

German-British Cooperation on the Antarctic: Overview and Future Perspectives

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Helmholtz Centre for Polar and
Marine Research



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26th February, 2014, Park Plaza Westminster Bridge, London, UK

Roadmap



- History
- Current projects:
 - Geosciences
 - Meteorology
 - Oceanography, Glaciology
 - Data portals and visualization
- Horizon 2020
- Summary

Filchner-Ronne Ice Shelf Project (FRISP)

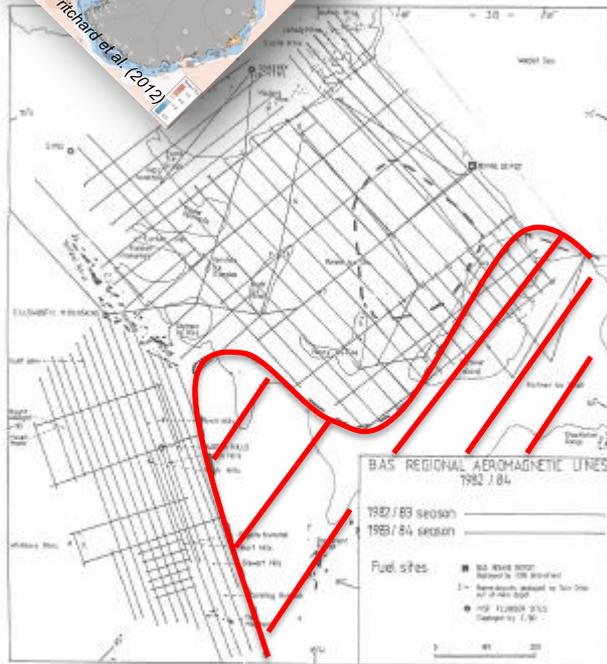
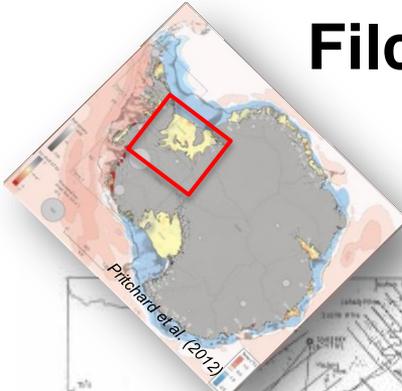


Figure 13

 Areas where ice thickness data are missing or less perfect

Areas where ice thickness data are missing or less perfect (1982/84)

Filchner-Ronne-Ice-Shelf-Programme

Report No 1

compiled by

H. Kohnen, Bremerhaven

with contributions of:

G. Grikuarov, Leningrad

O. Orheim, Oslo

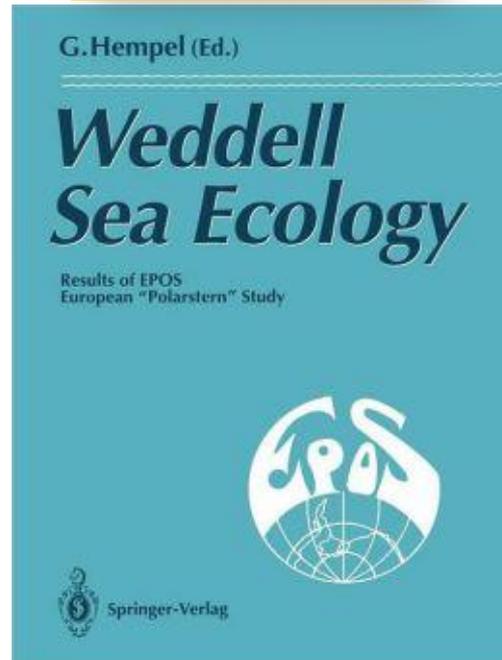
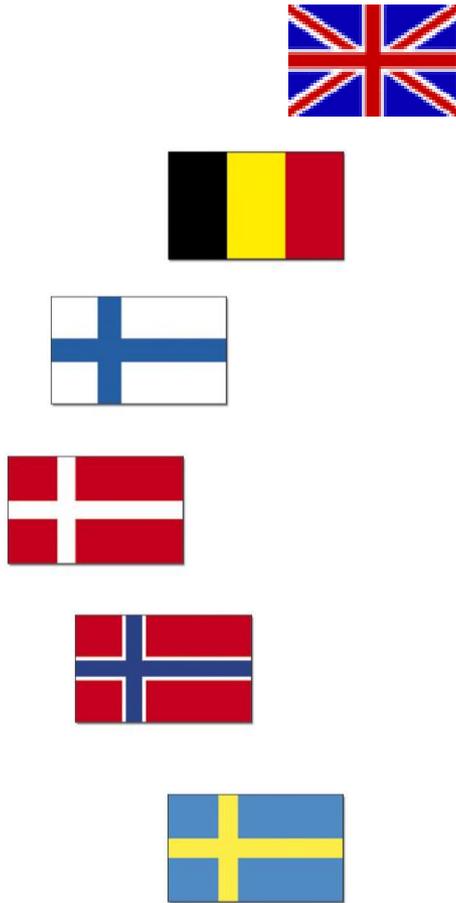
P. Skvarca, Buenos Aires

C.W.M. Swinbank, Cambridge

R.H. Thomas, Washington

Introduction by R.H. Thomas

History

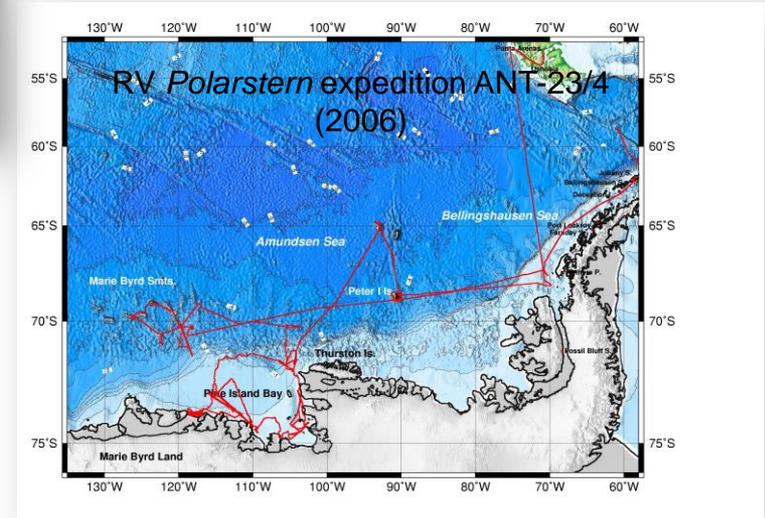


Geosciences: Amundsen Sea



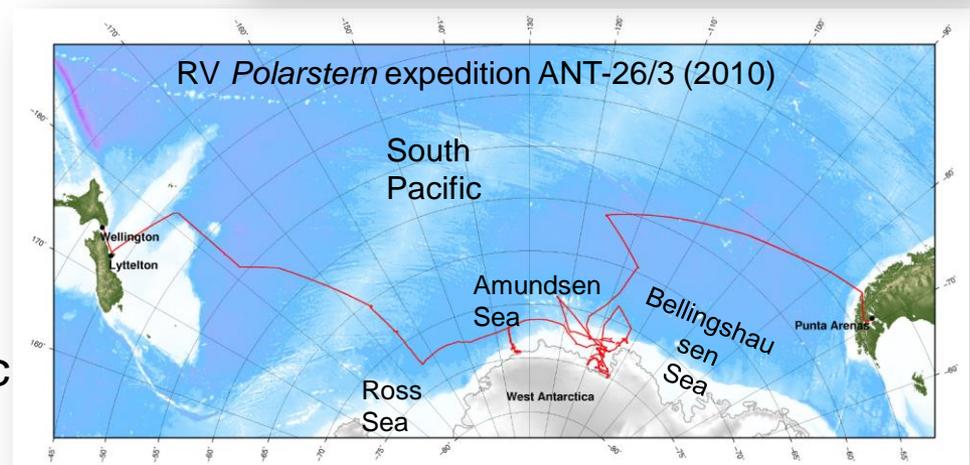
Collaborative work:

- 32 peer-reviewed articles
- BAS participation on RVIB *Polarstern* expeditions in 2009 and 2010
- BAS, Univ. of Exeter (UE), and Univ. of Leicester (UL)/NERC on RVIB *Polarstern* expedition in 2013

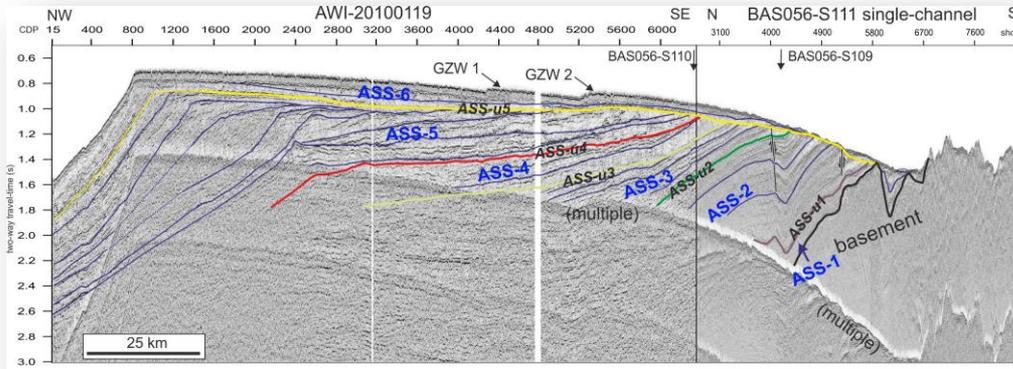


Research interest:

