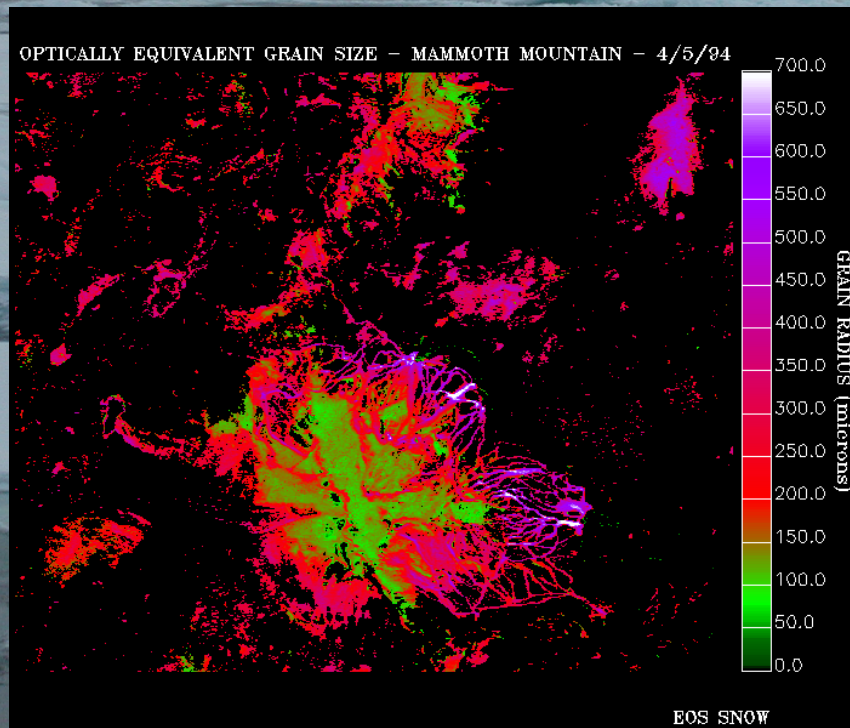
THE FRACTAL PARTICLE MODEL: PHASE FUNCTION



