

New Zealand's sea ice activities



Indian Ocean



	What?	Who?	Where?
2011-12	Wave-ice interaction	NZ, Aust & Norway	Modeling, mainly Arctic
	Ice shelf basal processes: Ice shelf oceanographic mooring	NIWA & SPRI	Coulman High, RIS
	Sea ice thickness: HEM bird, ground truth, CryoSAT	NZ & Haas	McMurdo Sound & Ice Shelf
	Biogeochemistry	EU collab. & NZ	McMurdo Sound
	Ice shelf-ocean-sea ice interaction: ocean mixing near ice bodies	NZ, USA & Italians	McMurdo Sound & Drygalski Ice Tongue
	Sea ice physical properties: mainly stable isotopes and electrical	NZ, USA, Toyota	McMurdo Sound & Barrow
	Atmospheric forcing of Antarctic sea ice, modelling sea ice at regional scale, and reconstruction of Antarctic sea ice extent by use of proxies.	NIWA, VUW	Modeling

In the near future

	What?	Who?	Where?
2012-13	Biogeochemistry	EU collab. & NZ	McMurdo Sound
	Polynya ocean processes: <i>Tangaroa</i> , 28 Jan to 11 Mar	NIWA, Aust, France	Mertz Polynya
	Ice shelf-ocean-sea ice interaction: ocean mixing near ice bodies & ice in the ocean	NZ, USA & Italians	Mertz Polynya & McMurdo Sound
	Wave-ice interaction	NZ, Aust, USA & Norway	Aurora cruise & modeling
	Ice shelf basal processes: ice shelf oceanographic mooring & phase sensitive radio echo sounding traverse	NIWA & SPRI	McMurdo Sound to Coulman High, RIS
	Sea ice physical properties: mainly stable isotopes and electrical	NZ, USA	McMurdo Sound & Barrow

