

Polar research in the Nordic countries: a publication-based approach

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The study

- n Survey funded by the Research Council of Norway
 - § Study of Norwegian polar research
 - § Survey of research activities on Svalbard (Spitsbergen)
 - § Mapping of global polar research – based on publications

Background

- n Research activities in the polar regions have expanded significantly in recent decades
- n Due in part to the awareness that the Arctic and the Antarctic play key roles in environmental problems such as climate change and ozone depletion
- n Prospects for oil and gas in polar oceans, potential expansion of sea-based transport and fisheries management have raised the needs and interests for increased research activities
- n Polar research has a strong geopolitical dimension connected to sovereignty claims
- n The International Polar Year (IPY) 2007-2008: a campaign for research to strengthen research activities in the polar regions

Polar research in the Nordic countries

- n Long research traditions in Arctic and Antarctic
- n Arctic rim states: Denmark (Greenland) and Norway (Svalbard)
- n Norway: Antarctic claimant
- n Norway, Sweden and Finland Consultative Parties of the Antarctic Treaty System

Delimitation

- n Polar research not a traditional scientific discipline. Rather than being defined according to thematic focus, it is geographically delimited
- n Polar research encompasses a range of disciplines from the humanities to technology and engineering, although the greatest proportion of research is carried out within the natural sciences.
- n In contrast to most other areas of science, it is hard to identify polar research based on journals. Only a limited portion of research findings are published in specialized journals for polar research (e.g. *Arctic*, *Polar Biology*, *Polar Research* etc.).

Definition

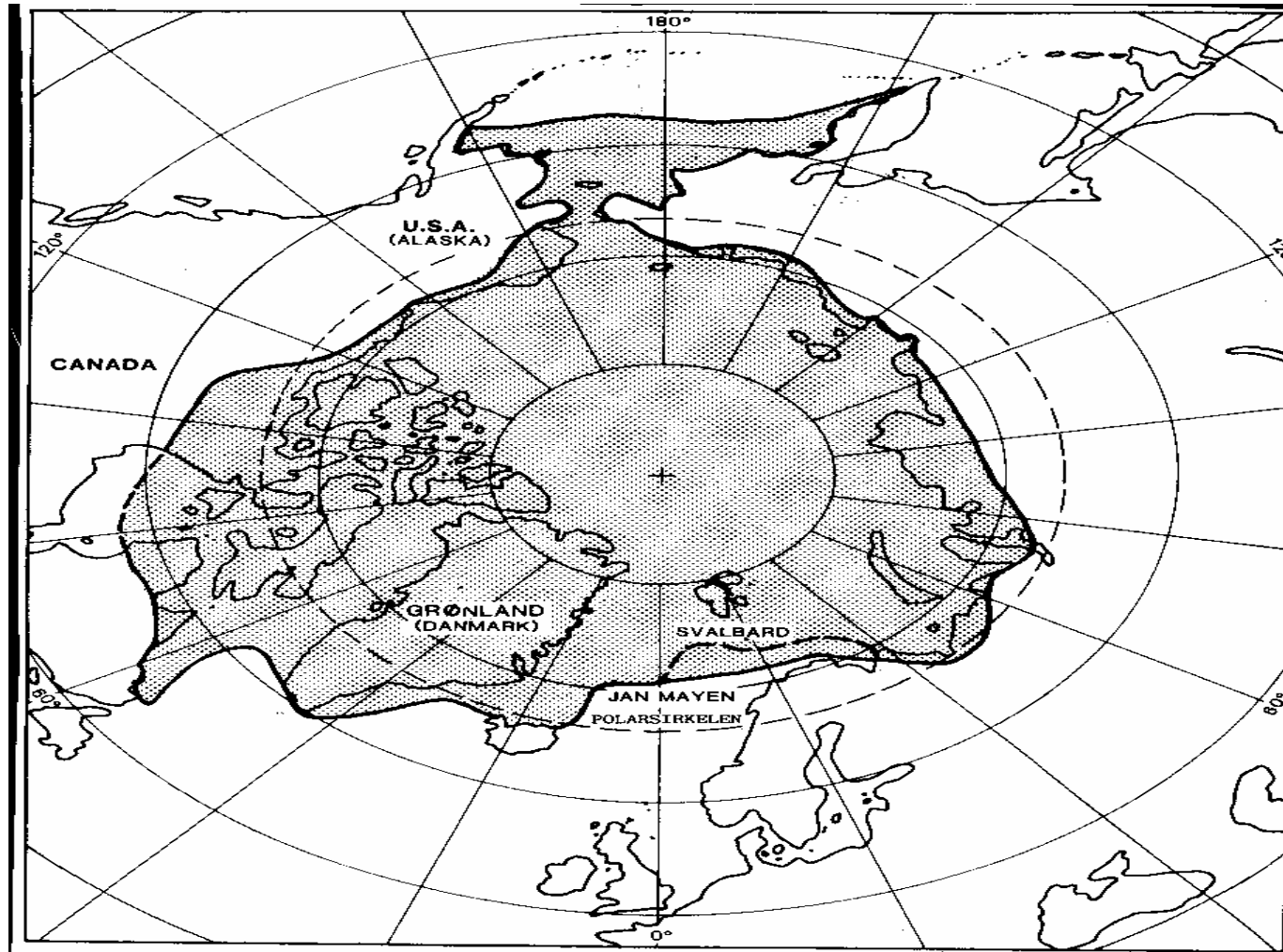
- n In this study we have used the following definition (cf. Ministry of the Environment, Norway 1993):