- glacial-marine sedimentation
- reconstruction of West Antarctic Ice-Sheet dynamics
- processes of ice retreat since last glacial maximum
- tectonic evolution of Southern Pacific and West Antarctica



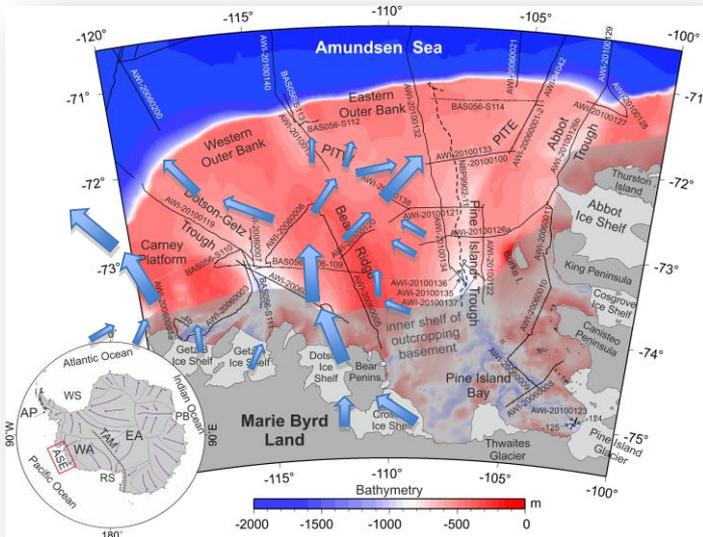
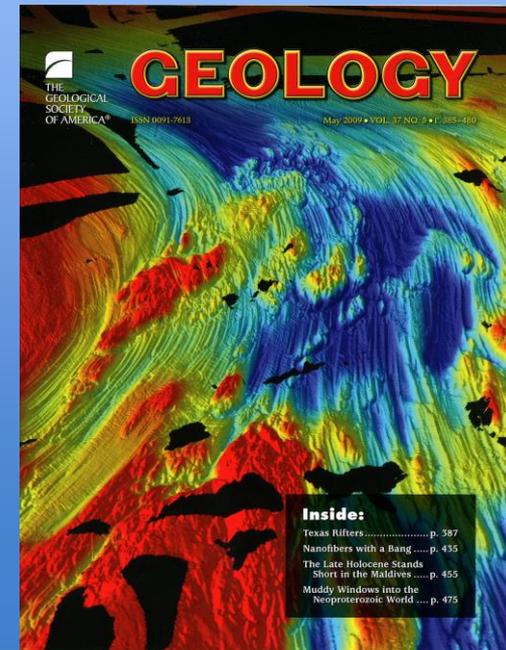
Geosciences: Amundsen Sea



AWI-BAS seismic profiles show glacially dominated built-up of shelf sediments. Results will be used to select future drill sites to study past ice-sheet dynamics (Gohl et al., 2013).

Combined swath-bathymetry data show glacial bedforms on seafloor of deeply incised glacial trough on Amundsen Sea shelf.

Cover page of journal with article by *Larter et al. (2009)*.



Amundsen Sea Embayment shelf with reconstructed past ice-stream paths.

Geosciences: Stability & Variability

West Antarctic Ice Sheet (WAIS)



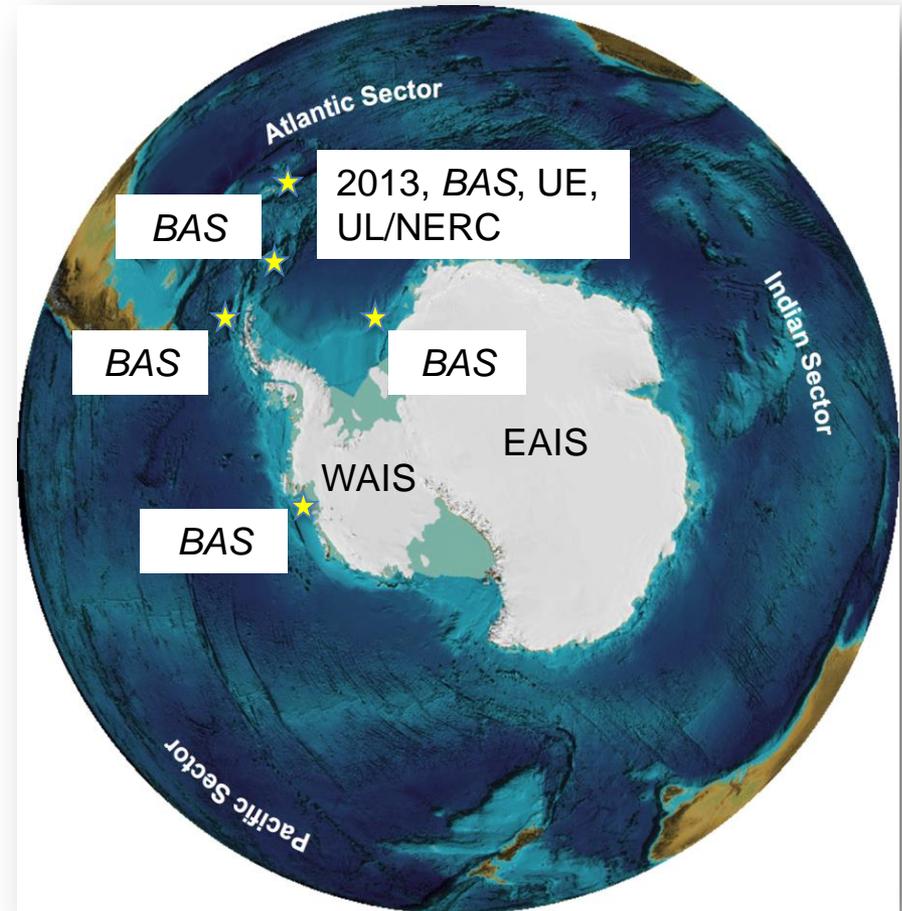
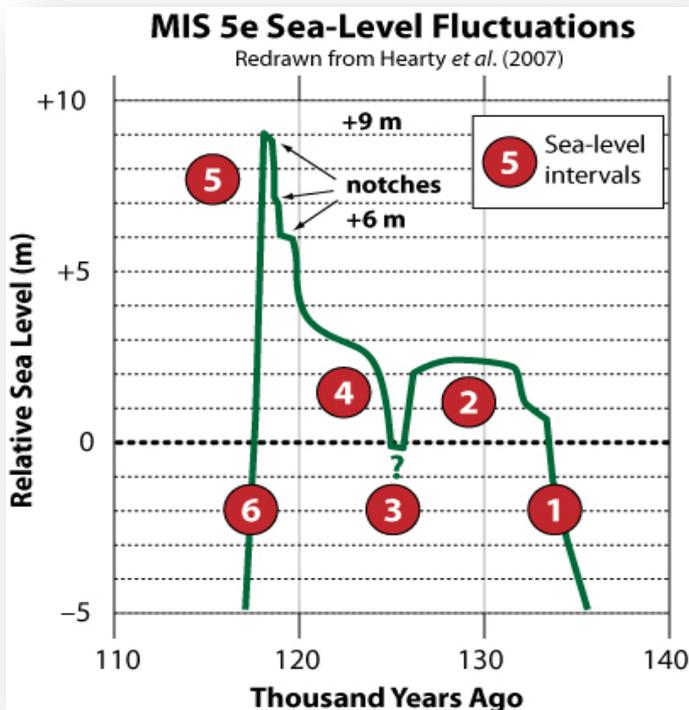
WAIS collapsed during warmer earth climate:

120 kyrs MIS 5e?

400 kyrs MIS 11?

1070 kyrs MIS 31 **yes ✓**

warmer future ?

