Amundsen Sea Polynya
International Research Expedition

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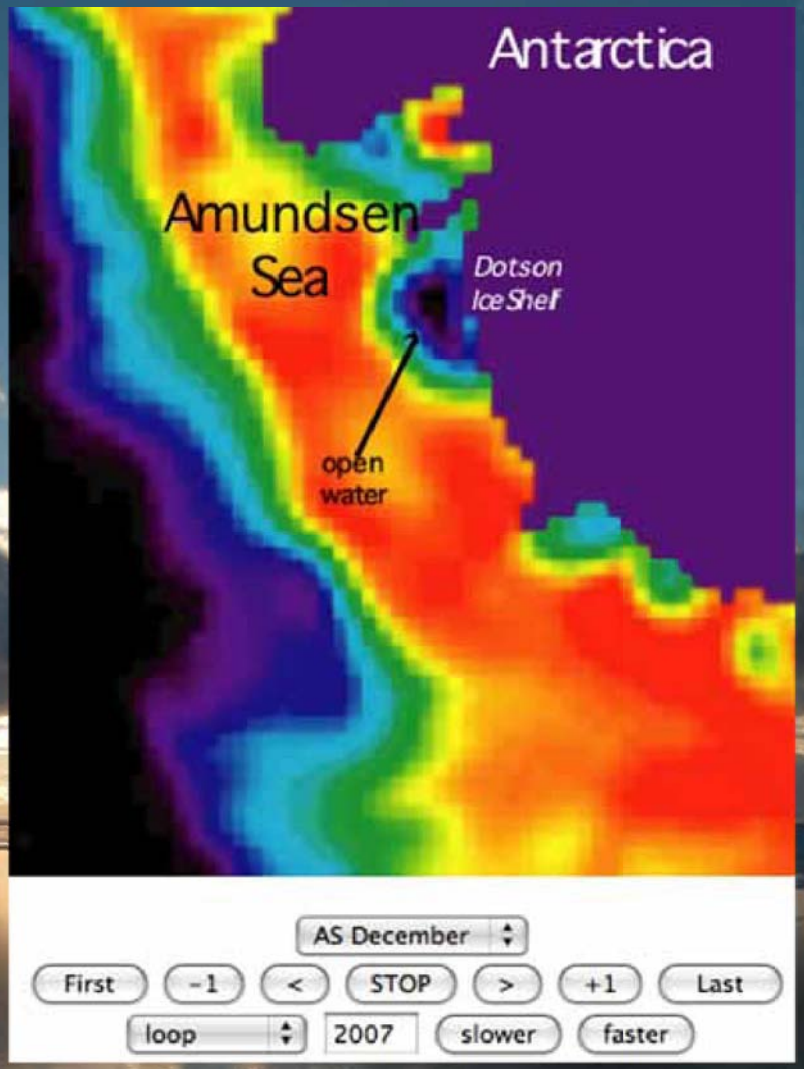
A regularly occurring polynya just off the Dotson Ice Shelf



http://www.ldeo.columbia.edu/~sharons/animAS_bymon.html

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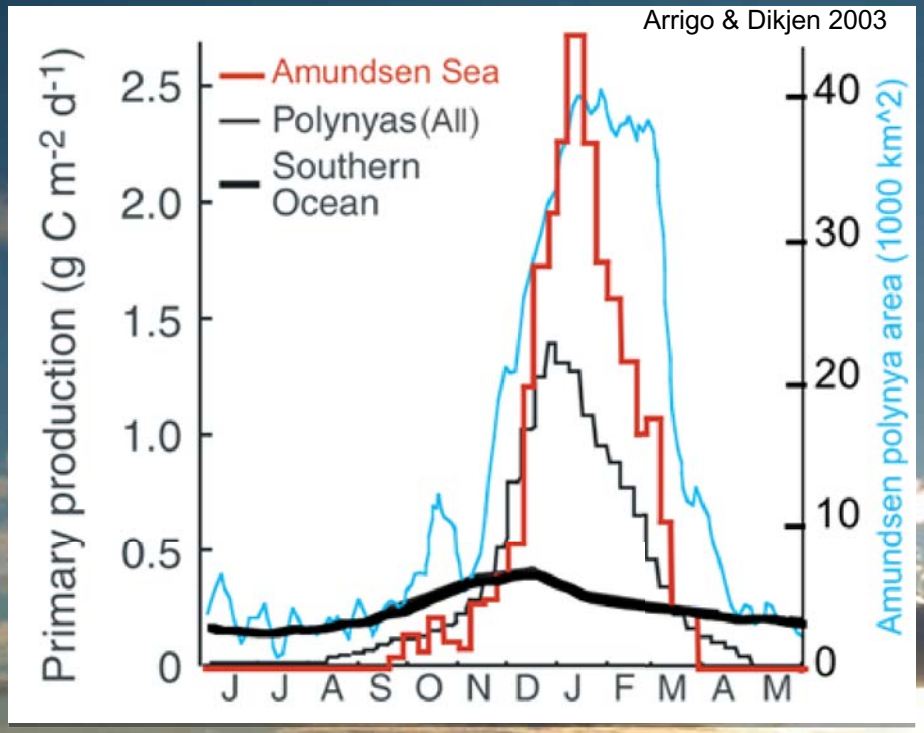