Research carried out on the basis of material from the polar areas (Arctic and Antarctic) or concerning phenomena localized in the polar areas.

Arctic: The land areas north of the tree line with continual permafrost and the ocean areas north of the limits for maximal sea ice.

Antarctic: The areas south of the Antarctic convergence (the borderline between cold and hot water at 50 to 60°S).

Arctic



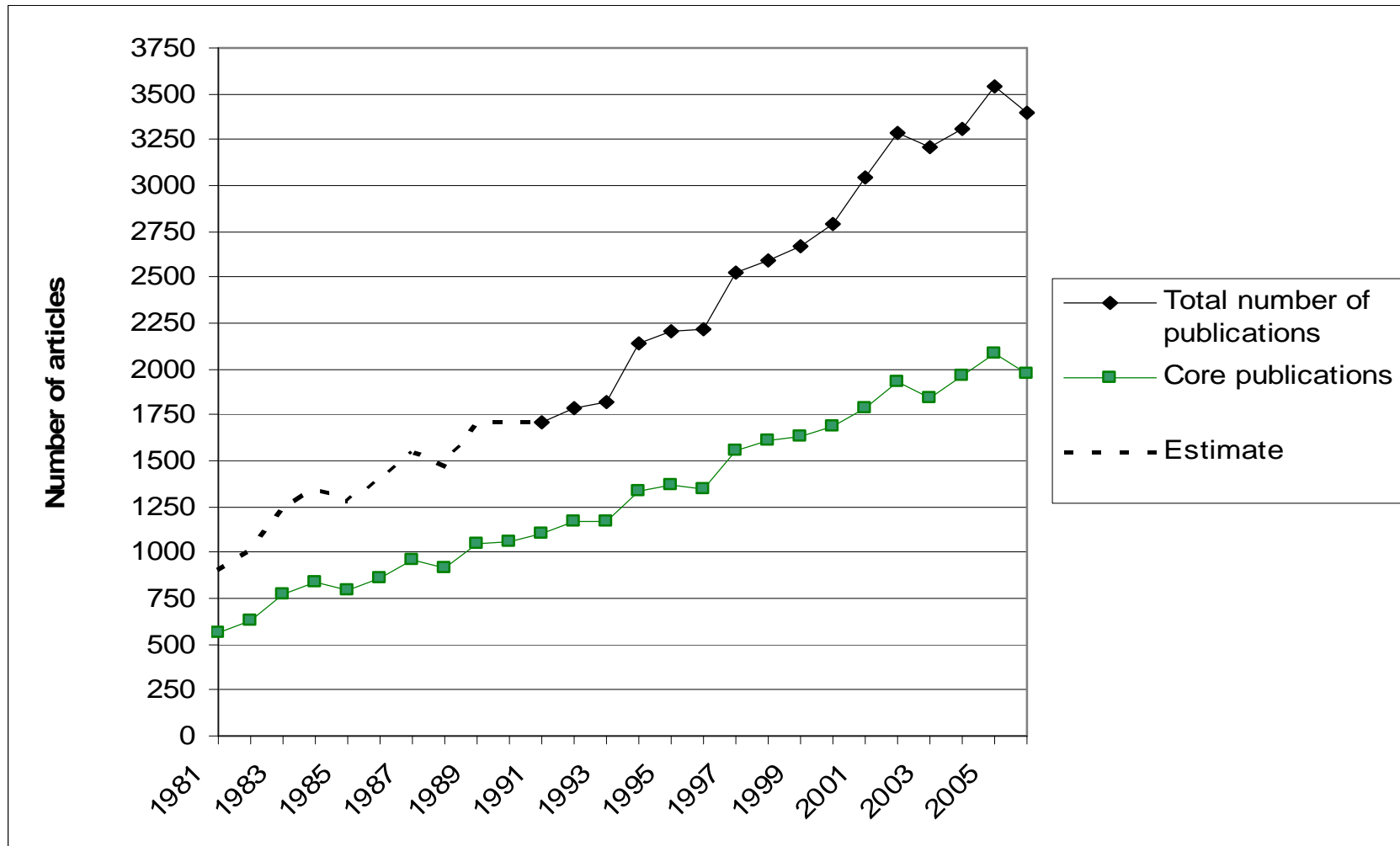
Data & methods

- n Data: Web of Science (ISI)
- n 1. Included all publications from the journals that entirely or mainly cover polar research.
- n 2. Applied geographical search terms for identifying the publications (Antarc*, Greenland, Svalbard...)
- n Search through the titles and abstracts of all the publications in the database
- n 1981-2007 analysed