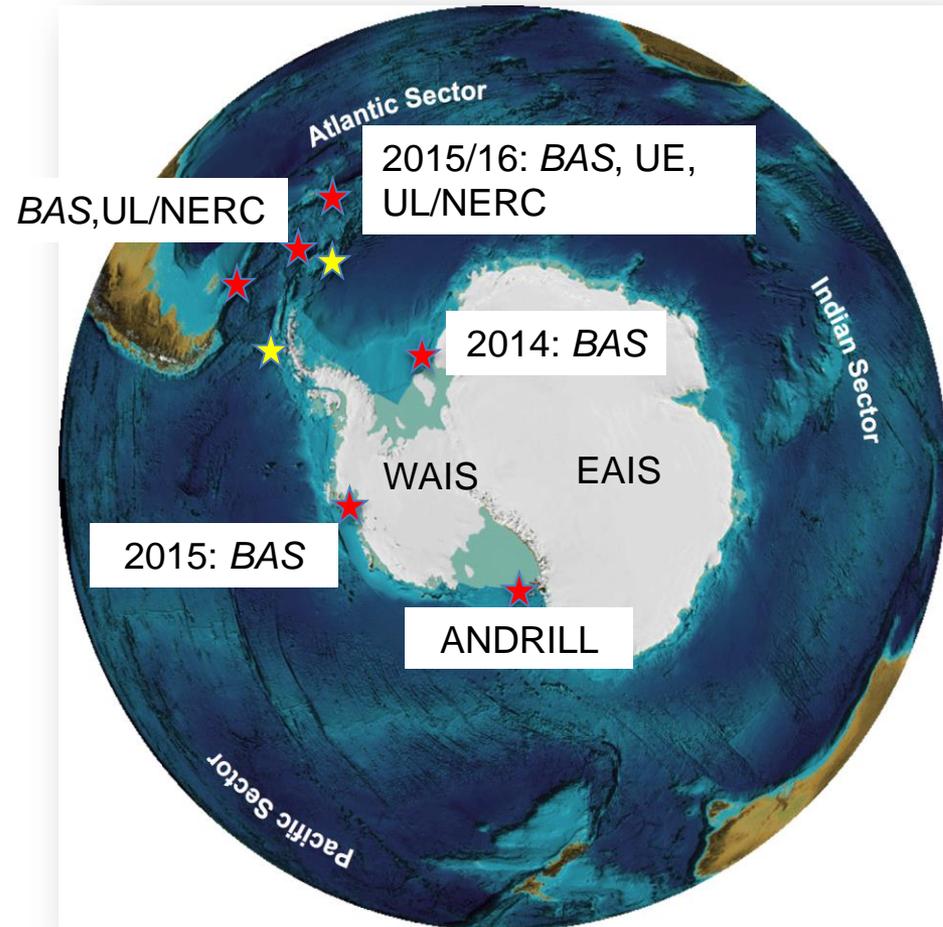
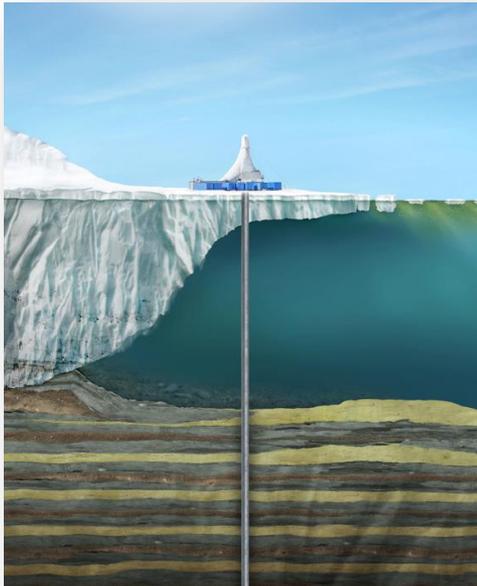


Geosciences: Future AWI-UK joined projects



- Expedition to South Georgia
- IODP Falkland Isl. and Scotia Sea
- Southwestern Weddell Sea
- MeBo and IODP Amundsen Sea Embayment

- ANDRILL Coulman High
(international drilling project)
UK: BAS, Univ. of Leeds,
Aberystwyth, Southampton,
Glasgow, Newcastle,
Imperial College



Meteorology: Antarctic Peninsula



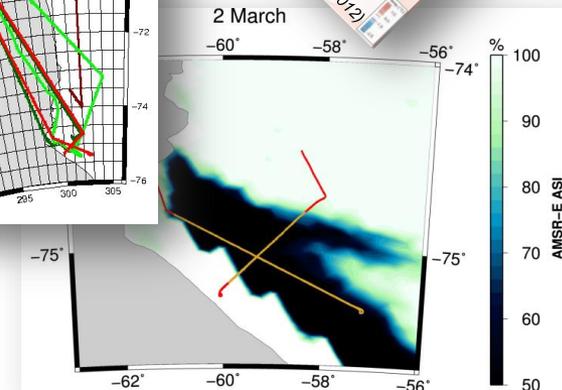
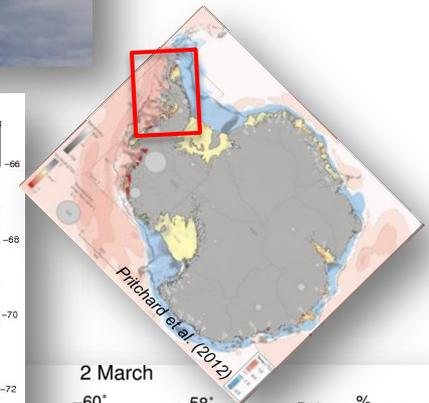
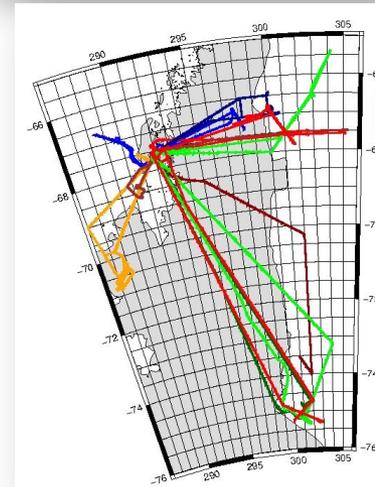
Collaborative work:

- JASPER campaign: joint **AWI-BAS** project over the Weddell Sea and Antarctic Peninsula



Goals:

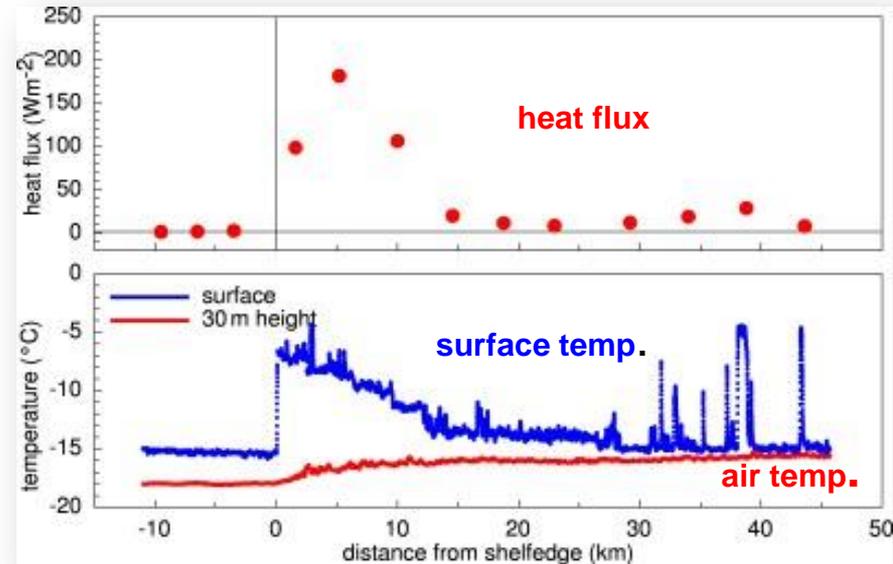
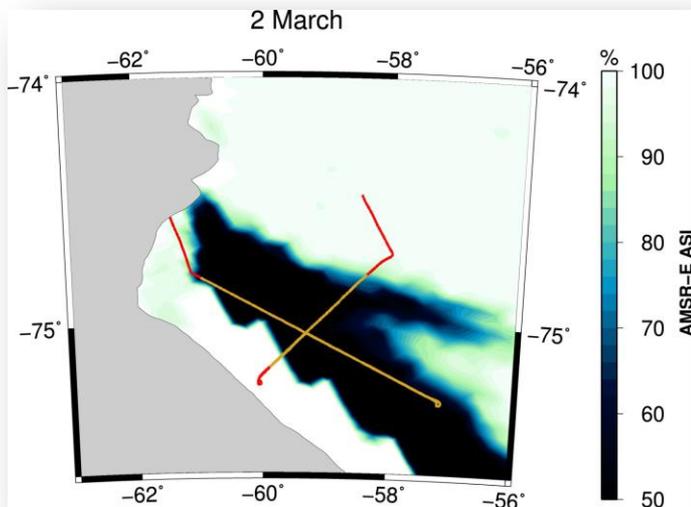
- Investigate atmospheric boundary layer processes
- Air-ocean energy fluxes over polynyas (along Larsen and Ronne Ice Shelf)
- Obtain in-situ atmospheric data for model validation



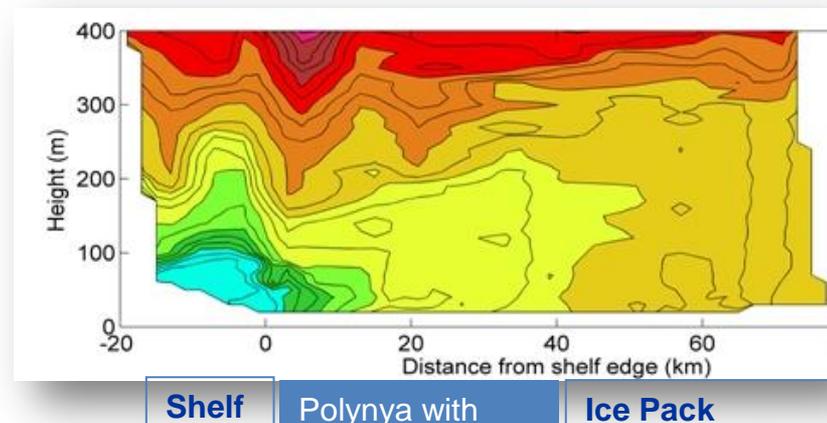
Meteorology: Antarctic Peninsula

Scientific output:

Observations indicate strong impact of Ronne polynya on the atmospheric boundary layer