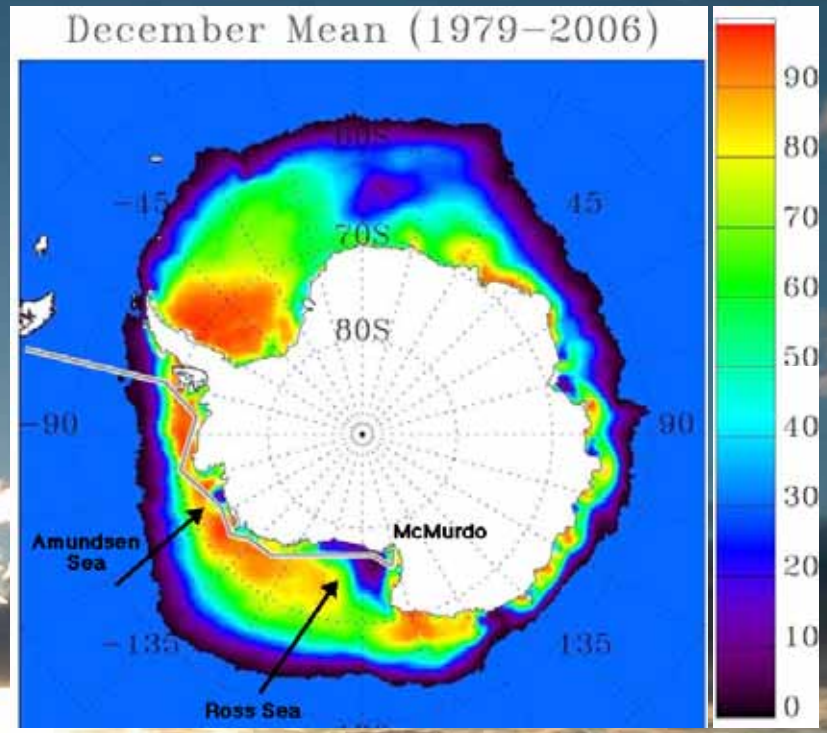

- **Fourth largest Antarctic polynya**
- **Highest peak and seasonally averaged chla concentration**
- **Greatest primary productivity per unit area**
- **Greatest interannual variability - WHY?**

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Project Objectives:

Use inter-annual and spatial variability to elucidate climate-sensitive mechanisms directing carbon fluxes in this region.

Focus on physical (light, mixed-layer) and chemical (micro-nutrient) mechanisms controlling the duration, timing, and community structure of the phytoplankton bloom

Determine controls on the fate of that production (zooplankton, microheterotrophy, particle flux)

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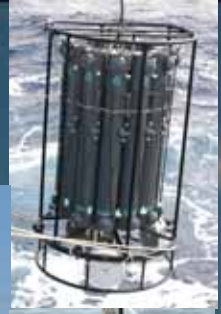
Trace Metals (Rob Sherrell / Per Anderson / Silke Severmann / Kuria Ndungu)

Dissolved and particulate Fe, Mn, Zn, Cu, No, Co, Cd, V, Mo, Ca, P, Corg, Norg, Ba, Al, Sc, T, Yb, Pb, REE
TMC CTD/rosette, Towed fish, in situ pumps



Phytoplankton Abundance and Physiology (Oscar Schofield)

Physiology: Fluorescence Induction Relaxation (FIRE; Fv/Fm); 14C-bicarb incubation
Webb Slocum Glider (CTD/ Ecopucks: spectral backscatter, chla fluor, CDOM)

Zooplankton (Kajsa Tonnesson)

Abundance, grazing rates, prey preference, pellet production

Particle dynamics and sedimentation (Hugh Ducklow / Per Anderson)