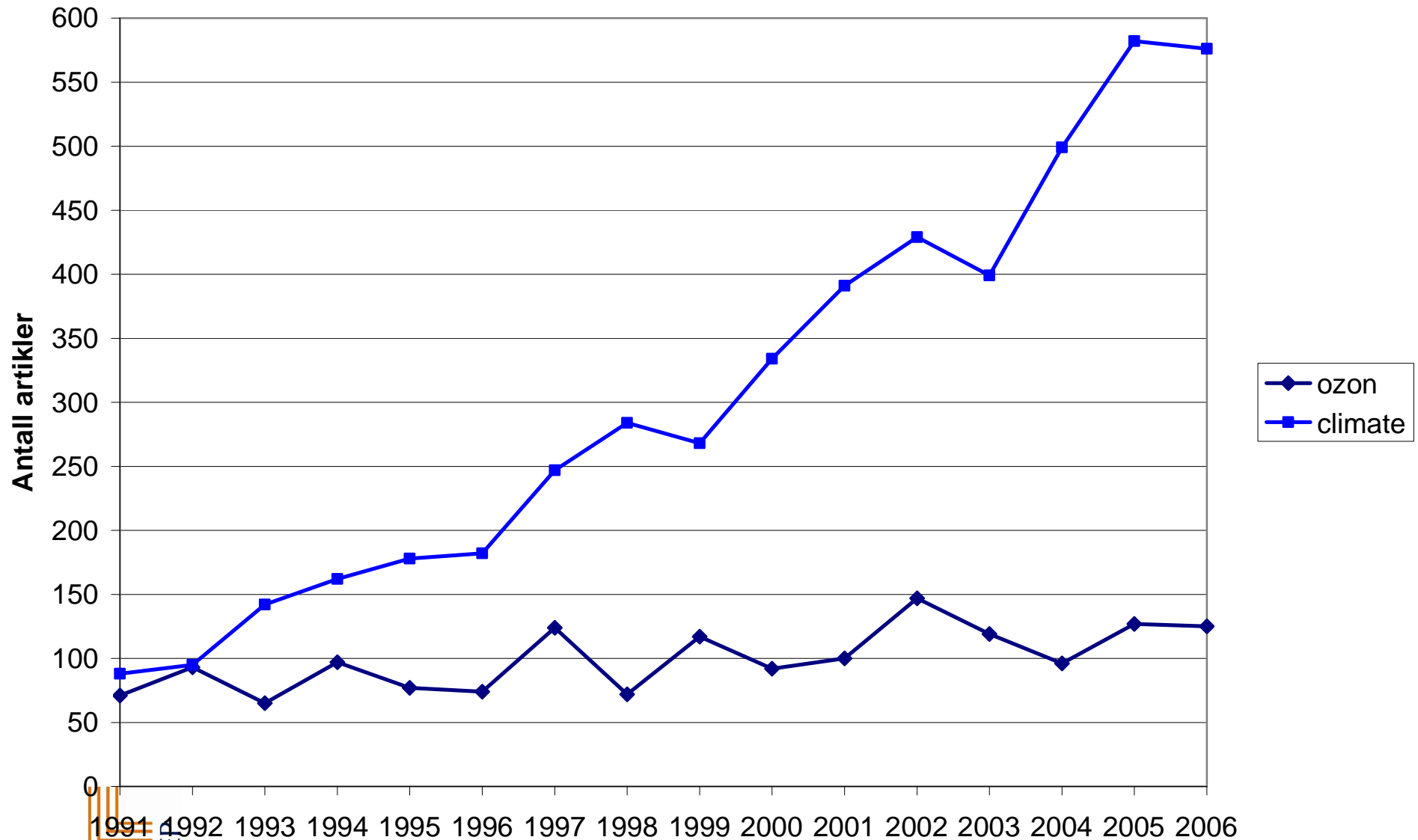
Results

- n Identified 53,000 polar research articles from the period 1981-2007
- n Number of publications: an