

AUVs in the Polar Oceans

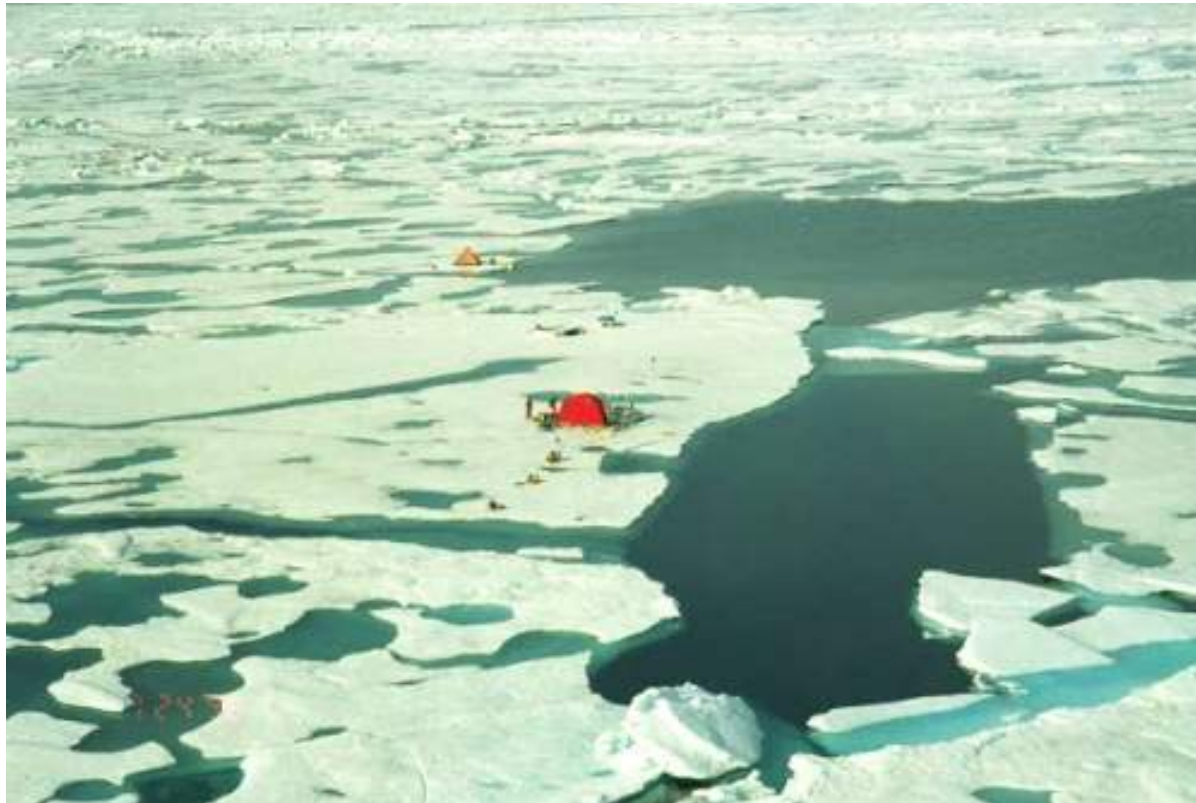
Sensor and instrument requirements

Dan Hayes

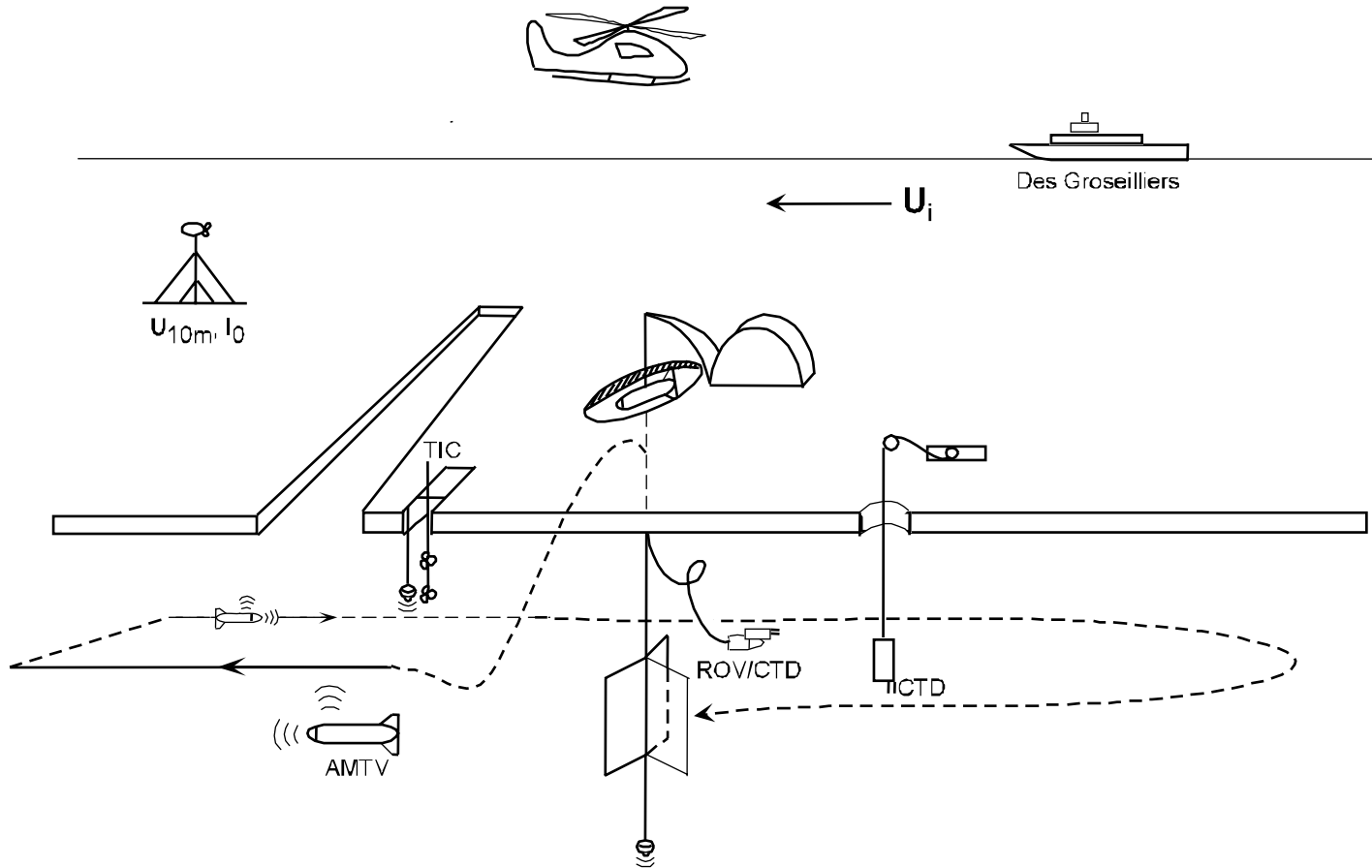


Autonomous is a relative term

Surface Heat Balance of the Arctic Ocean (SHEBA 1998)