Moored sediment trap, dissolved and particulate ^{234}Th , floating sediment trap

Microbial heterotrophy (Patricia Yager / Stefan Bertilsson / Lasse Riemann)

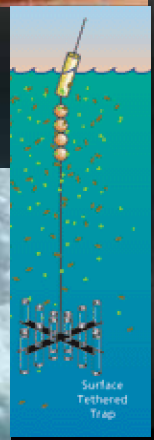
Free- and particulate bacterial and Archaeal abundance, production, respiration, community structure, exoenzymes, viral abundance, viral shunt, chemoautotrophy, bacterivory

Carbonate system (Melissa Chierici / Agneta Fransson / Patricia Yager)

Underway surface pCO2, DIC, ALK, pH

Physical Oceanography (Goran Bjork / Anna Wahlin / Lars Arneborg)

Water masses (especially CDW); CTD hydrography; conventional CTD/rosette



Ice-Ocean Atmosphere Interactions, data synthesis, modeling (Sharon Stammerjohn)

Large-scale ice-atmosphere variability, surface water properties, stratification, CDW
Ice-algal growth model, single-column KPP upper ocean mixing model with biogeochem

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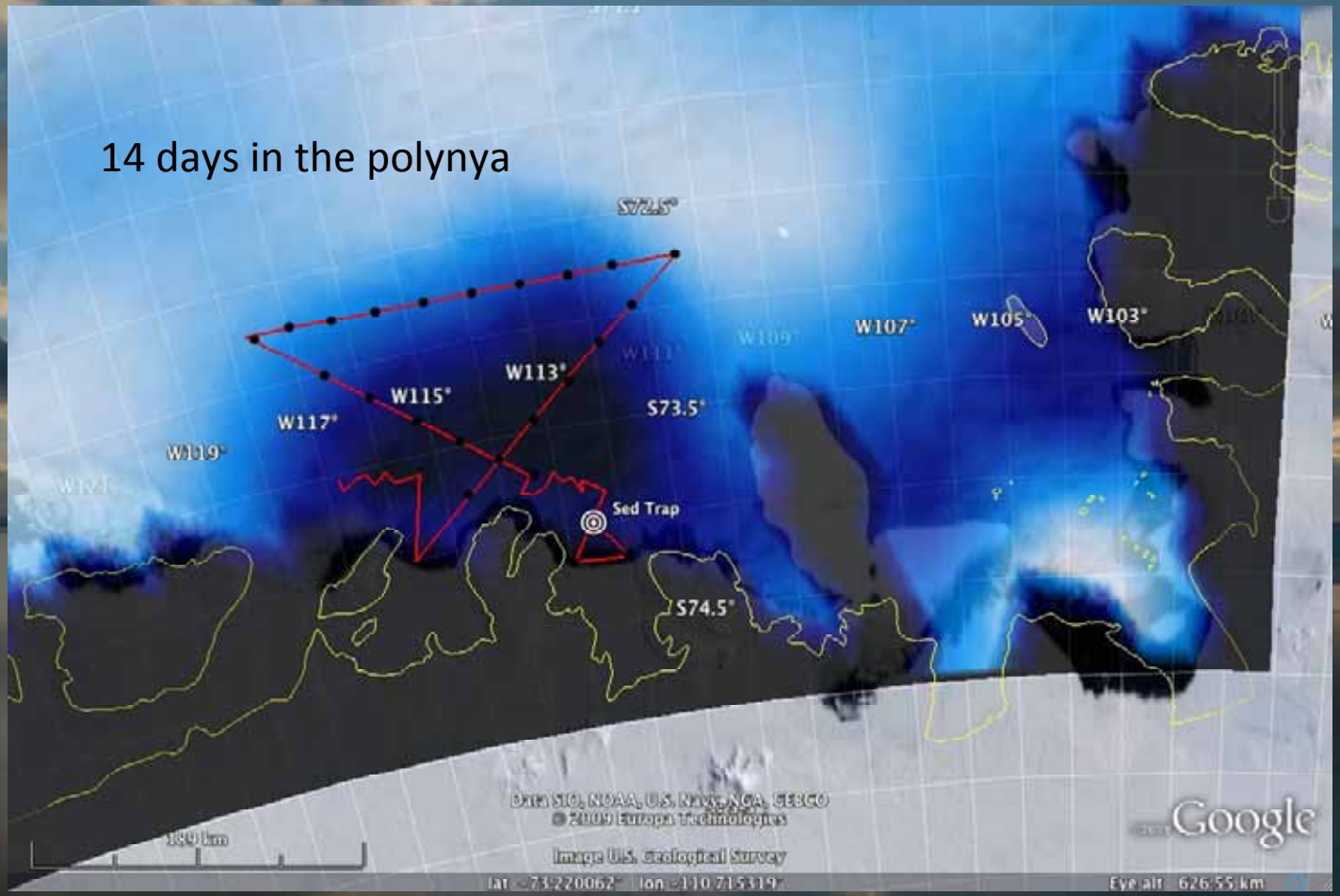
Proposed cruise track within the Amundsen Sea Polynya: Three transects and two 3-day drifting time series stations