indication of the polar research efforts of the different countries

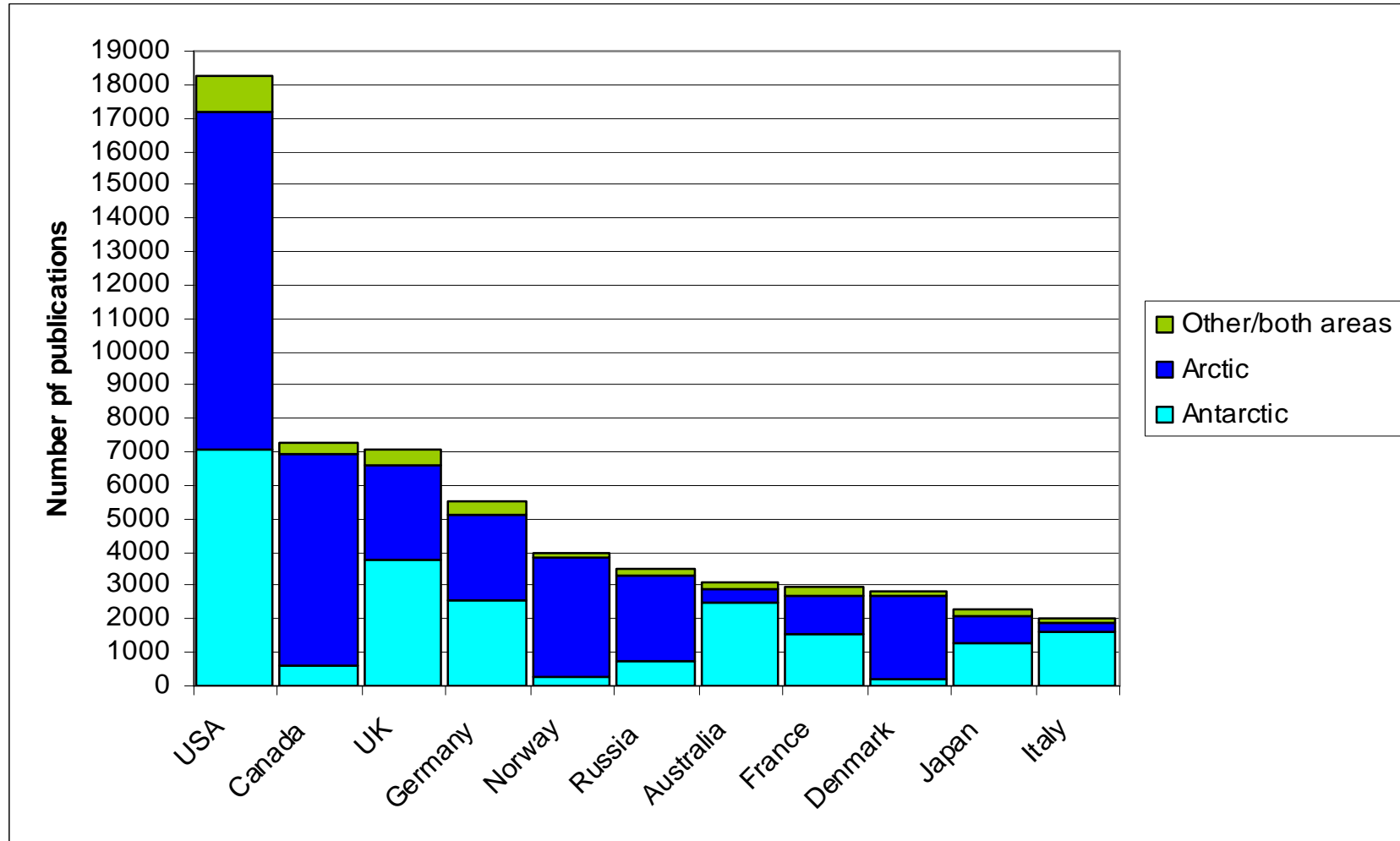
Total number of polar research articles, 1981-2006