Summer lead sampling: SHEBA '98



CTD = Conductivity Temperature Depth

TIC = Turbulence Instrument Cluster

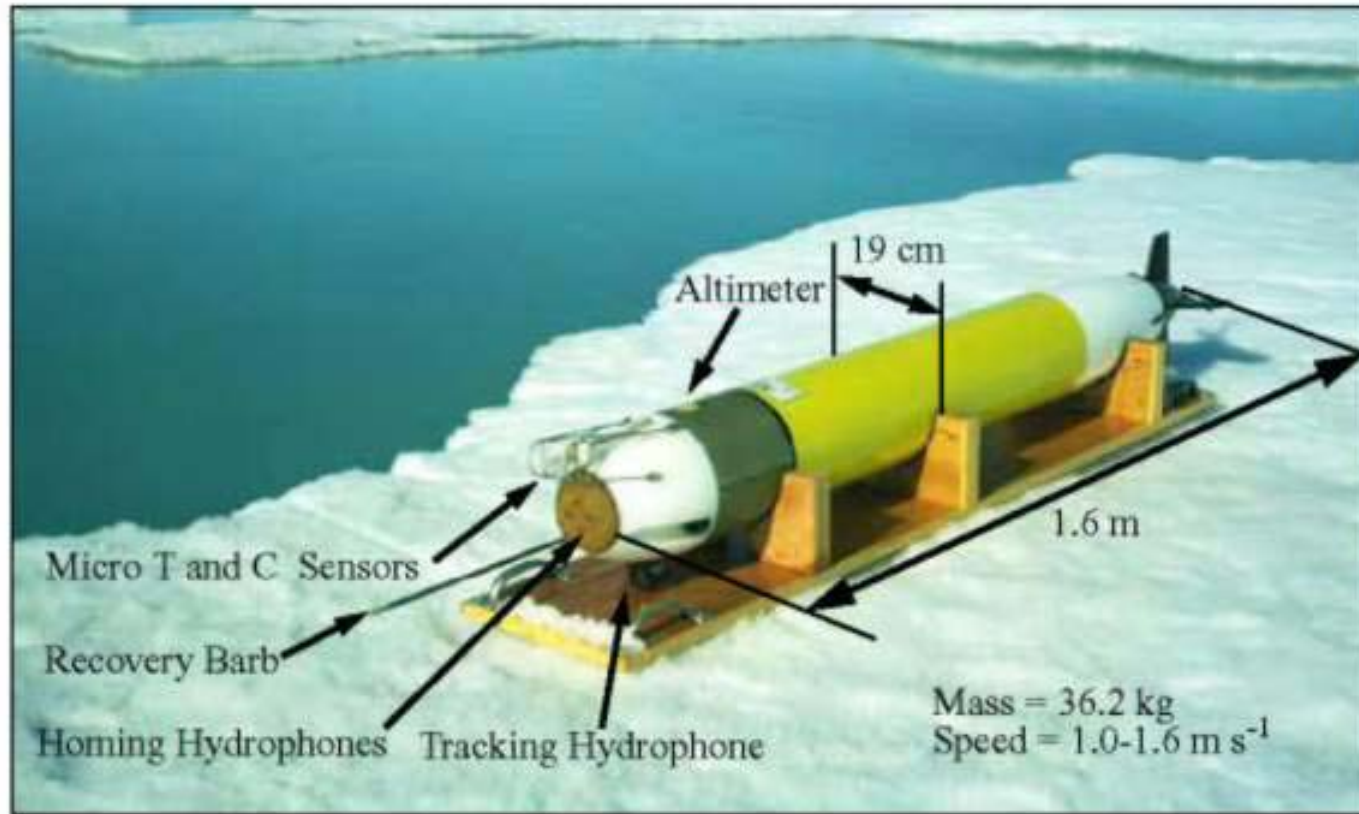
AMTV = Autonomous Microconductivity Temperature Vehicle

ROV = Remotely-Operated Vehicle

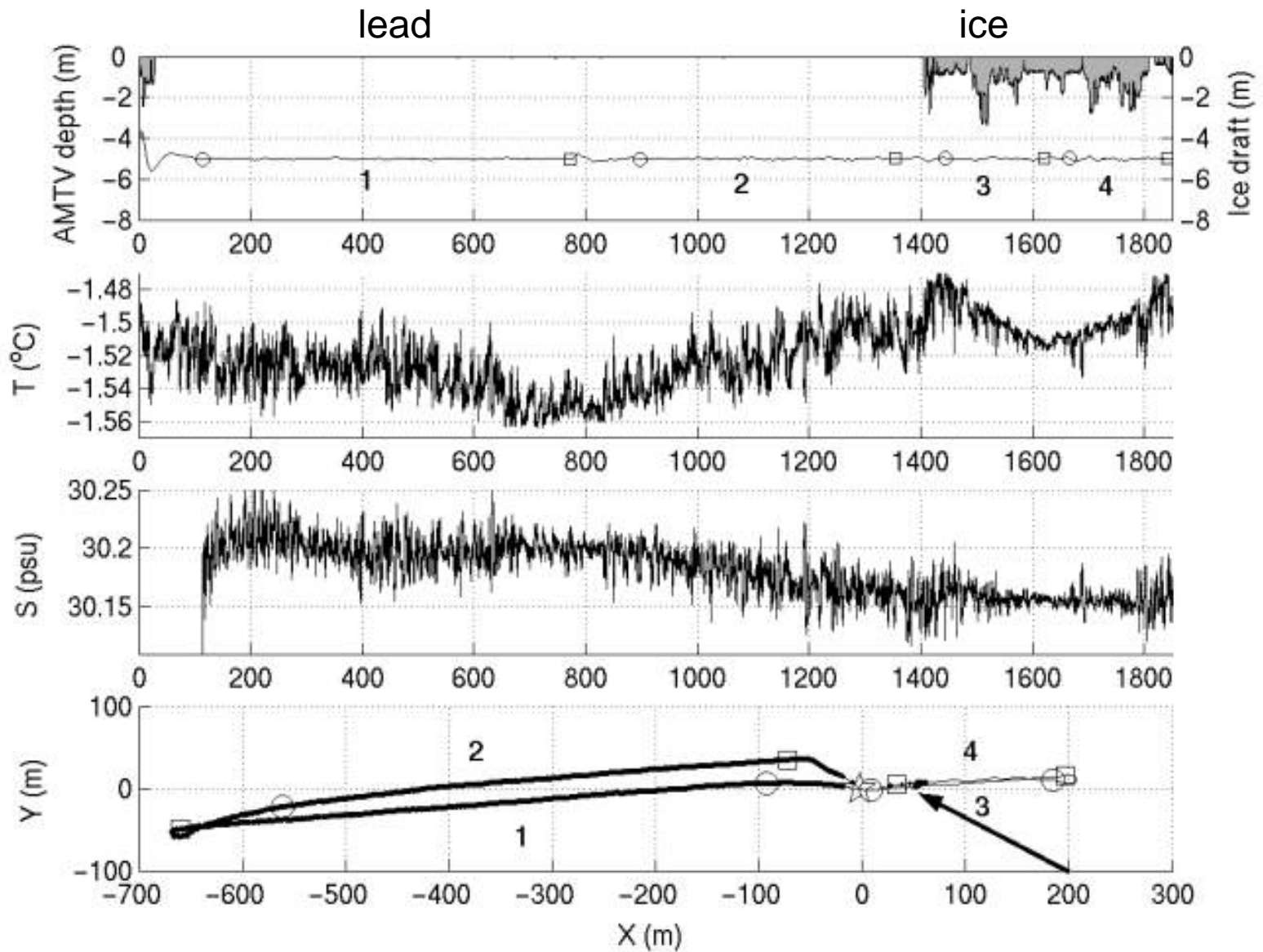
Breakout session goals

- Describe common experiences with sensors for polar AUV work: what has worked and what has failed
- Suggest solutions for common, existing problems with sensors
- Report latest sensor technology appropriate for polar AUV work
- Minimum set of sensors??
- ???