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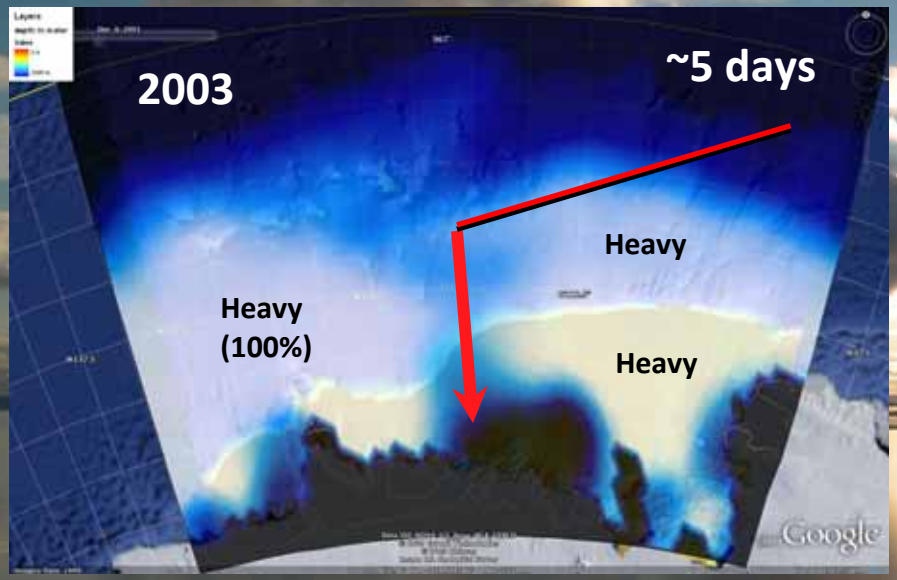
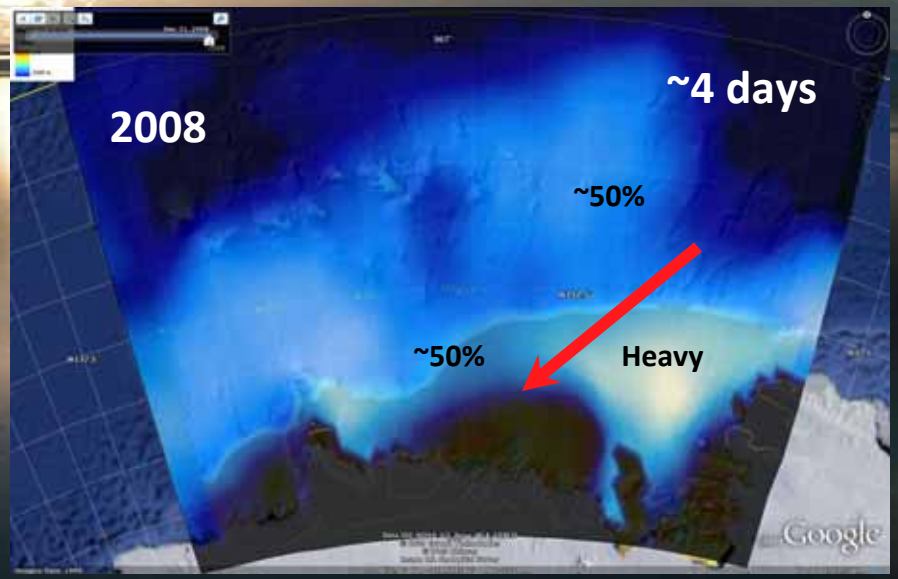
Sediment trap placed in area open for longest time