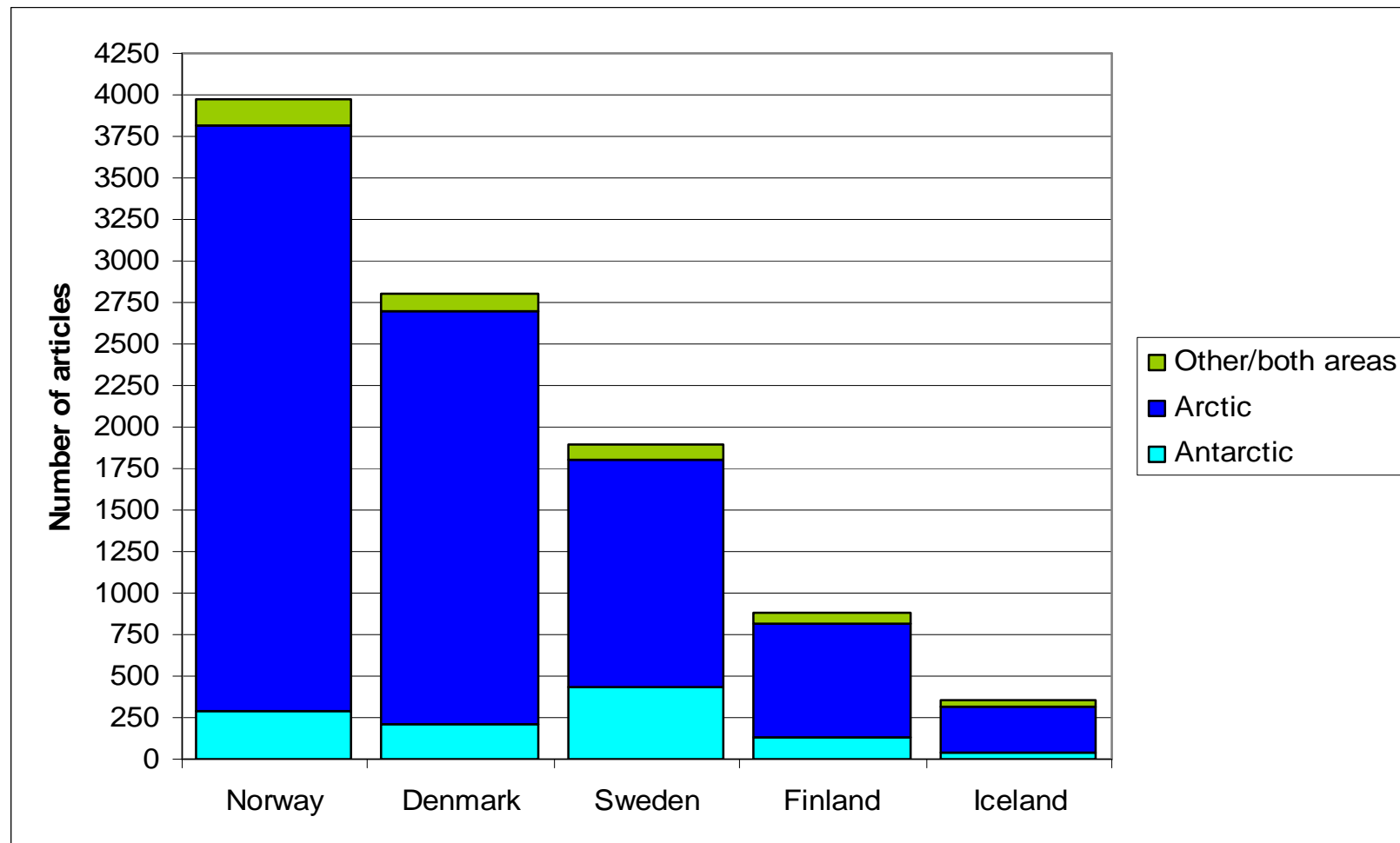
Examples: changing research focus. Ozon vs. climate – number of publications