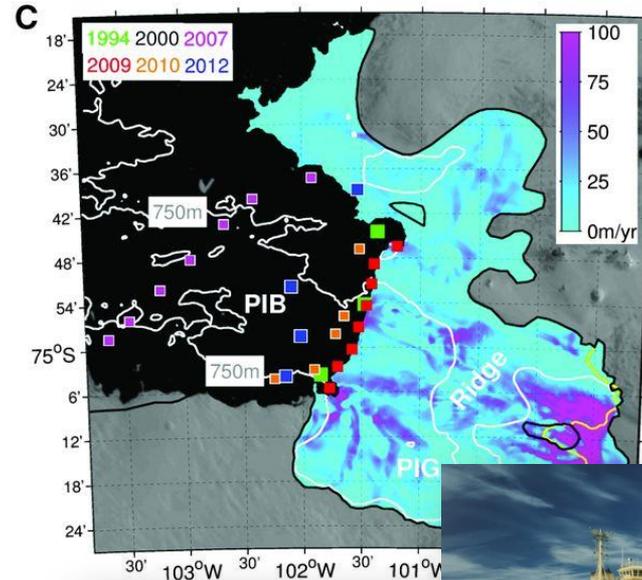
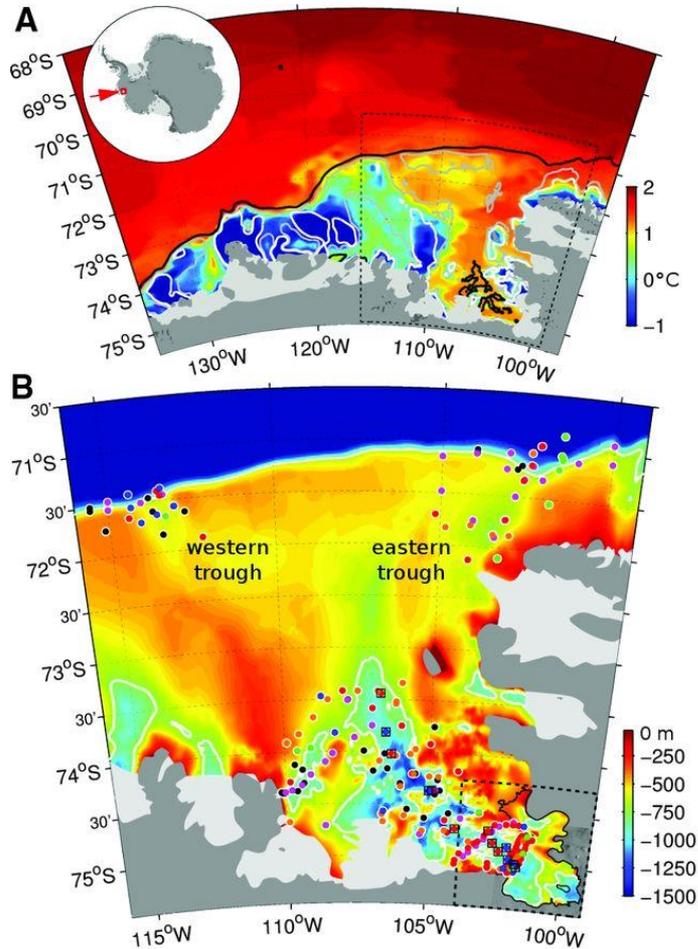
Aircraft Measured Potential Temperature



Oceanography: Amundsen Sea



Dutrieux et al. (2014) Strong Sensitivity of Pine Island Ice-Shelf Melting to Climate Variability



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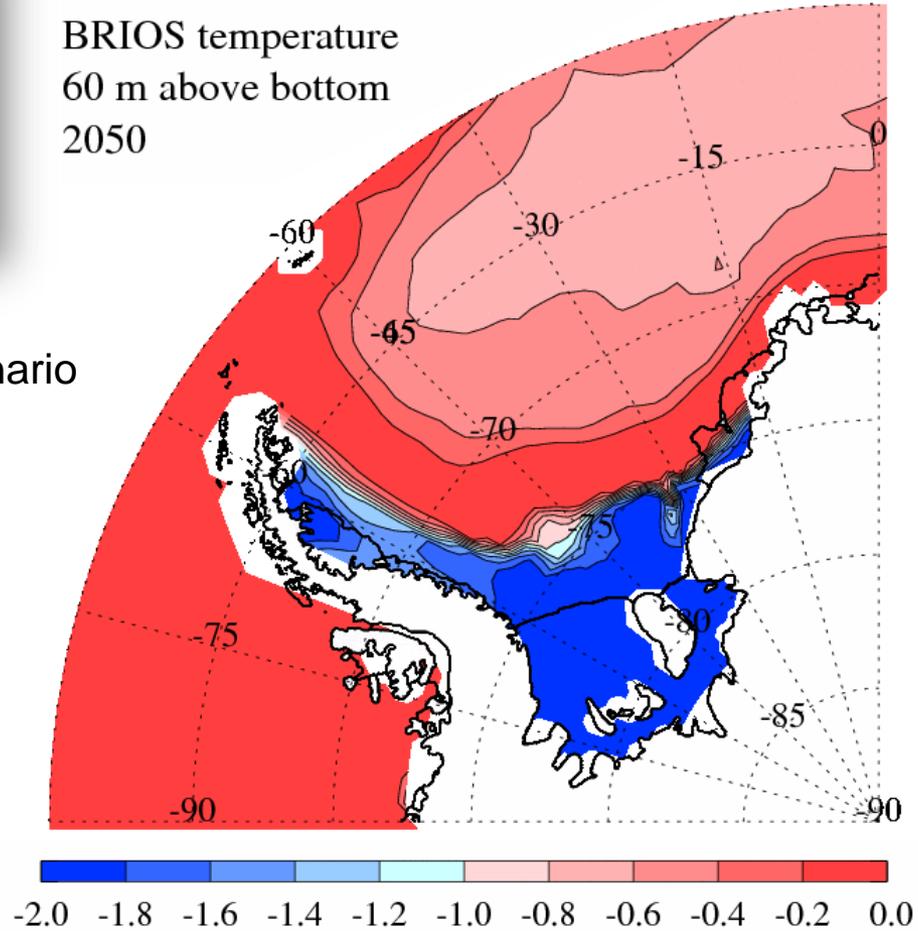


Oceanography: Weddell Sea



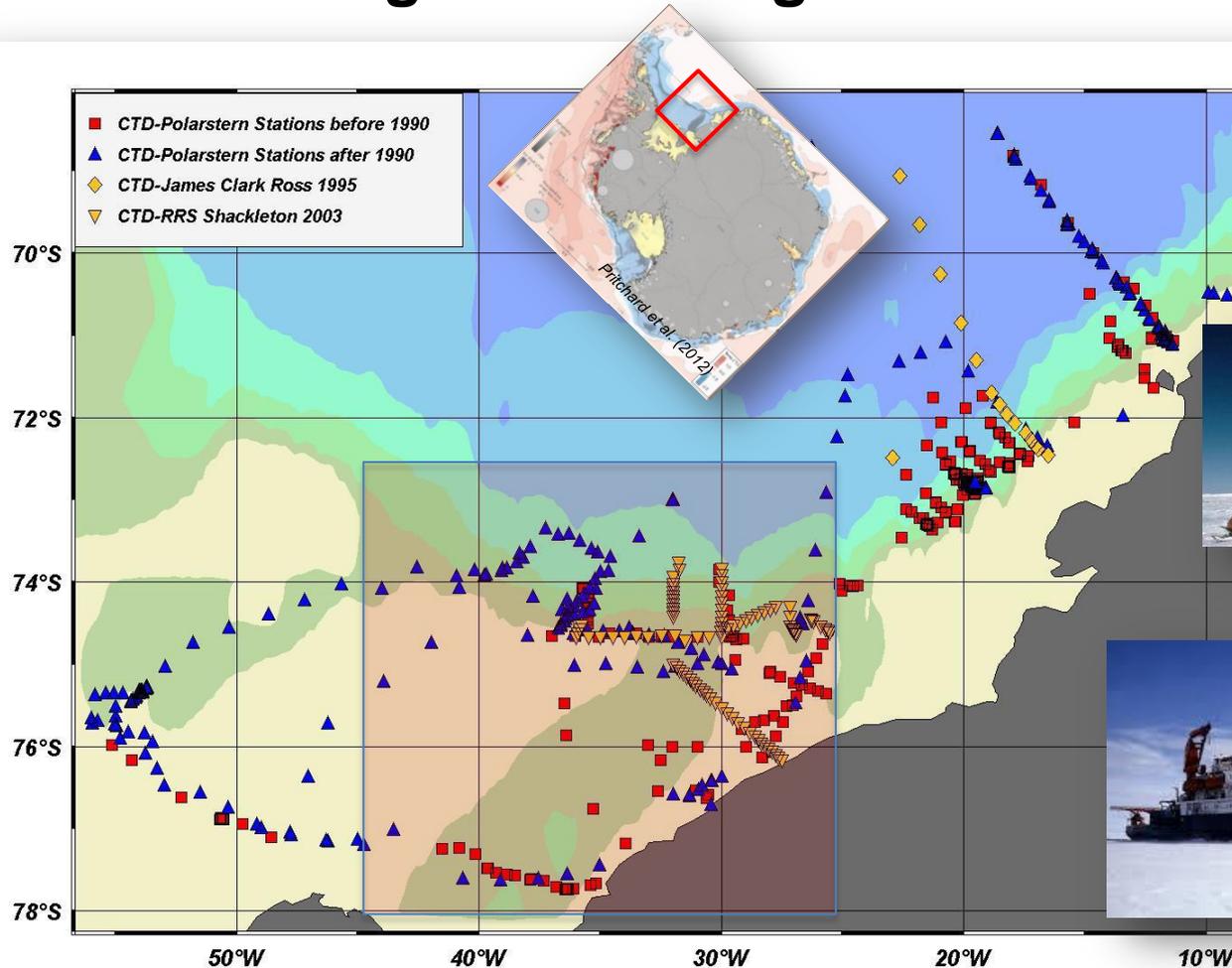
HadCM3
SRES A1B scenario

BRIOS temperature
60 m above bottom
2050



Hellmer et al. (2012)