Autonomous Microconductivity Temperature Vehicle (AMTV)



AMTV day 219

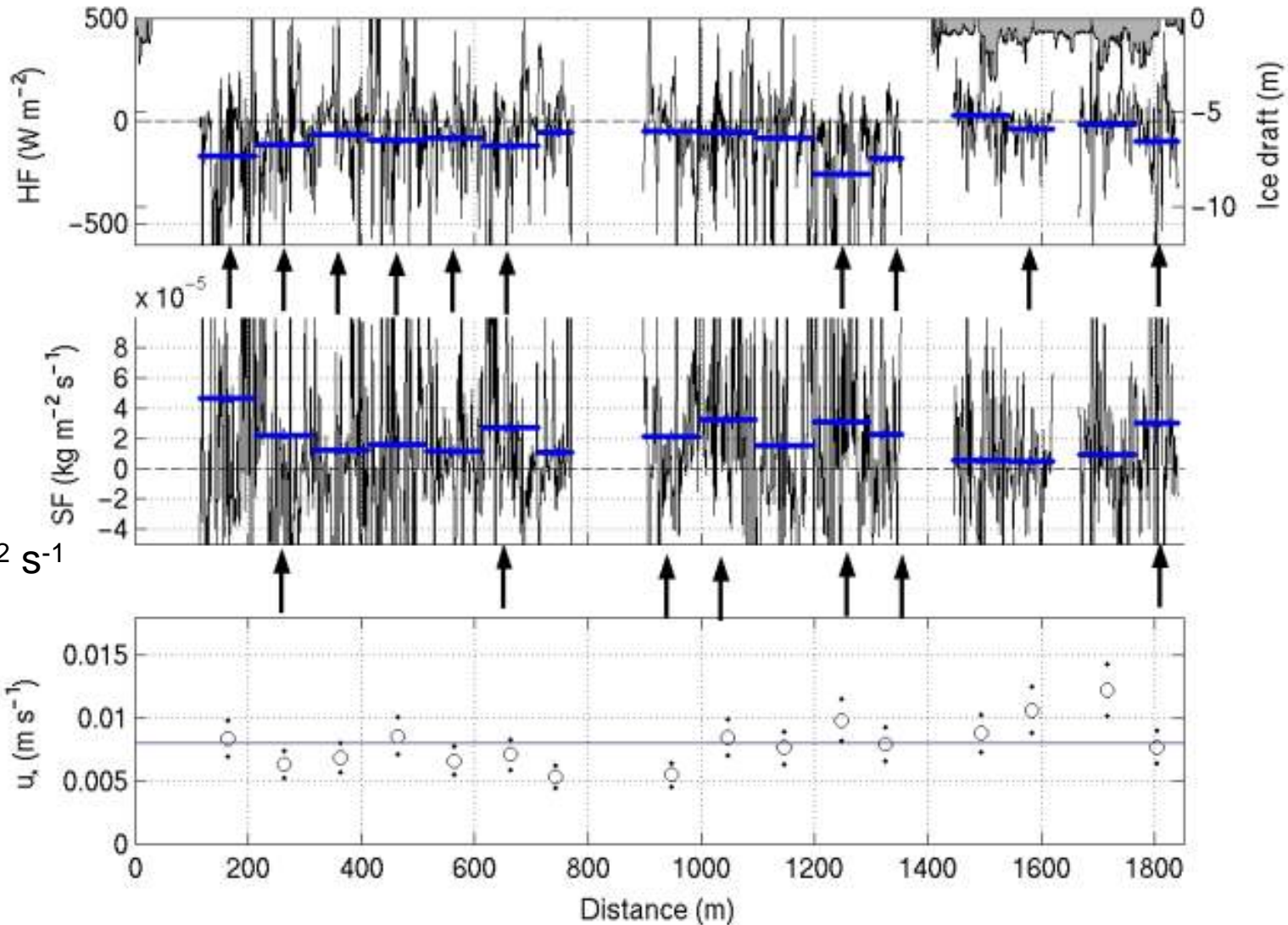


AMTV day 219

lead

ice

Lead fluxes:

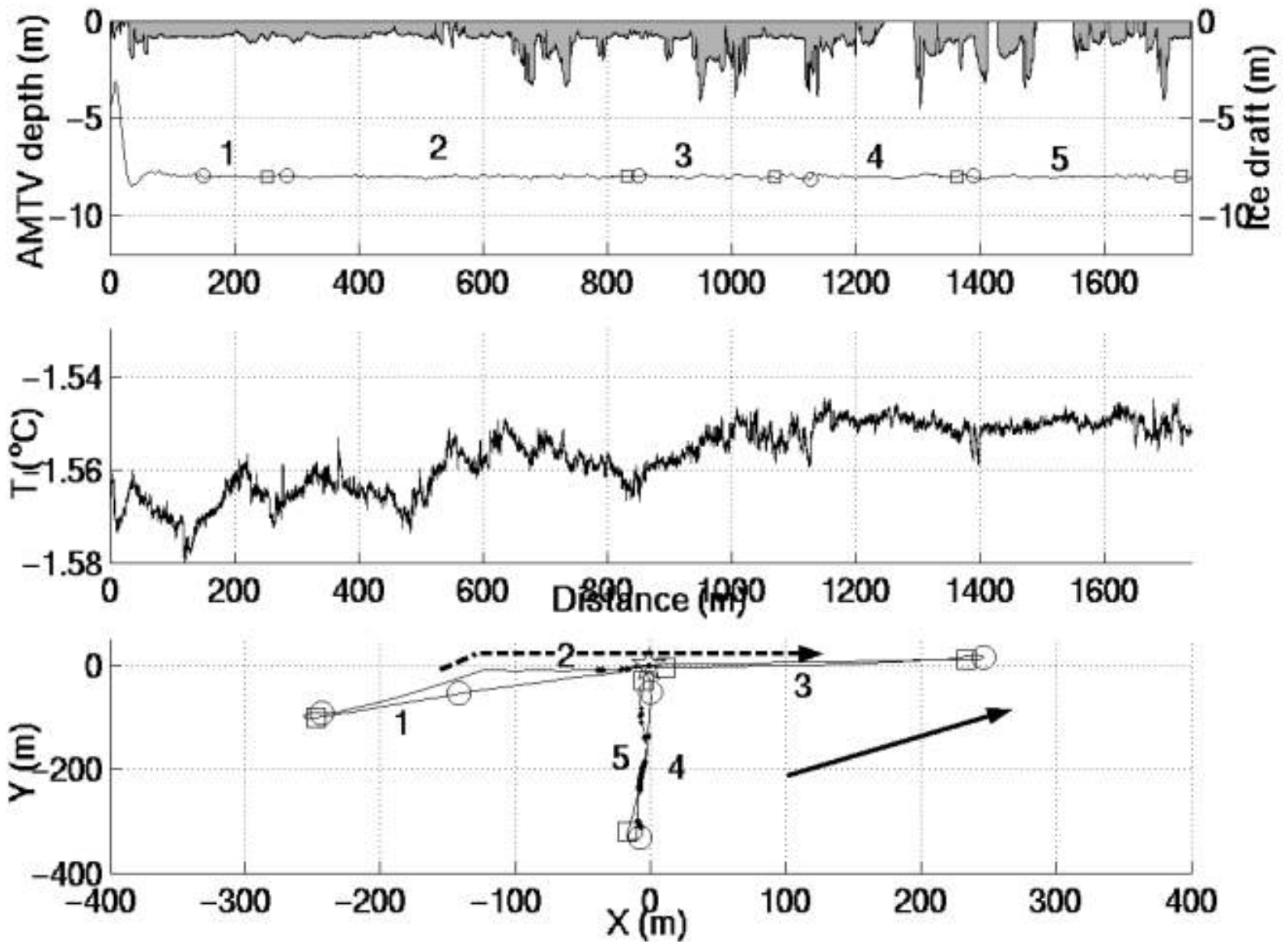


90 W m^{-2}

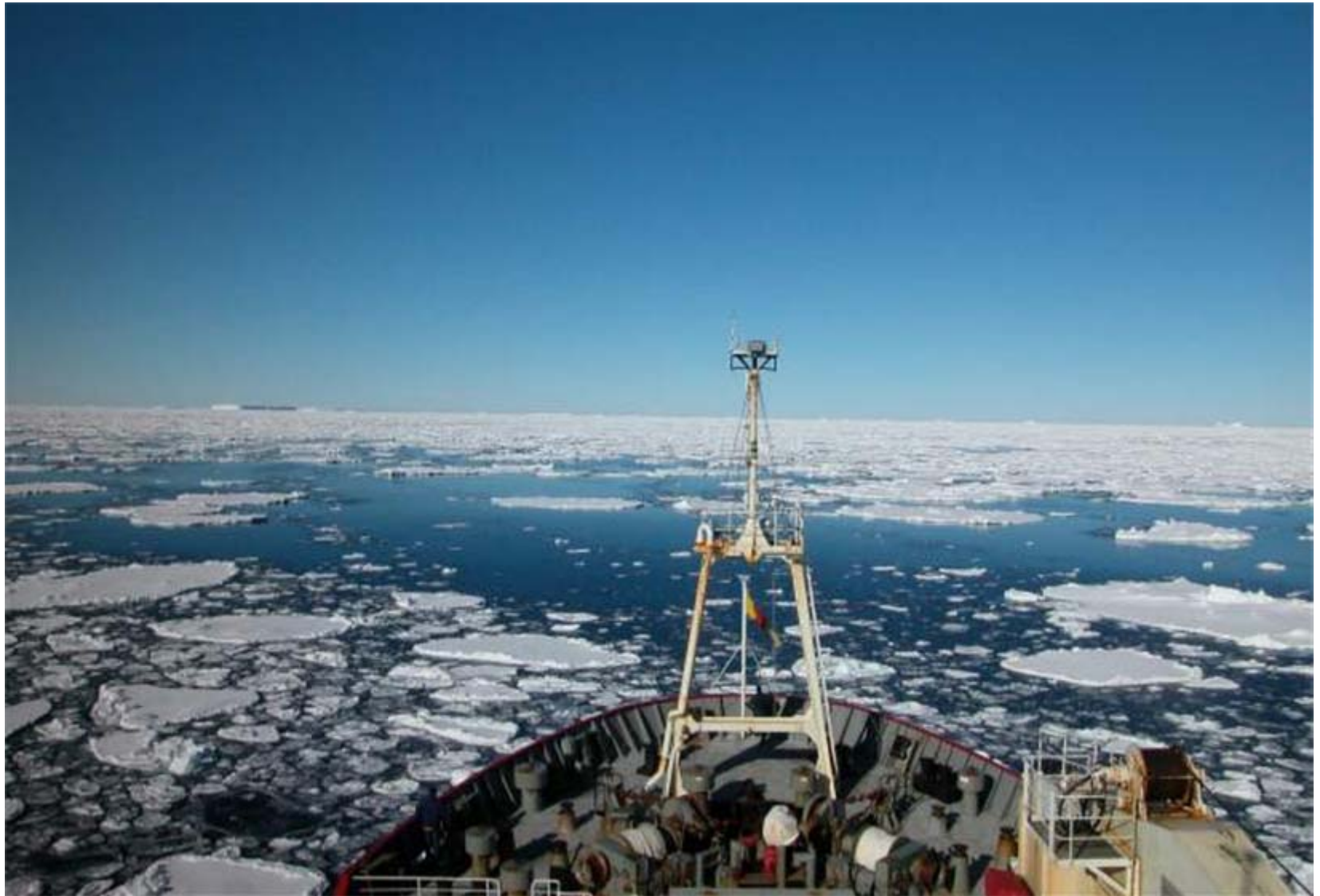
$1.3 \times 10^{-5} \text{ kg m}^{-2} \text{ s}^{-1}$