Total number of polar research articles, by country, 1981-2007



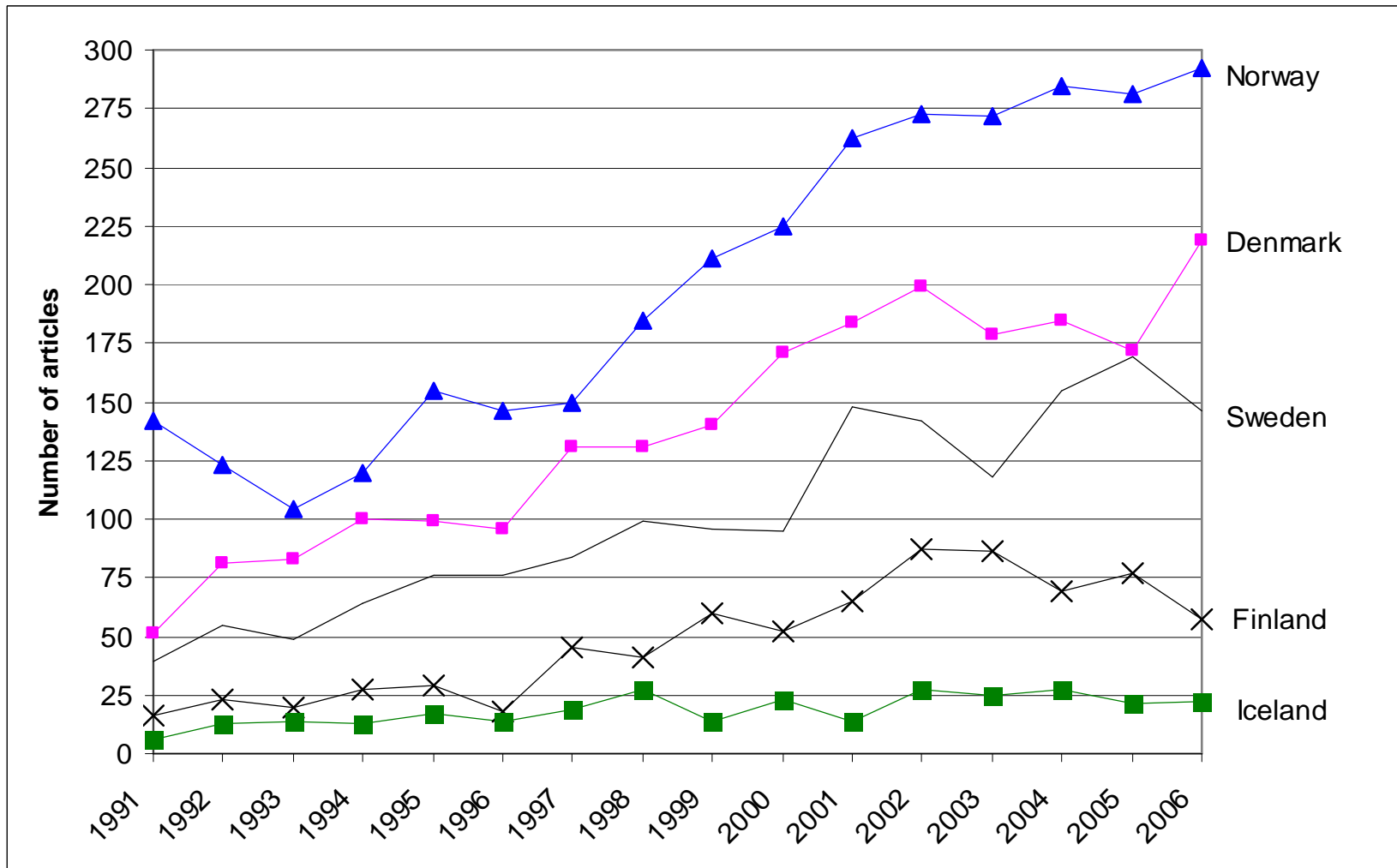
Total number of polar research articles, by country, 1981-2007