Filchner Trough Monitoring

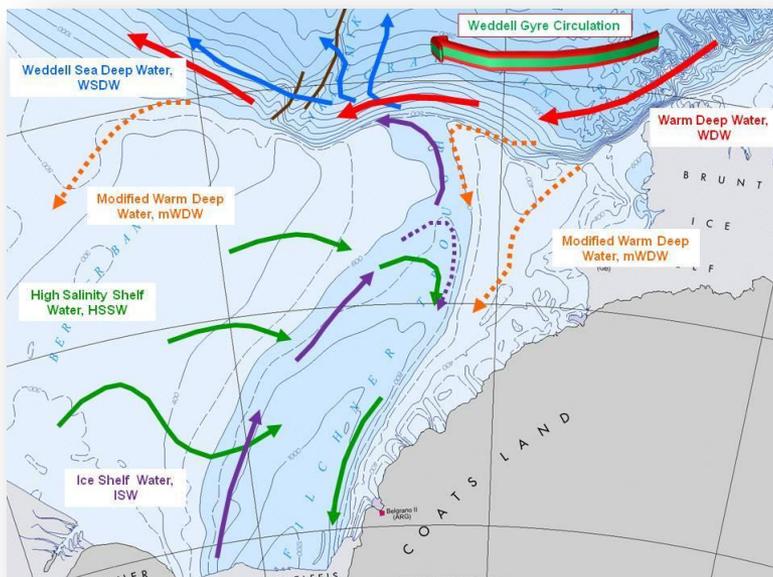
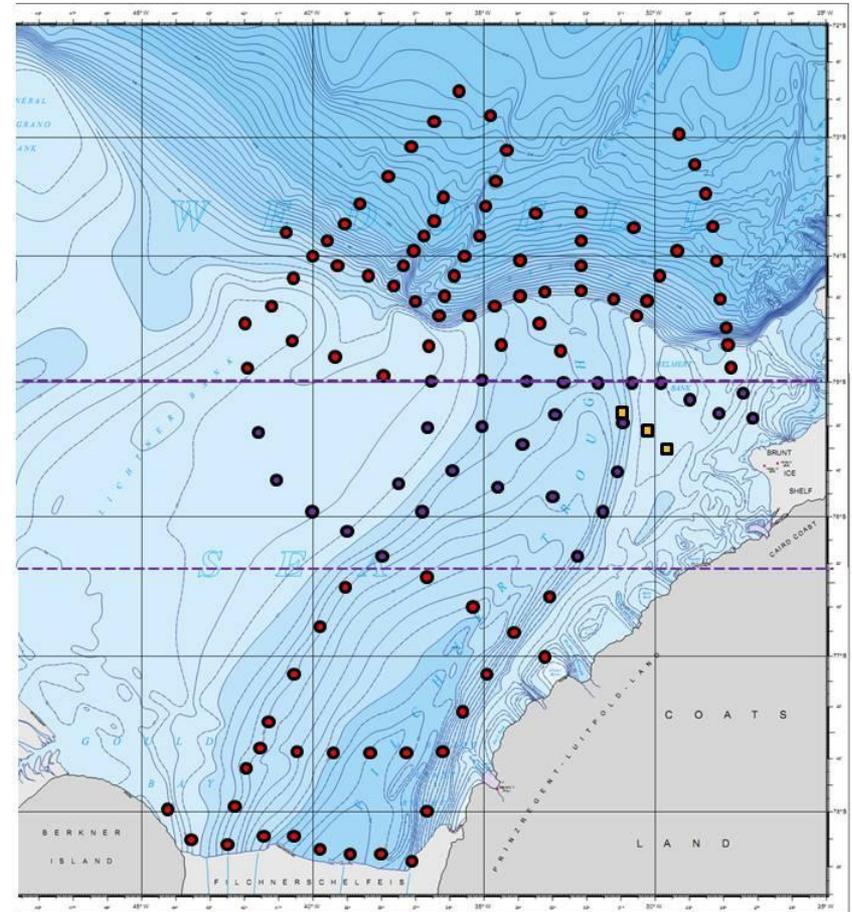


Oceanography: Weddell Sea

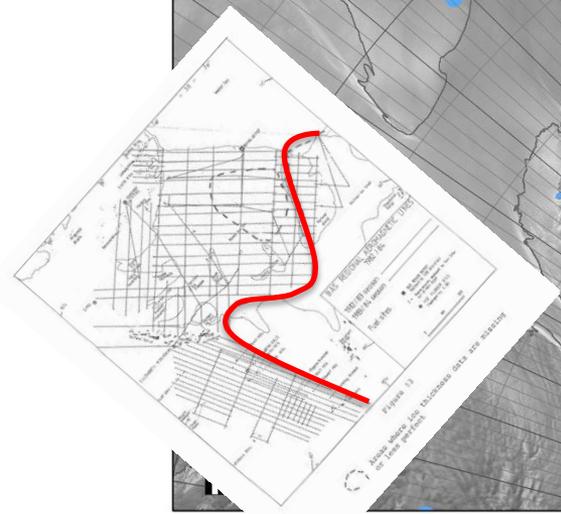
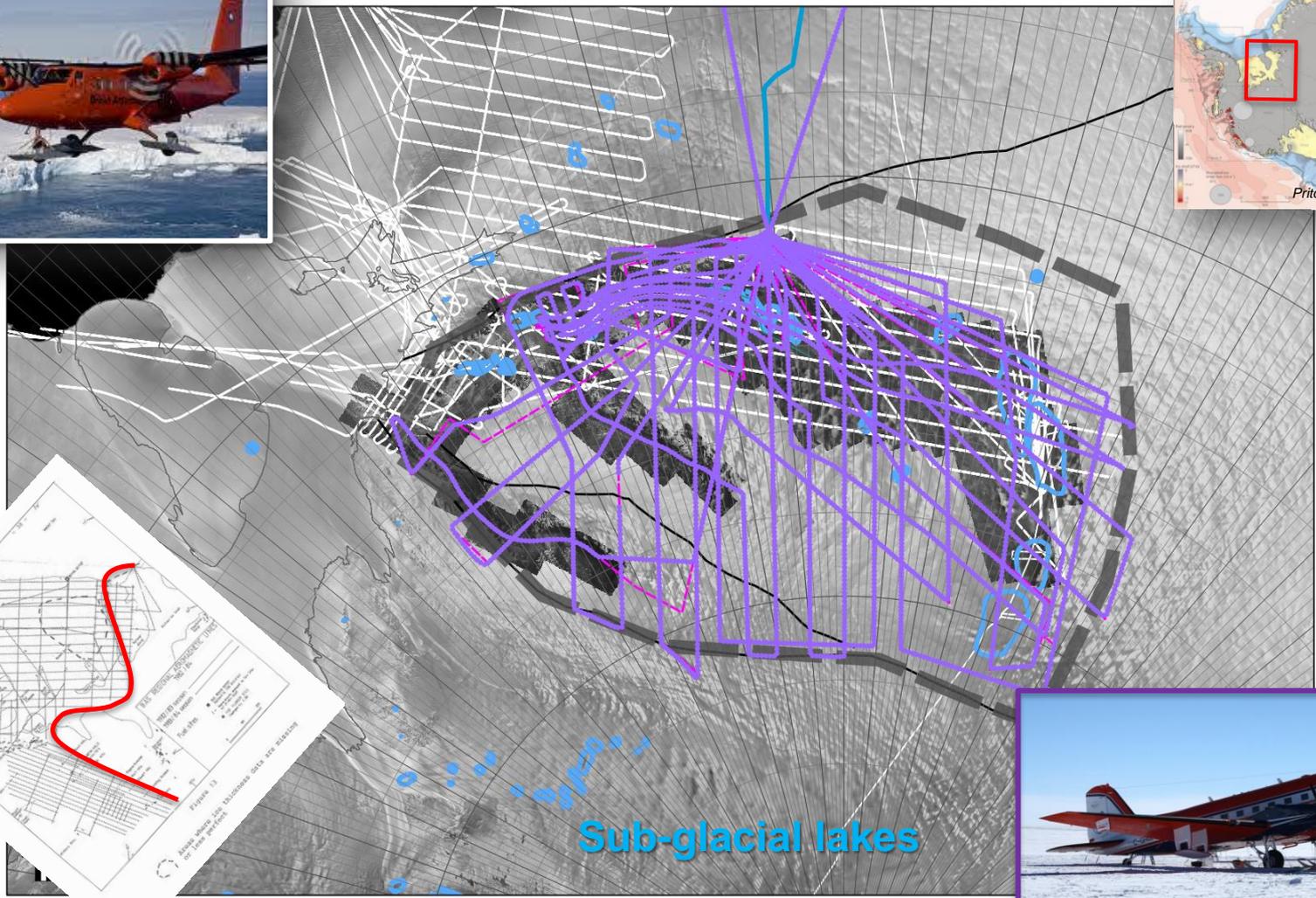
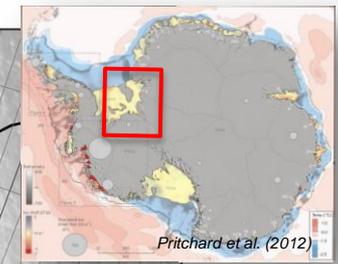