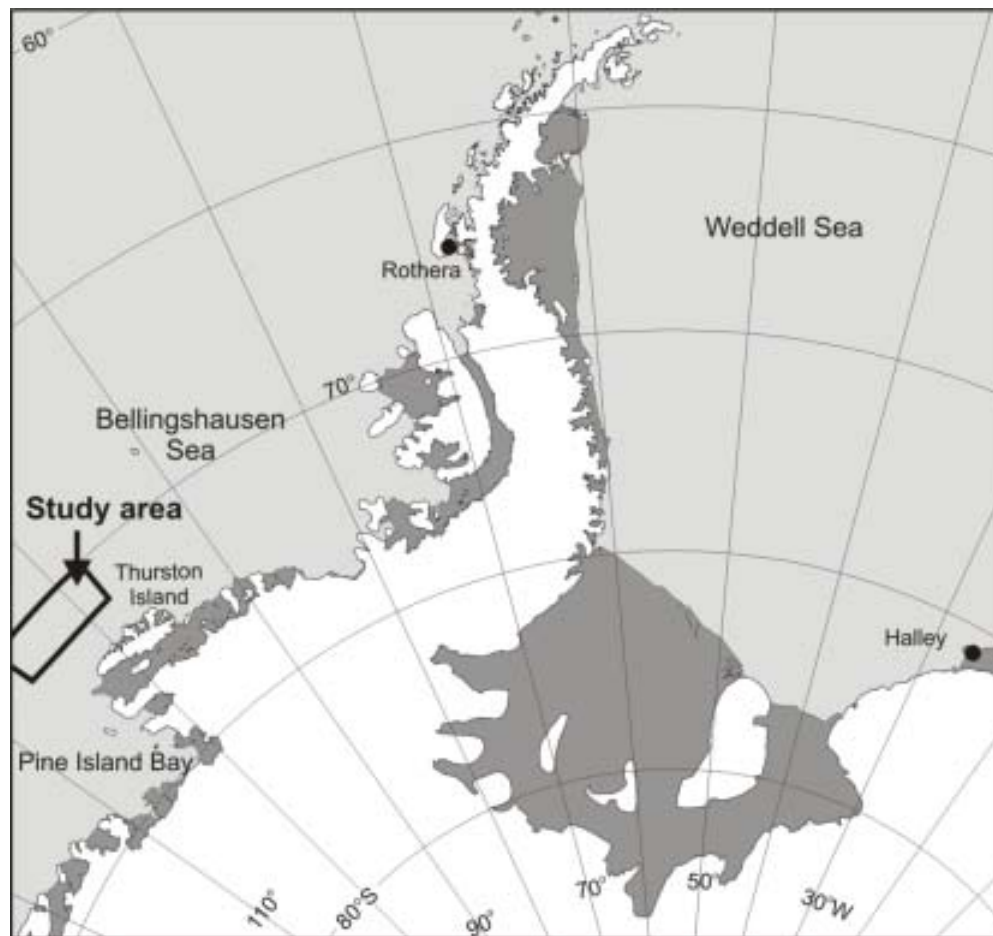
0.008 m s^{-1}

AMTV day 213: during the storm



Southern Ocean Autosub Under Ice 2003



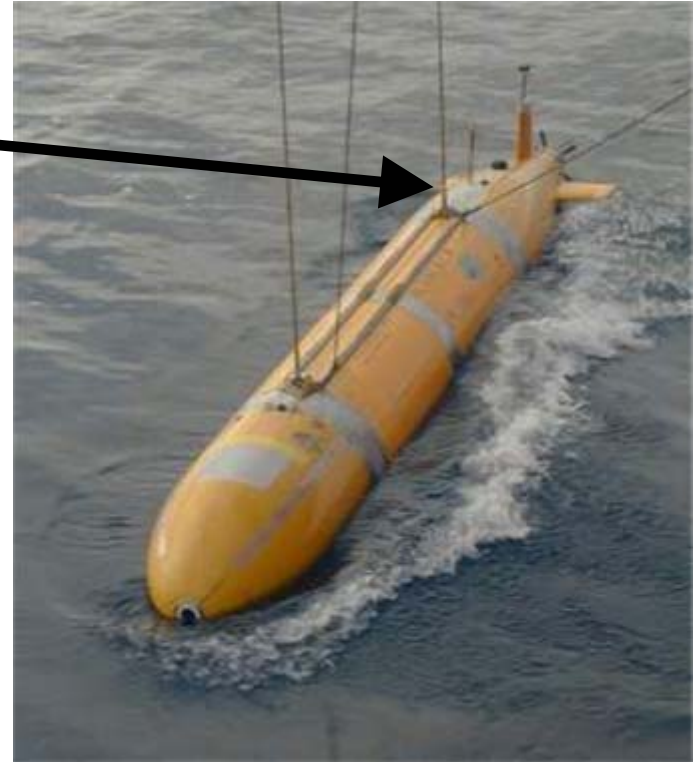




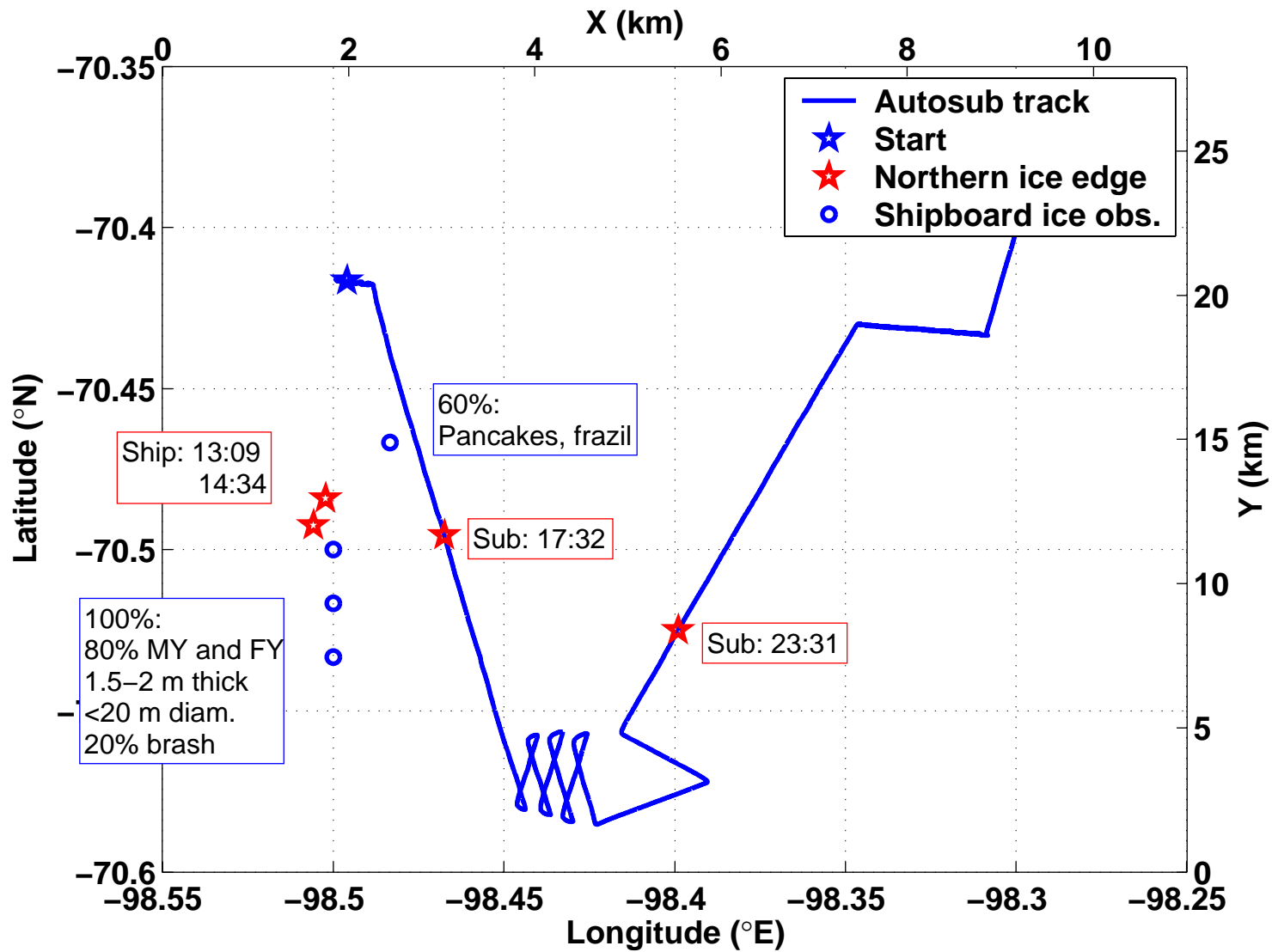


ADCP:

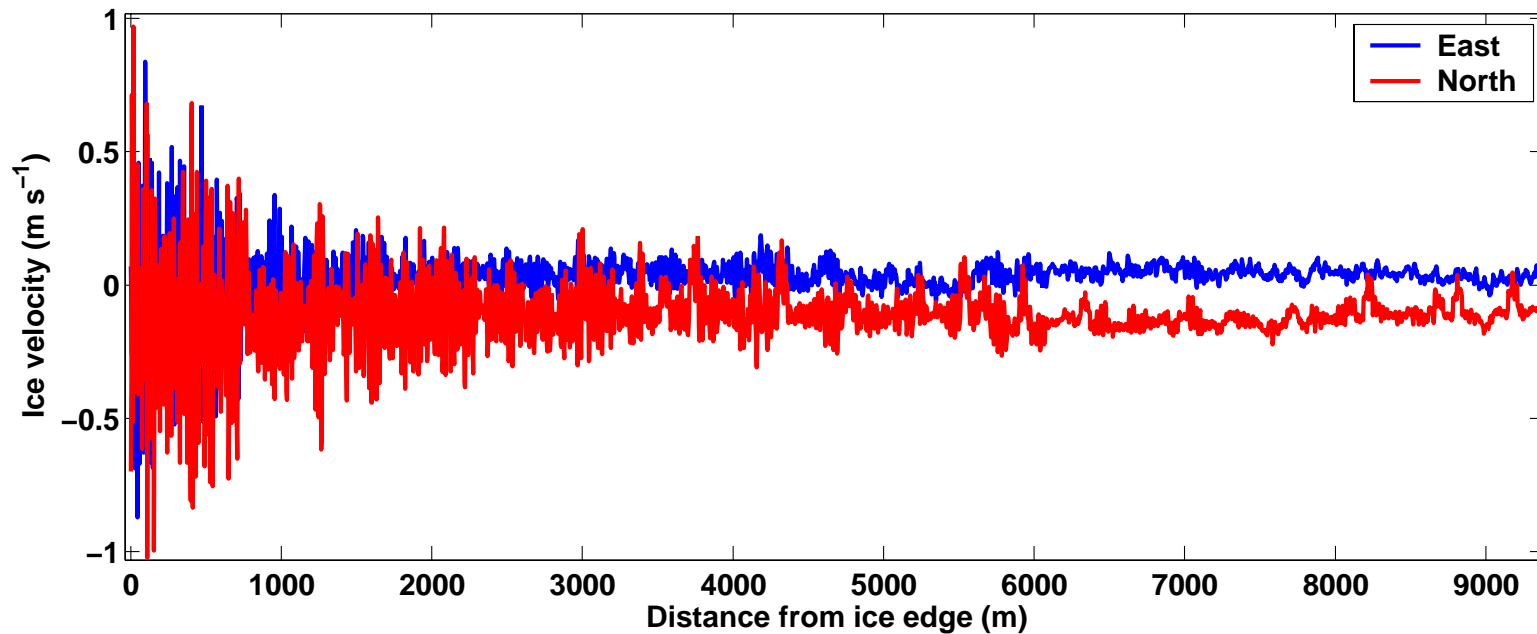
- 3 mm polyethylene window
- 300 kHz RDI
- 4 beams 30° from vertical
- 2 sec cycle
 - profile ping: 15 x 8 m bins
 - surface ping: range, velocity



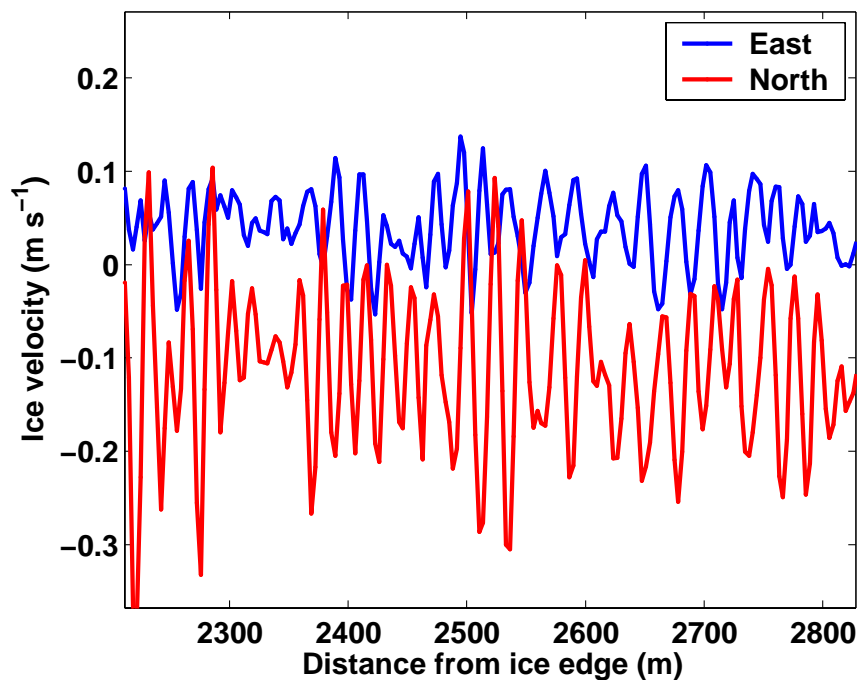
Autosub



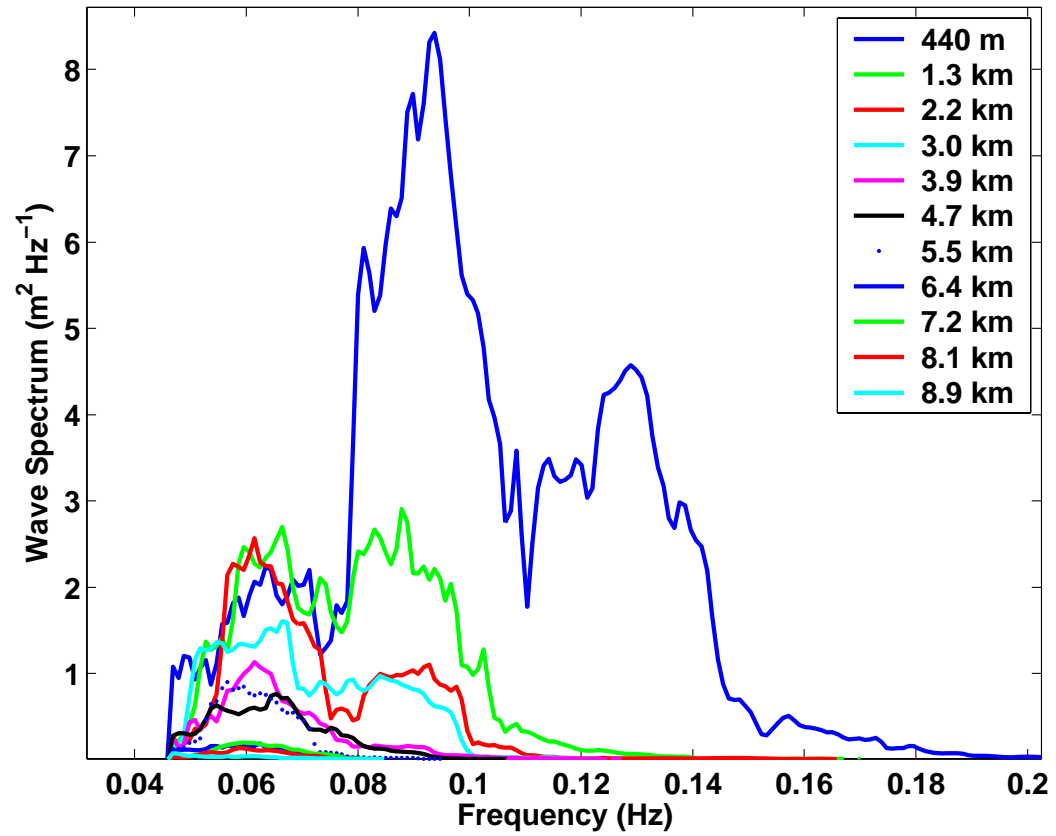
Mission 324 ADCP surface track horizontal velocity