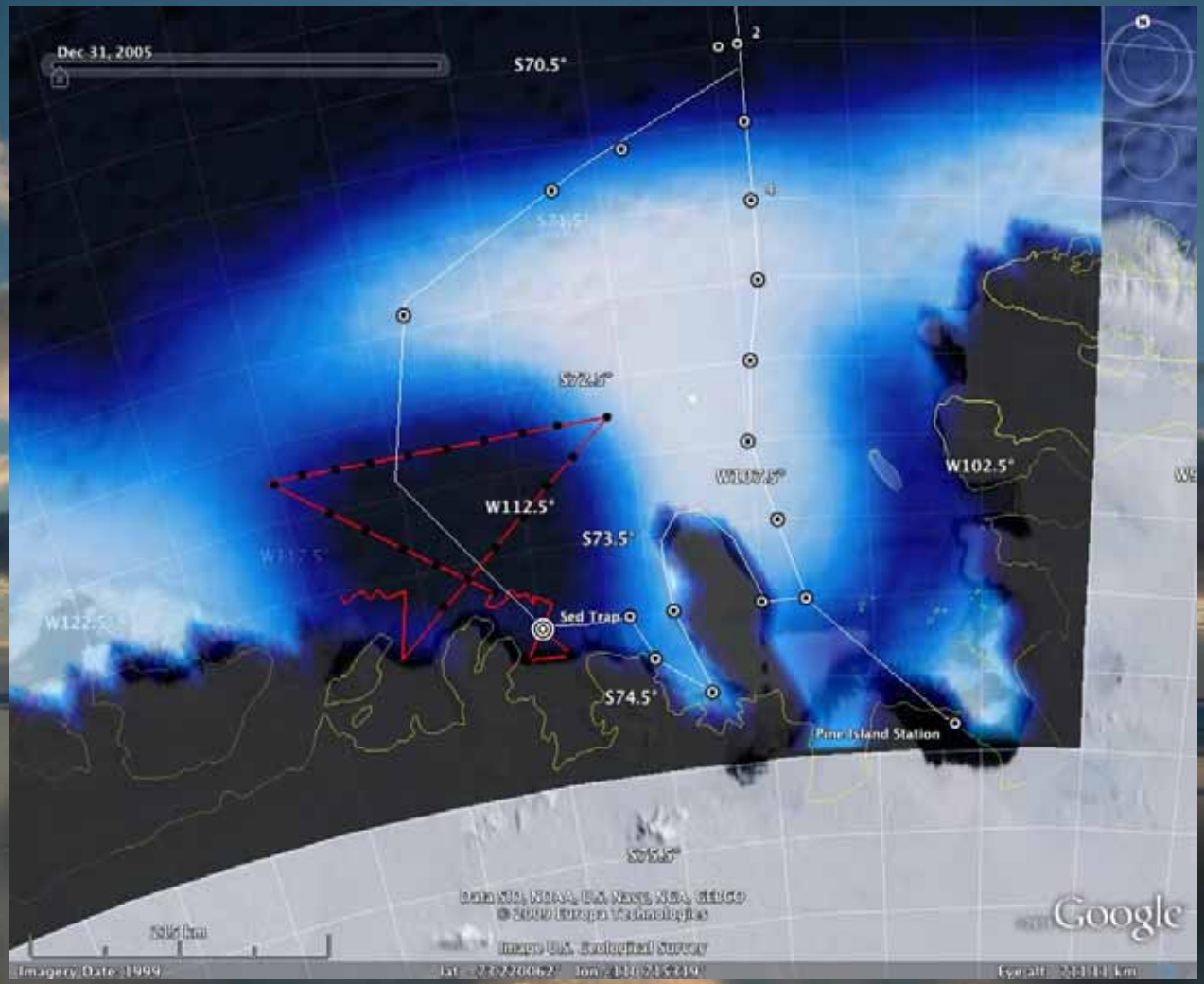
Examples of December sea ice conditions and 'quickest' routes to AS polynya





Sea Ice Image overlaid on land/bathymetry masks:

- Continental Ice is light/dark: grey (under ice image)
- Continental shelf: slightly shaded (under ice image)
- Open water: black
- Sea ice 100%: white
- Sea ice ~50%: light blue


Dec 31, 2005
S70.5°
S72.5°
W112.5°
S73.5°
W107.5°
W102.5°
Sed Trap
S74.5°
Pine Island Station
Google
Imagery Date: 1999

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Priorities for NBP:

1. Into the polynya as soon as possible
2. Deploy mooring and glider first
3. Two 3-day drifting experimental transects
4. Three cross-polynya transects
   (~25 nm station resolution)
5. Ice-shelf front: inputs to polynya
5. Trough sampling: inputs to polynya
6. Pine Island Polynya (depending on ice)

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