Results

- n Norway is the fifth largest polar nation in terms of publications, Denmark the ninth.
- n Polar research is one of few disciplines where Norway is a major contributor to the World's science: Norway's total publication share (all fields) is 0.6 % - but in polar research 6 %.
- n All the Nordic countries have little research output relating to the Antarctic.

Number of polar research articles, Nordic countries, 1991-2006



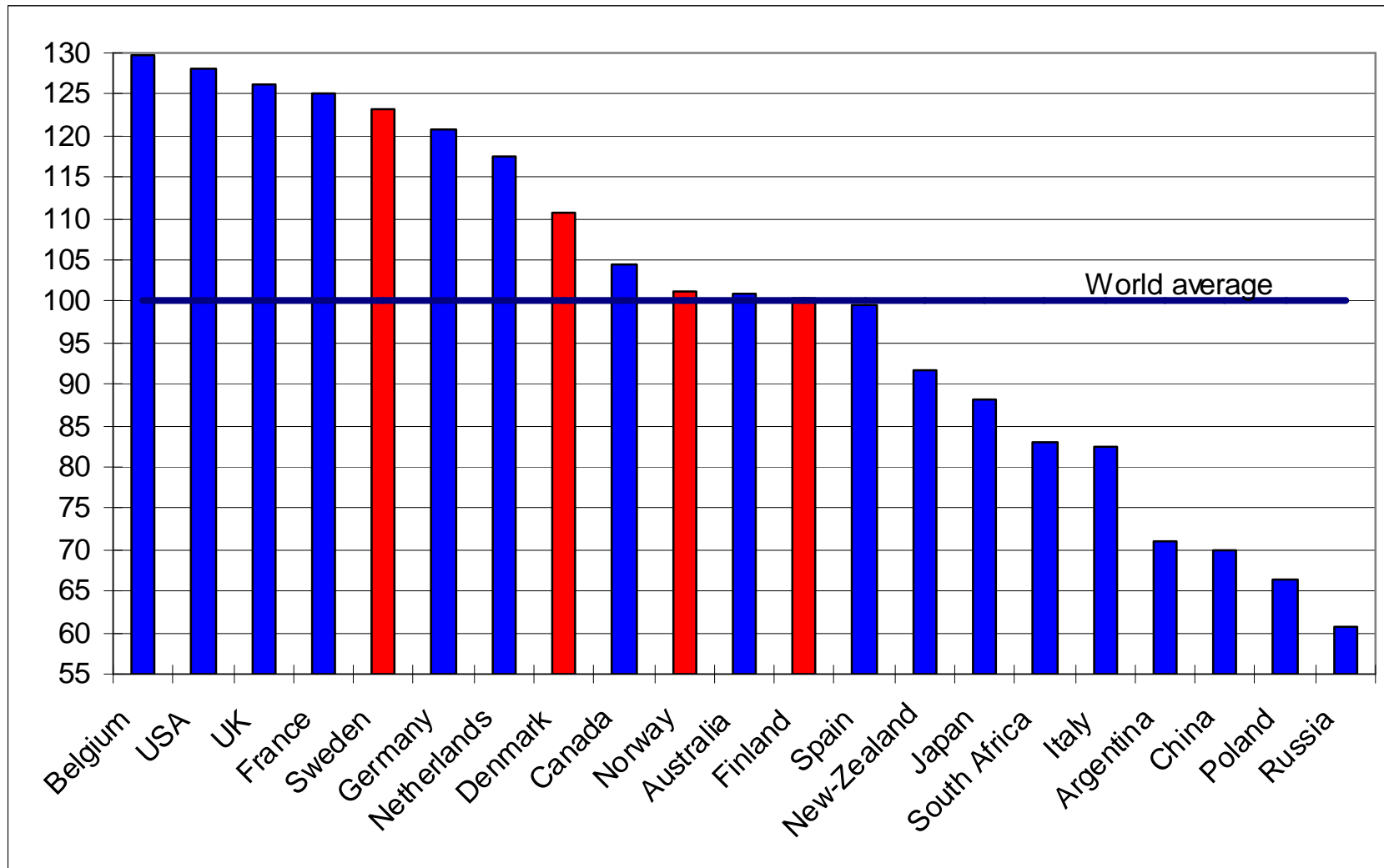
Arctic research: Proportion of publications by countries