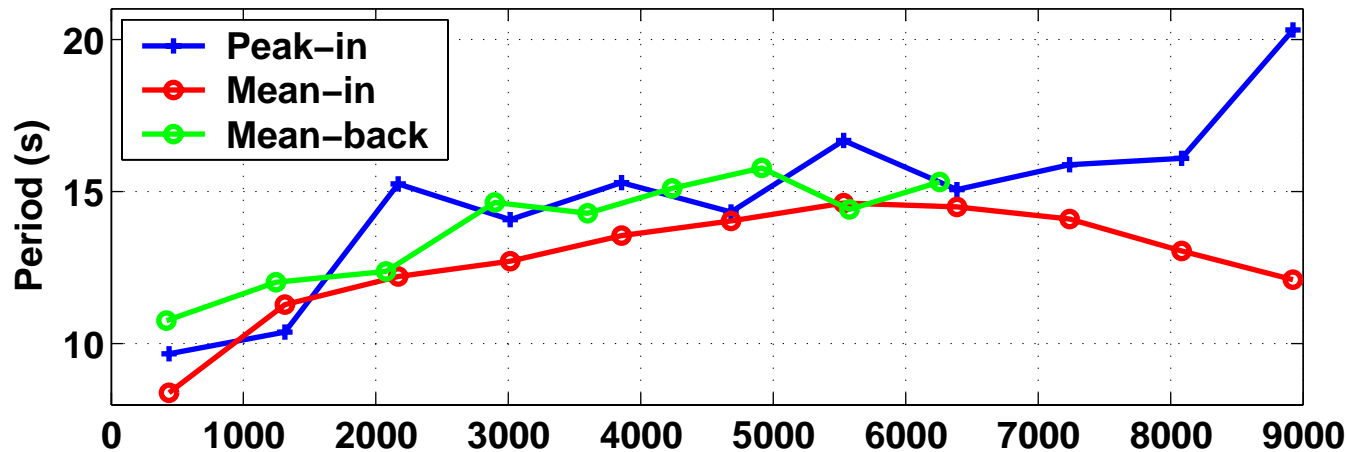
Mission 324 ADCP surface track horizontal velocity