FISP-2 2015/16 & 2016/17

91 CTD stations (red and pink)
3 moorings (yellow)



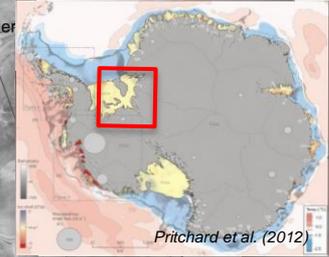
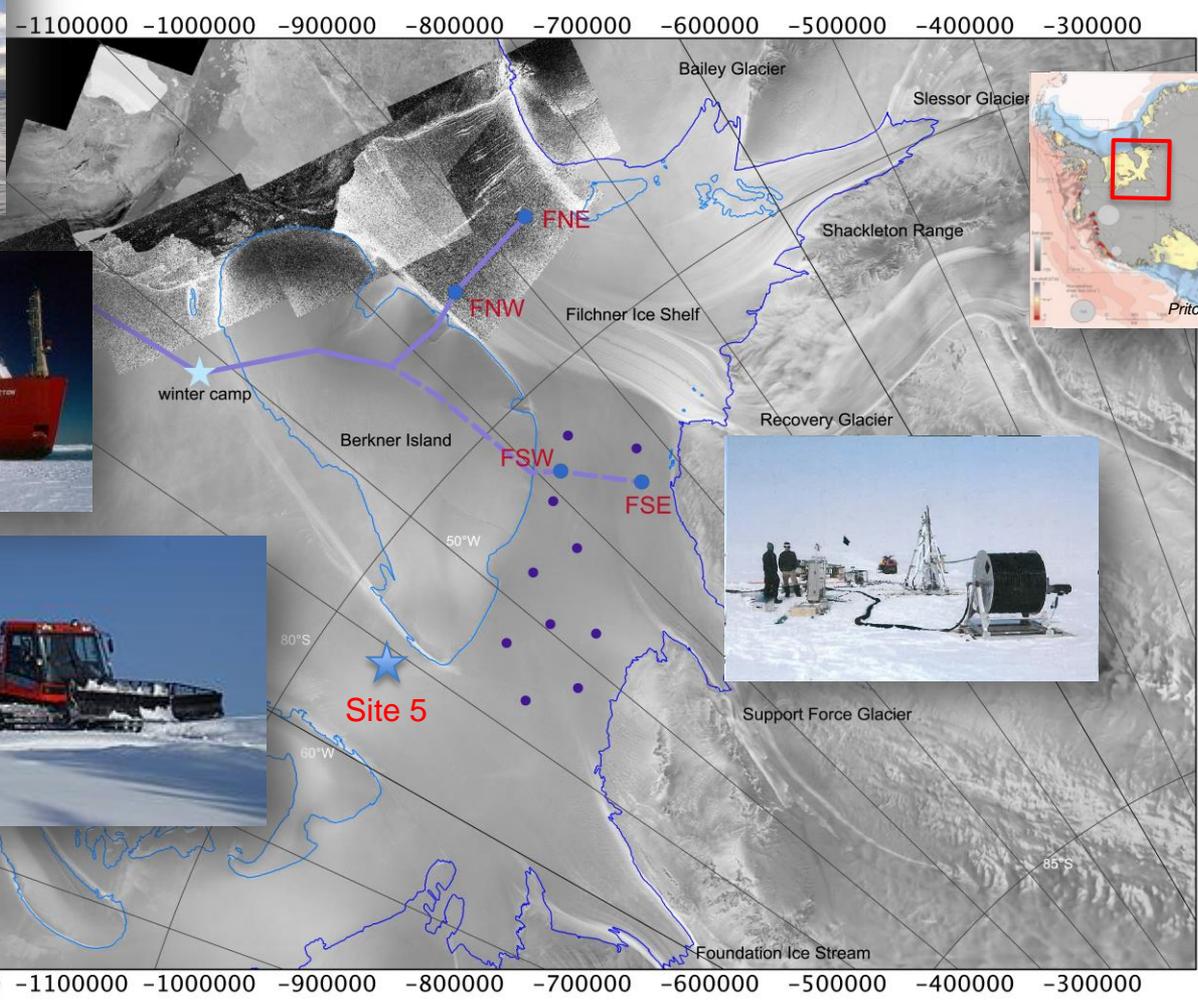
Glaciology: Filchner Ice Shelf



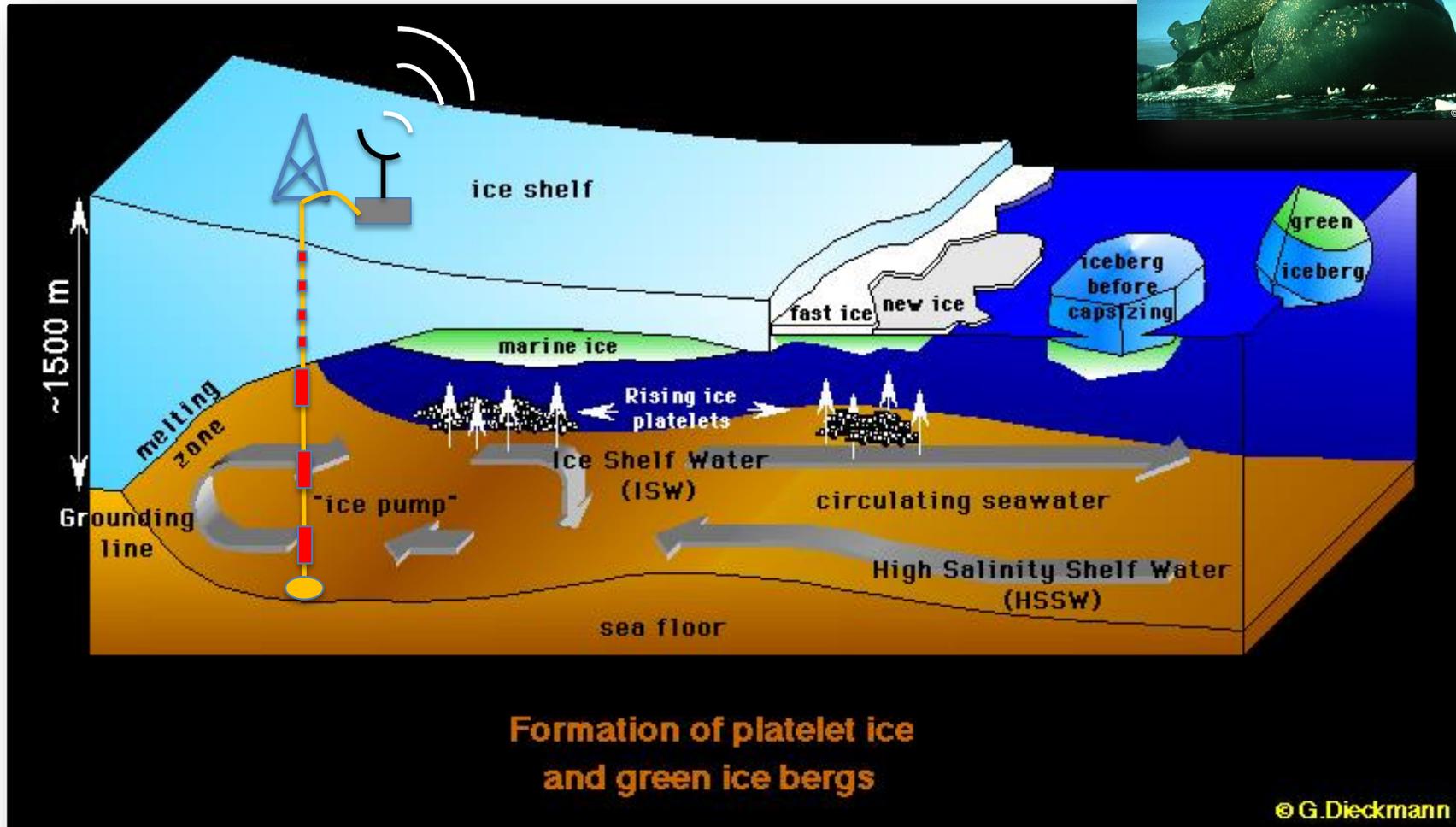
Glaciology: Filchner Ice Shelf



Filchner Ice Shelf – Basal Melting



Filchner Trough Monitoring (FTM)



Portal: EXPEDITION.AWI.DE

The screenshot displays the Expedition.AWI.DE portal interface. At the top, there is a navigation bar with 'Home', 'Expeditions', 'Search', and 'About'. The main content area is dominated by a map of Antarctica, showing expedition tracks in orange and yellow. A legend at the bottom right of the map indicates that yellow lines represent the 'Current expedition' and orange lines represent 'Selected expeditions'. On the left side, there are several filter panels: 'Expeditions' with a table listing PS82 (Polarstern) and HE415 (Heincke); 'Platforms' with checkboxes for Heincke and Polarstern; 'Temporal coverage' with date pickers for 'Begin' (2010-02-17) and 'End' (2014-02-17); and 'Layers' with checkboxes for 'Stations', 'DTM Framstrait', 'DTM Knipovich Ridge', 'DTM Scotia Sea', 'Arctic Sea Ice', and 'Antarctic Sea Ice'. Below these are 'Services' for downloading tracks, schedules, and data. On the right side, there are three data panels: 'Near real time data' for 'Heincke' (6.7°C Air, W Wind direction, 7.4 m/s Wind speed, 7.2°C Water temp.), 'Polarstern' (-7.4°C Air, E Wind direction, 11.7 m/s Wind speed, -1.4°C Water temp.), and 'Neumayer III Station' (-12.0°C Air, E Wind direction, 7.2 m/s Wind speed). Below these is an 'AWIPEV Station' panel (-4.0°C Air, SE Wind direction, 1.7 m/s Wind speed). At the bottom right, there is a 'Latest data and publications' section with 'Archived data' (listing sediment core samples) and 'Publications' (listing field studies and submarine landslides).