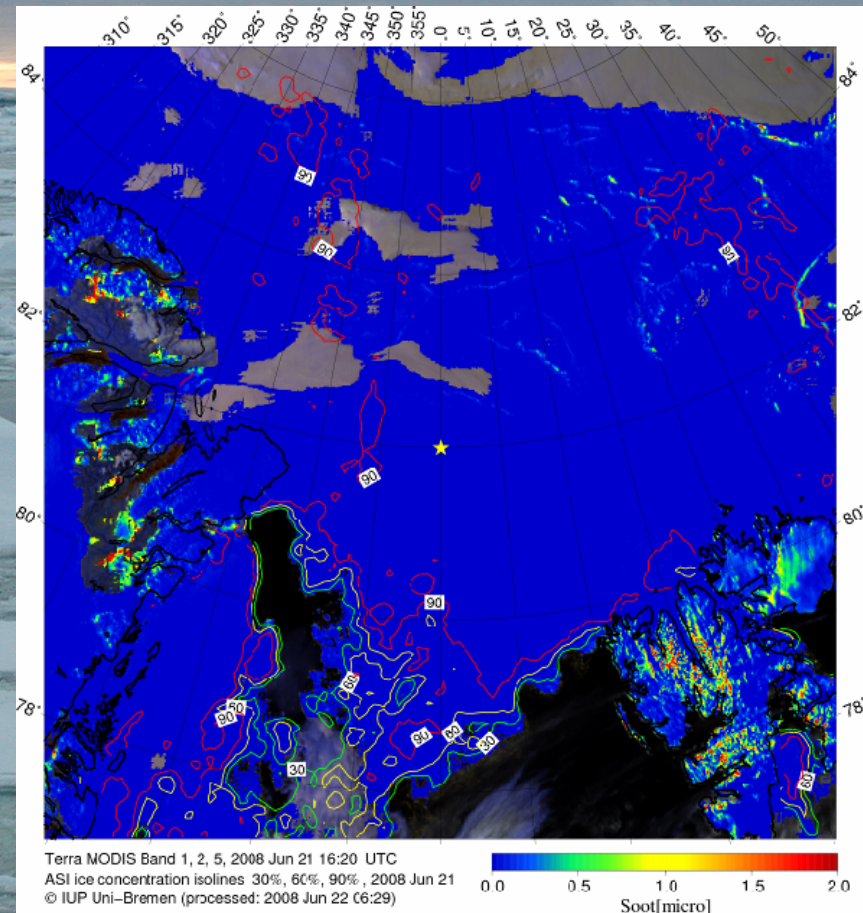
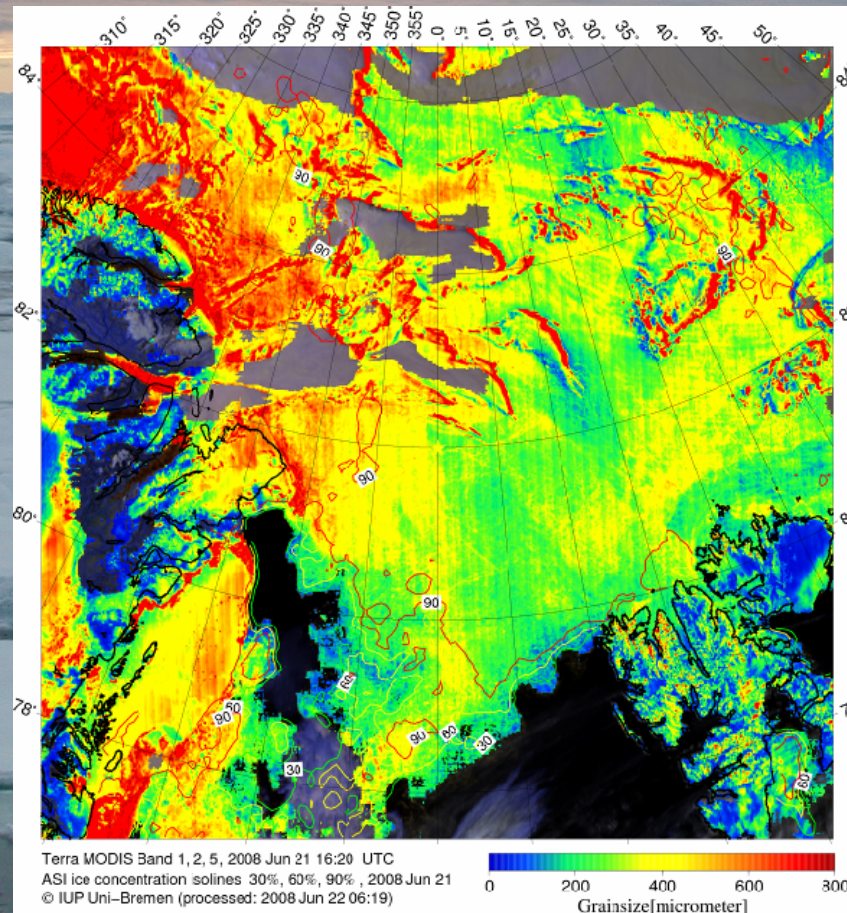
Properties of snow are important

- *Microwave measurements of ice thickness are strongly affected by snow cover*
- *Knowledge of snow properties is needed to treat the microwave measurements:*
 - *Snow grain size*
 - *Soot concentration*

Main goal:
to develop
and verify
the algorithm for the retrieval
of snow grain size
and pollution amount



Processing chain for NRT MODIS data including SGSP algorithm



CONCLUSION

- There are a lot of great scientific projects in the **FPS** of the **EU**
- **You can find your place!**