

“SPACE - Synoptic Pan-Arctic Climate and Environment Study”

Proposal for an Arctic IPY 2007 activity

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The International Polar Year envisions to combine efforts to conduct polar observations in a much more coordinated frame than at other times. Climate research will specifically benefit from a such an effort, since it provides the probably unique possibility to obtain a synoptic survey of the state of the Arctic climate and particularly of the Arctic Ocean.

During the last decades, observational data sets revealed dramatic changes in the Arctic and subarctic oceans like the Great Salinity Anomaly, a reduction of sea ice thickness and extent and in the same time the extensive warming of intermediate layers as well as changes in the circulation of the ice cover and upper ocean. These changes are linked to the variability of large-scale atmospheric patterns.

Particularly in the Arctic Ocean, data indicating change were obtained during individually planned cruises. All of these cruises revealed basic insights in the circulation patterns and in the same time demonstrated the variability of the system. However, they covered mostly different areas at different times and notably left large uncertainties in distinguishing spatial and time variability.

A coordinated effort of several international ice-breakers during IPY 2007 would enable to cover the key areas during the same year and thus to carry out a “**Synoptic Pan-Arctic Climate and Environment Study (SPACE)**”. In combination with existing or planned long-term observation programmes (e.g. ASOF, Northpole station, SEARCH, ...) a synoptic survey should be designed which allows to distinct between advected and locally induced features and processes taking place in the Arctic, to allow tracing patterns and determining lags.

In close accordance with the on-going discussion of the scientific goals of the IPY in the various involved panels we propose a series of sites in the Eurasian Arctic Ocean where multidisciplinary measurements should be made with regard to the properties and distribution of water mass, sea ice and biota. We anticipate that such activities will be complemented, especially in the Canadian/American sector, by field work from other proposals. Some of the here proposed sections – obviously some of those in the high Arctic - should be taken by Polarstern. Several EU-projects aim to contribute to the IPY with field work (ASOF-Fram, CARE, ...) and might comprehend this programm.

Proposed sections for a SPACE contribution with the German Ice Breaker Polarstern in the Eurasian Arctic:

Section BO – across the entire western Barents Sea Opening to capture the respectice part of inflow of Atlantic Water, recirculation and the Arctic Ocean outflow. Particular attention should be given to the Norwegian Coastal Current as one of the freshwater sources for the Barents Sea. The southern part of this section is run annually since several decades.

Section FS - across Fram Strait to capture the respective part of inflow of Atlantic Water, Fram Strait recirculation and the Arctic Ocean outflow. This section was surveyed during several years in the last decades, since 1997 annually.

Section SG –from northern Svalbard to northern Greenland. This section was run in 1991 by Oden and part of it by various other cruises. It captures the Fram Strait Atlantic Water boundary current and the various branches returning from the Eurasian and Canadian Basins towards Fram Strait.

Section FN – north of Franz-Joseph-Land to the North Pole covering the circulation in the Eurasian Basin upstream of the confluence of the Fram Strait and Barents Sea branches in the St.-Anna-Trough. Captured by Oden 1991 and partly by Polarstern 1993, LS-St-Laurent 1994 and by various SCICEX cruises.

(At the North Pole, an international ice-breaker meeting and a respective party could take place. This affords an extra sophisticated co-ordination.)