Expedition	Begin	End
PS82 (Polarstern)	2013-12-19 - Cape Tow	2014-03-05 - Cape Tow
HE415 (Heincke)	2014-02-05 - Bremerhaven	2014-02-26 - Bremerhaven

Platform	Temperature (Air)	Wind direction	Wind speed	Water temp.
Heincke	6.7°C	W	7.4 m/s	7.2°C
Polarstern	-7.4°C	E	11.7 m/s	-1.4°C
Neumayer III Station	-12.0°C	E	7.2 m/s	-
AWIPEV Station	-4.0°C	SE	1.7 m/s	-

- Archived data
 - IP25 concentration of resting samples from sediment core PS66/309-1 (2014)
 - Sortable silt mean grain size of sediment core PS67/224-1 (2014)
 - Sortable silt mean grain size of sediment core PS67/219-1 (2014)
- Publications
 - Comparing RD94 dropsonde and aircraft temperature and humidity measurements based on data from arctic field studies (2014)
 - Large-scale submarine landslides, channel and gully systems on the southern Weddell Sea margin, Antarctica

AWI, jointly with BODC, is providing data to EU projects: SeaDataNet II, EUROFLEETS II, ODIP prototypes

Data provider



Repositories and IPY collections

- PANGAEA as recommended data repository by ELSEVIER
- IPY collections
 - Data collections in PANGAEA
 - Publication collections in EPIC

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Earth and Planetary Science Letters

Volume 305, Issues 1–2, 1 May 2011, Pages 83–91



Modulation of the Southern Ocean cadmium isotope signature by ocean circulation and primary productivity

W. Abouchami^a, S.J.G. Gale^a, H.J.W. de Baar^b, A.C. Alderkamp^c, R. Middag^d, P. Laan^d, H. Feldmann^a, M.O. Andreae^a

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Abstract

The High Nutrient Low Chlorophyll (HNLc) Southern Ocean plays a key role in regulating the biological pump and the global carbon cycle. Here we examine the efficacy of stable cadmium (Cd) isotope fractionation for detecting differences in biological productivity between regions. Our results show strong meridional Cd isotope and concentration gradients modulated by the Antarctic Fronts, with a clear biogeochemical divide located near 56°S. The coincidence of the Cd isotope divide with the Southern Boundary of the Antarctic Circumpolar Current (ACC), together with evidence for northward advection of the Cd signal in the ACC, demonstrate that Cd isotopes trace surface ocean circulation regimes. The

Article outline

Show full outline

Abstract

Graphical abstract

Keywords

1. Introduction
 2. The Southern Ocean
 3. Sampling and methods
 4. Results and discussion
 5. Conclusions and perspectives
- Acknowledgments
References

Figures and tables



Not logged in (log in or sign up)

Always quote citation when using data

Show Map | Google Earth | RIS | BibTeX



PANGAEA[®]
Data Publisher for Earth & Environmental Science

Data Description

Citation: Hallanger, IG et al. (2011): Stable isotopes, PCBs and pesticide concentrations in zooplankton, seawater and POM from Kongsfjorden and Liefdefjorden, Svalbard. doi:10.1594/PANGAEA.810522

Supplement to: Hallanger, Ingeborg G; Ruus, Anders; Warner, Nicholas A; Herzke, Dorte; Evenset, Anita; Schøyen, Merete; Gabrielsen, Geir W; Borgå, Katrine (2011): Differences between Arctic and Atlantic fjord systems on bioaccumulation of persistent organic pollutants in zooplankton from Svalbard. *Science of The Total Environment*, 409(14), 2783-2795 | doi:10.1016/j.scitotenv.2011.03.015

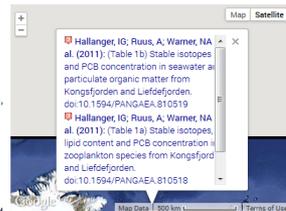
Abstract: Differences in bioaccumulation of persistent organic pollutants (POPs) between fjords characterized by different water masses were investigated by comparing POP concentrations, patterns and bioaccumulation factors (BAFs) in seven species of zooplankton from Liefdefjorden (Arctic water mass) and Kongsfjorden (Atlantic water mass), Svalbard, Norway. No difference in concentrations and patterns of POPs was observed in seawater and POM, however higher concentrations and BAFs for certain POPs were found in species of zooplankton from Kongsfjorden. The same species were sampled in both fjords and the differences in concentrations of POPs and BAFs were most likely due to fjord specific characteristics, such as ice cover and timing of snow/glacier melt. These confounding factors make it difficult to conclude on water mass (Arctic vs. Atlantic) specific differences and further to extrapolate these results to possible climate change effects on accumulation of POPs in zooplankton. The present study suggests that zooplankton do biomagnify POPs, which is important for understanding contaminant uptake and flux in zooplankton, though consciousness regarding the method of evaluation is important.

Project(s): International Polar Year (2007-2008) (IPY)

Coverage: Median Latitude: 79.275000 ° Median Longitude: 10.735000 ° South-bound Latitude: 78.940000 ° West-bound Longitude: 8.540000 ° North-bound Latitude: 79.610000 ° East-bound Longitude: 12.930000

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Size: 4 datasets



Conference-Conference paper

Hiltenbrand, C. D., Bernett, S., Elmham, W., Larier, R. D., Ó Cotagáin, C., Doedelwell, J. A., Grobe, H. and Graham, A. G. C. (2007)

Glacial dynamics of the West Antarctic Ice Sheet in the southern Bellingshausen Sea during the last glacial cycle. *Online Proceedings of the 10th ISAES X*, edited by A.K. Cooper and C.R. Raymond et al., USGS Open-File Report 2007-02. Extended Abstract. doi:10.13130/2007.02

21. Berichte zur Polar- und Meeresforschung (Reports on Polar and Marine Research), Bremerhaven, Alfred Wegener Institute for Polar and Marine Research, 560. 226 p. doi:10.13130/2007.02

22. Berichte zur Polar- und Meeresforschung (Reports on Polar and Marine Research), Bremerhaven, Alfred Wegener Institute for Polar and Marine Research, 560. 226 p. doi:10.13130/2007.02

23. Article Nash, T., Powell, R., Levy, R., Florindo, F., Harwood, D., Kuhn, G., Niessen, F., Talarico, F. and Wilson, C. (2007) A Record of Antarctic Climate and Ice Sheet History Recovered. *EOS, Transactions, American Geophysical Union*, 88 (50), pp. 567-568. doi:10.13130/2007.02

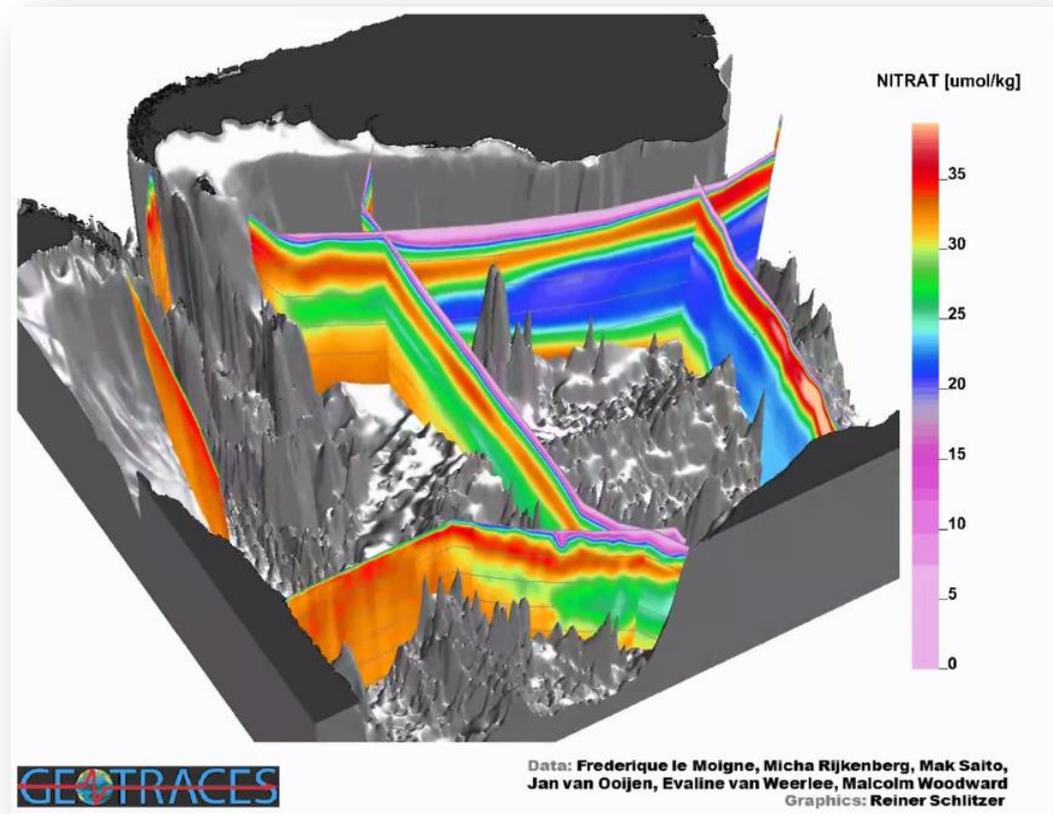
24. Article Obermüller, B., Puntarulo, S. and Abele, D. (2007) UV-tolerance and instantaneous physiological stress responses of two Antarctic amphipod species *Gondogeneia antarctica* and *Ogortoa furcata* during exposure to UV radiation. *Marine Environmental Research* 64:295, 267. doi:10.1016/j.marenres.2007.02.001. doi:10.13130/2007.02