Country	81-83	91-93	05-07	Country	81-83	91-93	05-07
USA	37,4 %	33,0 %	27,3%	Japan	1,2 %	1,1 %	2,6 %
Canada	28,2 %	20,5 %	14,9%	France	1,0 %	2,4 %	2,4 %
<u>Norway</u>	5,7 %	10,0 %	9,0 %	China	0,0 %	0,1 %	2,0 %
UK	6,2 %	5,8 %	7,2 %	<u>Finland</u>	0,4 %	1,3 %	1,7 %
Germany	0,8 %	4,9 %	7,2 %	Australia	0,3 %	0,9 %	1,2 %
Russia	5,5 %	6,4 %	6,3 %	Netherlands	0,2 %	0,9 %	1,2 %
<u>Denmark</u>	8,4 %	5,3 %	4,5 %	Poland	0,3 %	0,4 %	1,1 %
<u>Sweden</u>	2,7 %	2,5 %	3,0 %	Other countries	1,6 %	4,7 %	8,2 %

Antarctic: Publication proportions of nations with consultative status

Country	81-83	91-93	05-07	Country	81-83	91-93	05-07
USA	34,03 %	30,62 %	24,14 %	<u>Sweden</u>	0,00 %	1,69 %	1,55 %
UK*	17,22 %	12,10 %	11,23 %	South Africa	1,96 %	2,50 %	1,51 %
Australia*	9,91 %	7,25 %	8,13 %	Brazil	0,05 %	0,60 %	1,40 %
Germany	6,33 %	9,50 %	7,35 %	Belgium	0,14 %	0,94 %	1,29 %
Italy	0,10 %	5,16 %	5,67 %	<u>Norway*</u>	1,15 %	0,86 %	1,25 %
France*	3,81 %	5,14 %	4,62 %	Poland	3,35 %	0,93 %	0,95 %
Japan	7,04 %	3,94 %	4,18 %	Chile*	0,14 %	0,65 %	0,93 %
Spain	0,00 %	1,30 %	3,30 %	South Korea	0,00 %	0,10 %	0,90 %
New Zealand*	5,57 %	3,79 %	3,18 %	<u>Finland</u>	0,00 %	0,35 %	0,47 %
China	0,22 %	0,97 %	3,07 %	Ukraine	0,00 %	0,24 %	0,23 %
Argentina*	0,23 %	1,30 %	2,84 %	Bulgaria	0,14 %	0,00 %	0,20 %
Russia	5,80 %	3,14 %	1,96 %	Uruguay	0,00 %	0,00 %	0,04 %
Netherlands	0,43 %	1,18 %	1,90 %	Ecuador	0,00 %	0,00 %	0,01 %
India	0,22 %	1,72 %	1,76 %	Peru	0,00 %	0,03 %	0,00 %
				Other/non-consulting countries	2,16 %	4,00 %	5,94 %

Relative citation index of the largest polar research nations, 2001-2007



Conclusions

- n Polar research has expanded far more rapidly than science in general.
- n Nordic countries are important contributors to Arctic research in particular with a proportion of 18% of the total research output in 2005-07
- n Norway the third largest research nation in Arctic research
- n The strong growth in research activities in the polar regions will most likely continue in the years to come.