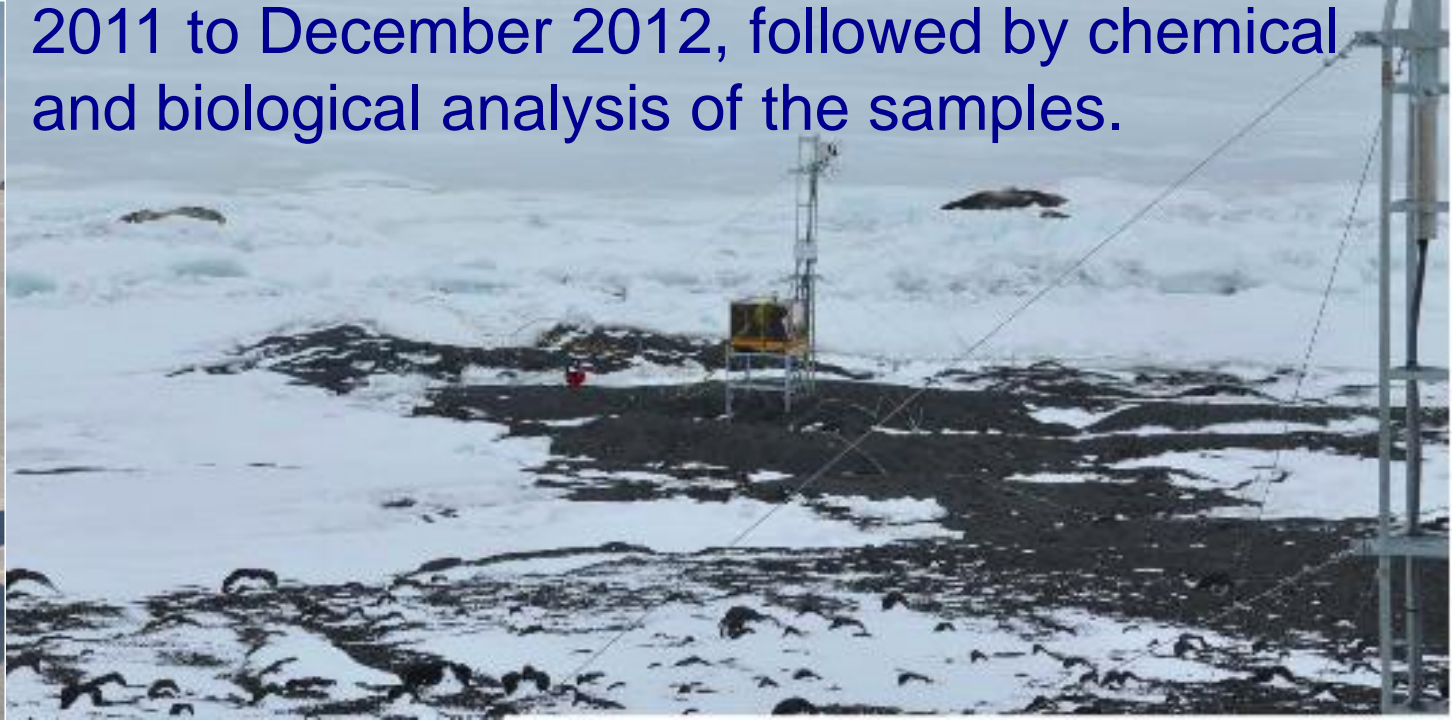
In the more distant future

	What?	Who?	Where?
2013-14	Sea ice thickness: HEM bird, ground truth, snow radar, CryoSAT	NZ, Haas, US	McMurdo Sound & Ice Shelf & beyond
	Coordinated winter platelet ice survey (CoWPIS) (sea ice physics / biology / biogeochemistry)	AFIN/ Anyone who wants to join in	McMurdo Sound and other Antarctic sites

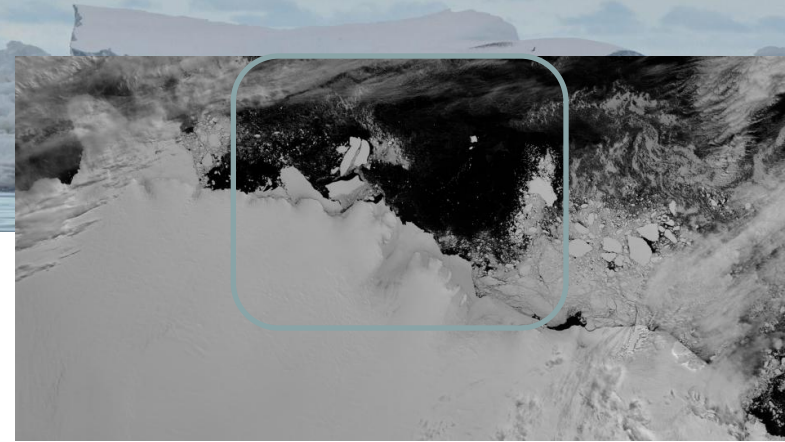
Biogeochemistry

- To determine the exchanges of energy and matter across the ocean-sea ice-atmosphere interfaces during growth and decay of first year sea ice.
- To quantify the impact of CO_2 , DMS, CH_4 and N_2O on the atmosphere & on carbon and nutrient transport to the deep ocean.

Year-long monitoring station from December 2011 to December 2012, followed by chemical and biological analysis of the samples.