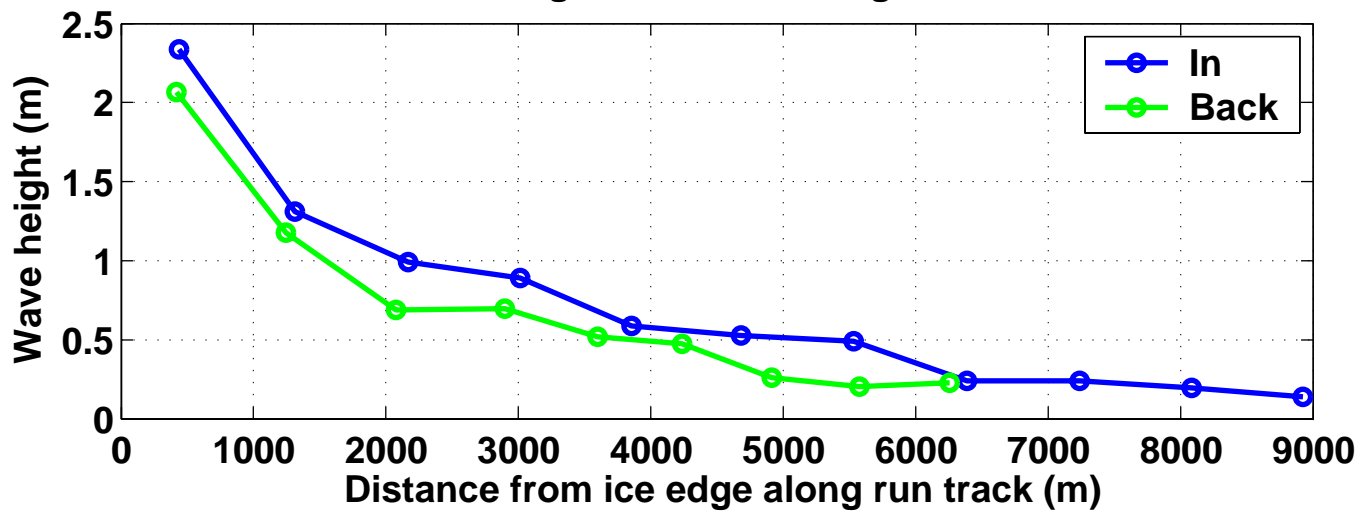
Mission 324 25 March 2003



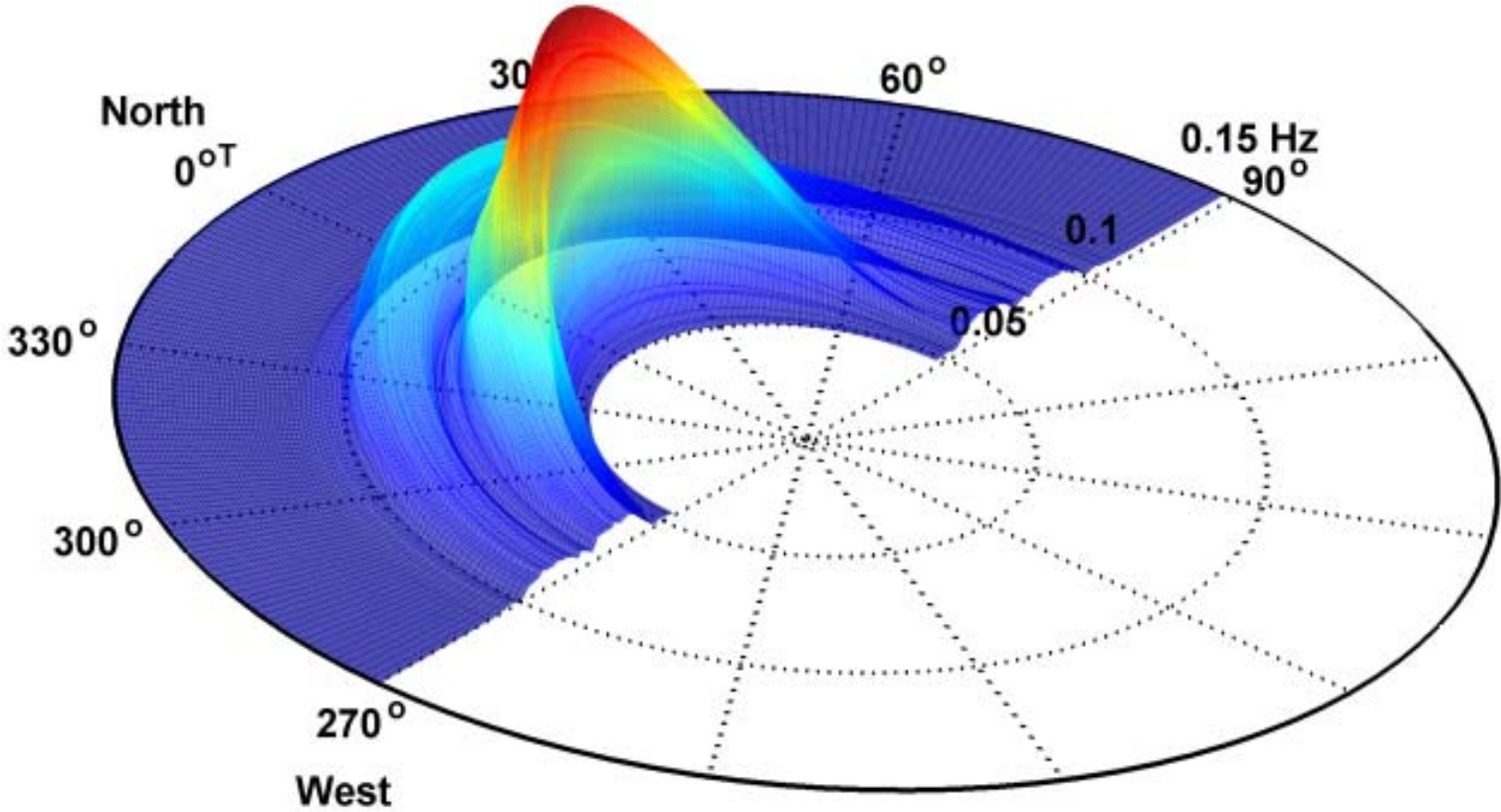
Peak and mean period for mission 324



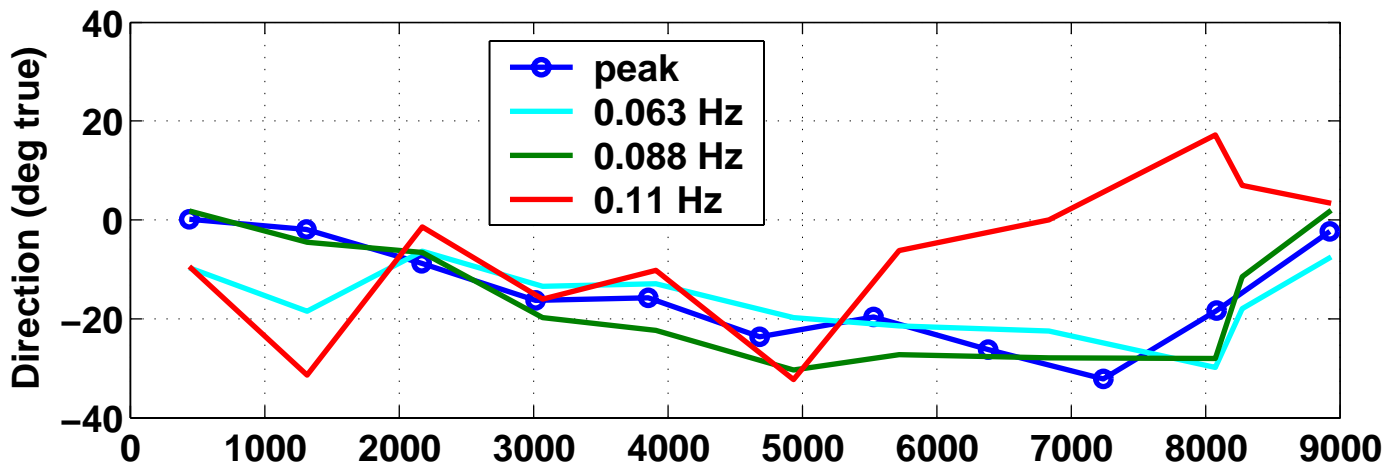
Significant wave height



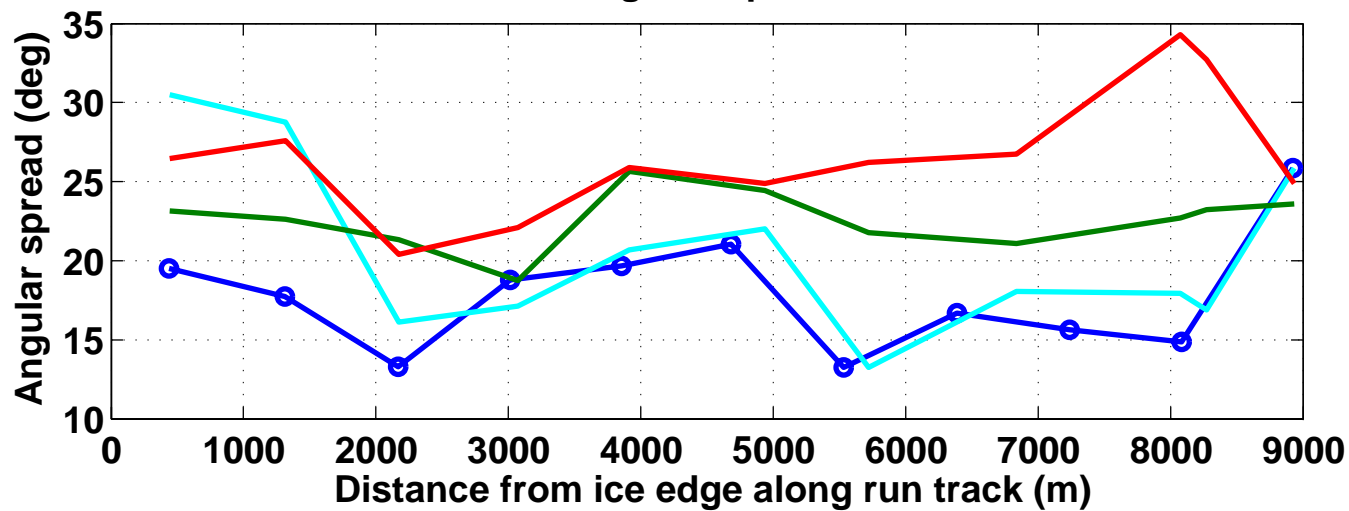
Spectral density over frequency and direction
Mission 324, segment 3 (2.2 km from edge)



Mean direction for mission 324



Angular Spread



Conclusions

- Backup sensors (redundancy)
- Field testing
- Engineer-scientist development collaboration
- ???