25. Article Peck, L. S., Morley, S. A., Portner, H. O. and Clark, M. S. (2007) Thermal limits of overwintering capacity are linked to origin availability and size in the Antarctic clam *Laternula elliptica*. *Geocologia* 154, pp. 479-484. doi:10.1007/s00442-007-6858-0. doi:10.13130/2007.02

26. Article Portner, H. O., Peck, L. S. and Somero, G. N. (2007) Thermal limits and adaptation in marine Antarctic ectotherms: an integrative view. *Physiological transactions of the royal society of london series b-biological sciences* doi:10.1098/rstb.2006.1947. doi:10.13130/2007.02



- Compiled using GEOTRACES data sets (**BODC** offers data portal for the project)
- „**Ocean Data View**“ visualization software for graphics and animations (R. Schlitzer, AWI)



International Panels



and



– partners and allies under the international Antarctic Treaty System



Antarctic Treaty



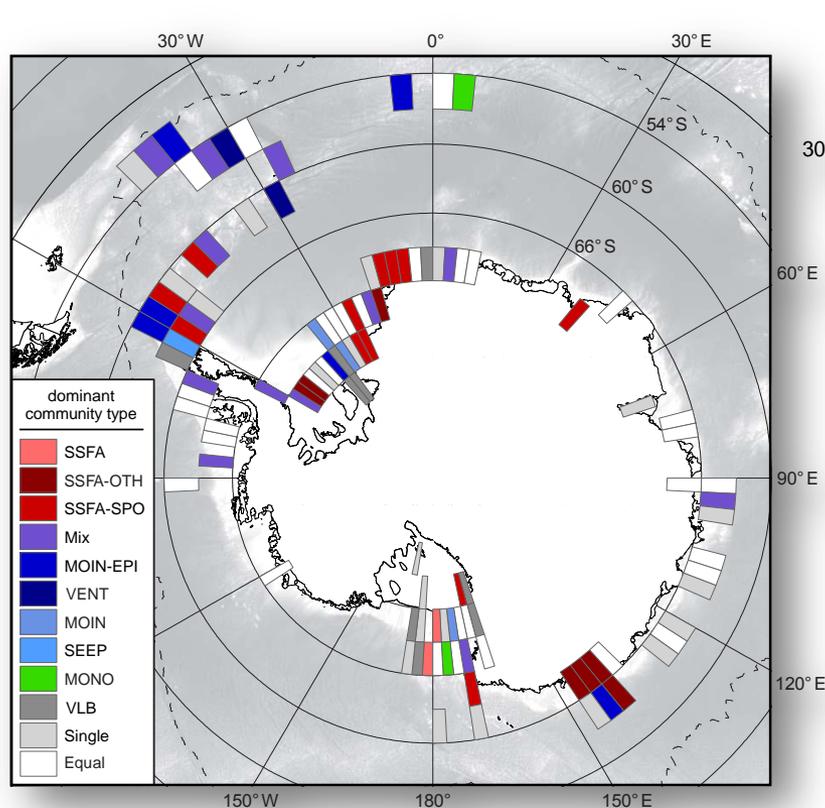
Consultative Meeting
Hobart, Australia 2012

Example:

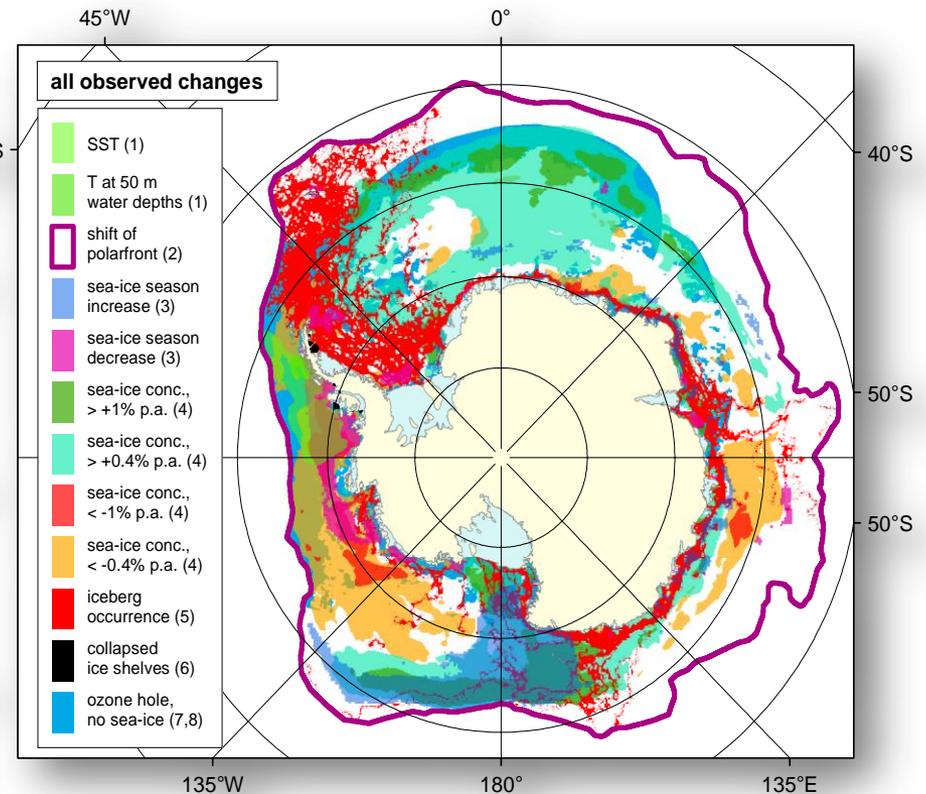
Scientists from *BAS* and *AWI* are working closely together in the challenge to establish **Marine Protected Areas in Antarctica under the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)**

Modelling the future of marine life under multiple climate change stresses

- sea-floor communities
- pelagic communities
- ice-shelf collapse
- acidification
- melting sea-ice
- ocean warming



Gutt, Griffiths, Jones, 2013



Gutt et al. unpubl. assembled from various sources



EUR-OCEANS Consortium Flagship for Polar Ecosystem Change and Synthesis (PECS)

*Our polar marine ecosystems strategy (distributed to the European Commission in March 2013) underpins this workshop, **identifying the significant role of biological components of polar oceans** in both regional and Earth System scale processes, and highlighting why **research on both Arctic and Antarctic ecosystems should form a significant component of Horizon 2020.***

*Without such dedicated actions at the European level the present **fragmentation** of globally important polar research **cannot be overcome. Europe has a major role to play in marine ecosystem research at both poles.** We fully support European leadership in polar marine ecosystem science, policy and integration.*

***Prof. Dieter Wolf-Gladrow, Dr. Judith Hauck, Dr. Christoph Völker,**
Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany*

***Prof. Eugene Murphy, Dr. Rachel Cavanagh, Dr. Nadine Johnston,**
Natural Environment Research Council, British Antarctic Survey, Cambridge, UK*



With the completion of major projects in Greenland and Antarctica over the last 15 years, the **international ice coring community is planning for the next several decades**. The costs and scope of future work create the need for coordinated international collaboration. Developing this international collaboration is the charge of IPICS, **the International Partnerships in Ice Core Sciences**, a planning group currently composed of ice core scientists, engineers, and drillers from 18 nations. IPICS is supported by [PAGES](#) (Past Global Changes), [SCAR](#) (Scientific Committee on Antarctic Research) and [IACS](#) (International Association of Cryospheric Sciences), although it is not a formal project under any of these organizations.

Summary



- Cooperation in **Antarctica** between *BAS* und *AWI* on numerous scientific projects dates back several decades
- Cooperation on logistics and cyberinfrastructure (data portals and visualization tools) is improving
- Several techniques developed for Antarctica are now applied to the Arctic
- Cooperation in the **Arctic** started recently – **a new challenge!**