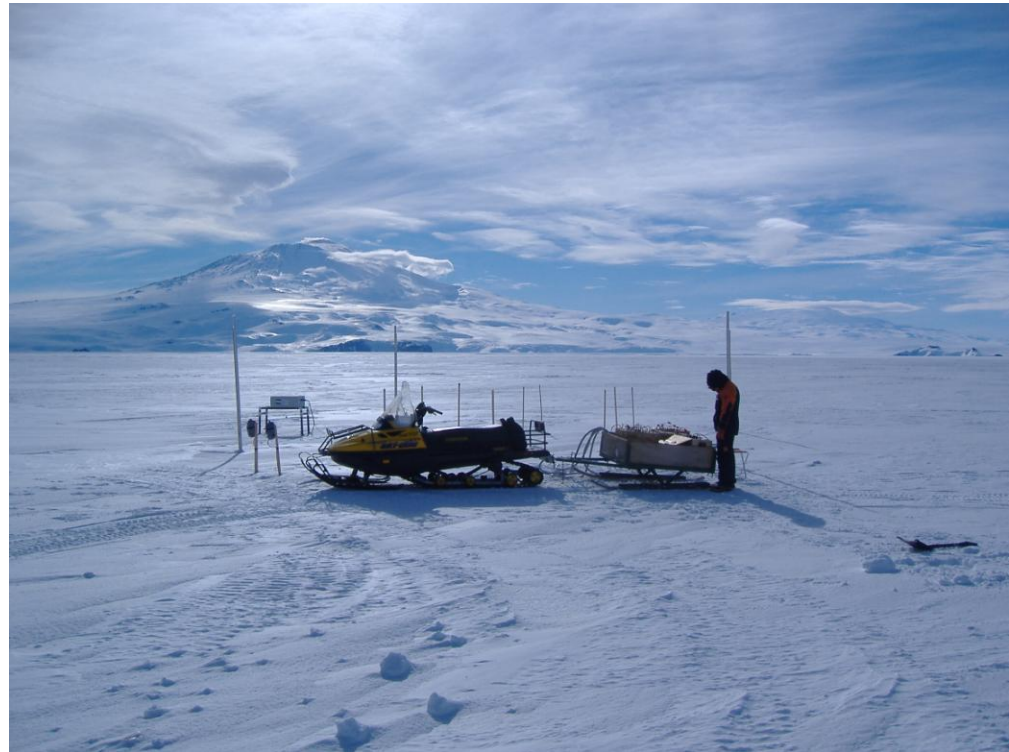
Mertz Polynya



- Bottom water formation
 - Repeat hydrography to look at variations
 - Mooring
- Ocean Acidification
 - Marine Chemistry focus will be on ocean acidification along with oxygen and carbon isotopes, nutrients, salts and dissolved oxygen
- Turbulence with a focus on near vertical ice walls and in polynya
 - Links to ice-ocean interaction
- Paleography
 - Mertz
 - Southern Ocean (in transit)
- Jointly funded by ACECRC and NIWA, with participants from NZ, Australia, and France

Physical properties of sea ice and relationship to structure

- In-situ measurements of both dc and ac conductivity to derive permittivity – porosity implications for microstructure.
- Temperature measurements for seasonal sea ice growth rate, coupled with sampling stable isotopes in sea ice. Aim is retrospective measurement of growth rate from isotope.

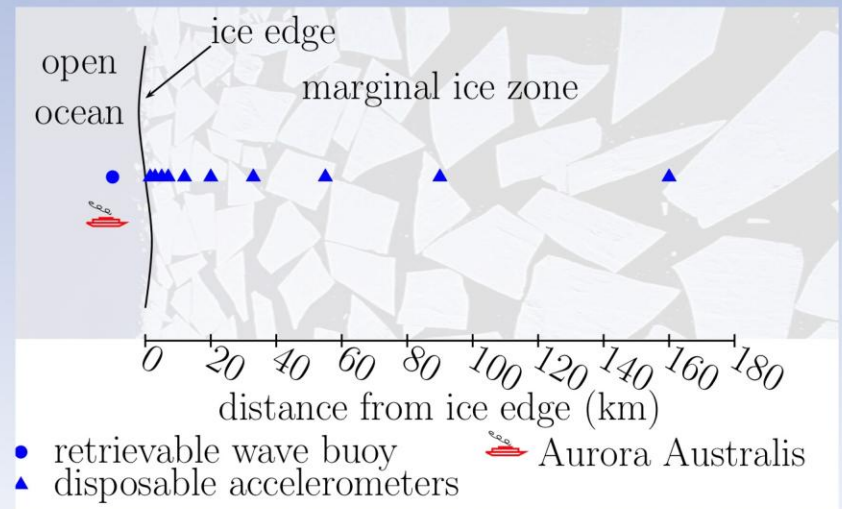


Barrow, Alaska & McMurdo Sound

Wave-ice interaction in ice-ocean models at basin-scale

- Aim is to embed the influence of waves on sea ice in global climate models (ie by improving parameterisation of floe-size distribution leading to a change in heat fluxes etc).
- A fully 3D heterogeneous ocean wave/sea ice interaction model is being implanted into the NERSC¹ TOPAZ ice-ocean modelling system.
- Measurement of attenuation of waves through a floe field is also underway.

- Antarctic MIZ wave experiments are planned for 2012 in collaboration with the Australian Antarctic Division and the Antarctic Climate Ecosystems Cooperative Research Centre
- attenuation of waves in a MIZ will be measured
- results will be used to validate waves-in-ice models



Ice shelf-ocean-sea ice interaction

- Building on expertise built up over past 10 years & 2 seasonal experiments (2003, 2009).
- **2010**: ocean mixing in front of Erebus glacier tongue.
- **2011**: Drygalski Ice Tongue.
- **2013**: Mertz Polynya
- **2014**: Repetition of year-long experiment, including
 - biology and biogeochemistry in the measurements suite with sea ice physical properties and basic near-surface ocean;
 - coordinated at a number of sites.



Nov 2009: Pilot study of production of sea ice thickness maps of McMurdo Sound. Comparison with ICESat underway.

Nov 2011: helicopter survey with two frequencies McMurdo Sound sea ice & Ice Shelf. CryoSat comparison underway.

2013/14: Basler aircraft survey of HEM bird and Cressis snow radar.

**Sea ice thickness:
remote sensing**



2010-2014: Ground truth data (snow, ice and sub-ice platelet layer thickness & freeboard) for HEM bird and CryoSat.

Sea ice thickness:
remote sensing (contin)