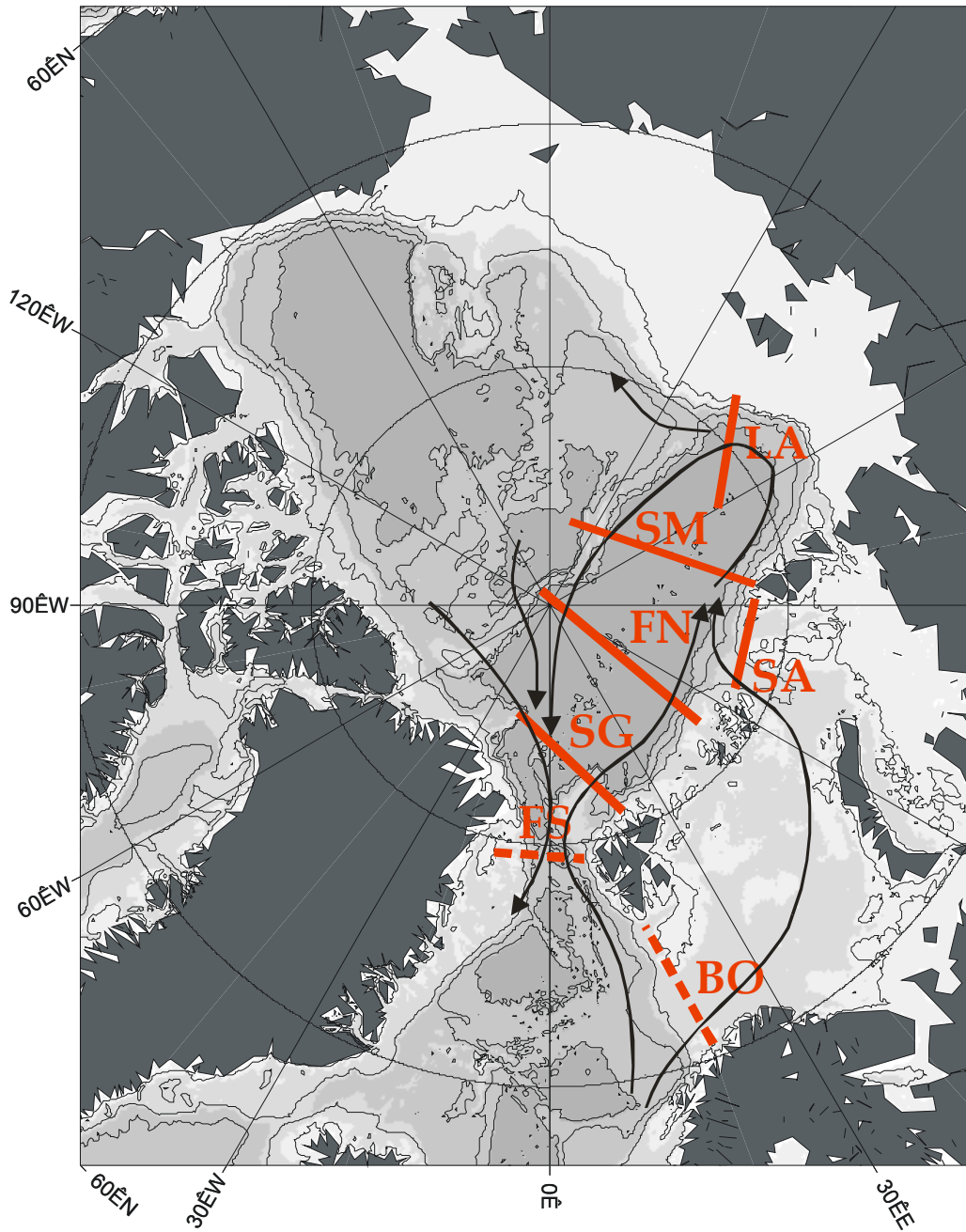
Section SA – across the St. Anna Trough to measure the input of the Barents Sea branch of Atlantic Water to the central Arctic Ocean after its modification in the Barents Sea. Data from this section exist from Northwind in 1965 and from Polarstern in 1996.

Section SM – from north of Severnaya Zemlya to the Makarov Basin. This captures the confluence of the Fram Strait and Barents Sea branches and recirculation of the so formed boundary current within the Nansen and the Amundsen basin. Part of it was taken by Polarstern in 1993, 1995 and fully in 1996.

Section LA – north of the Laptev Sea to capture the boundary current in the Amundsen Basin before it branches into the Canadian Basin and along the Eurasian side of the Lomonosov Ridge. Captured in 1993, 1995 and 1996 by Polarstern.

At this stage it is not possible to suggest in detail which of the sections should be taken by Polarstern and which by other vessels. This will depend on further development of the IPY programme.

Proposal Polarstern IPY 2007



(BO Barents Sea Opening)

(FS Fram Strait)

SG Svalbard - Greenland, Yermak/Morris Jessup Plateau

FN FranzJosef Land - North Pole

SA St. Anna Trough

SM Severnaya Zemlya - Makarov Basin

LA Laptev Sea - Amundsen Basin

- Polarstern or other ice breaker
- - - - - no ice breaker necessary