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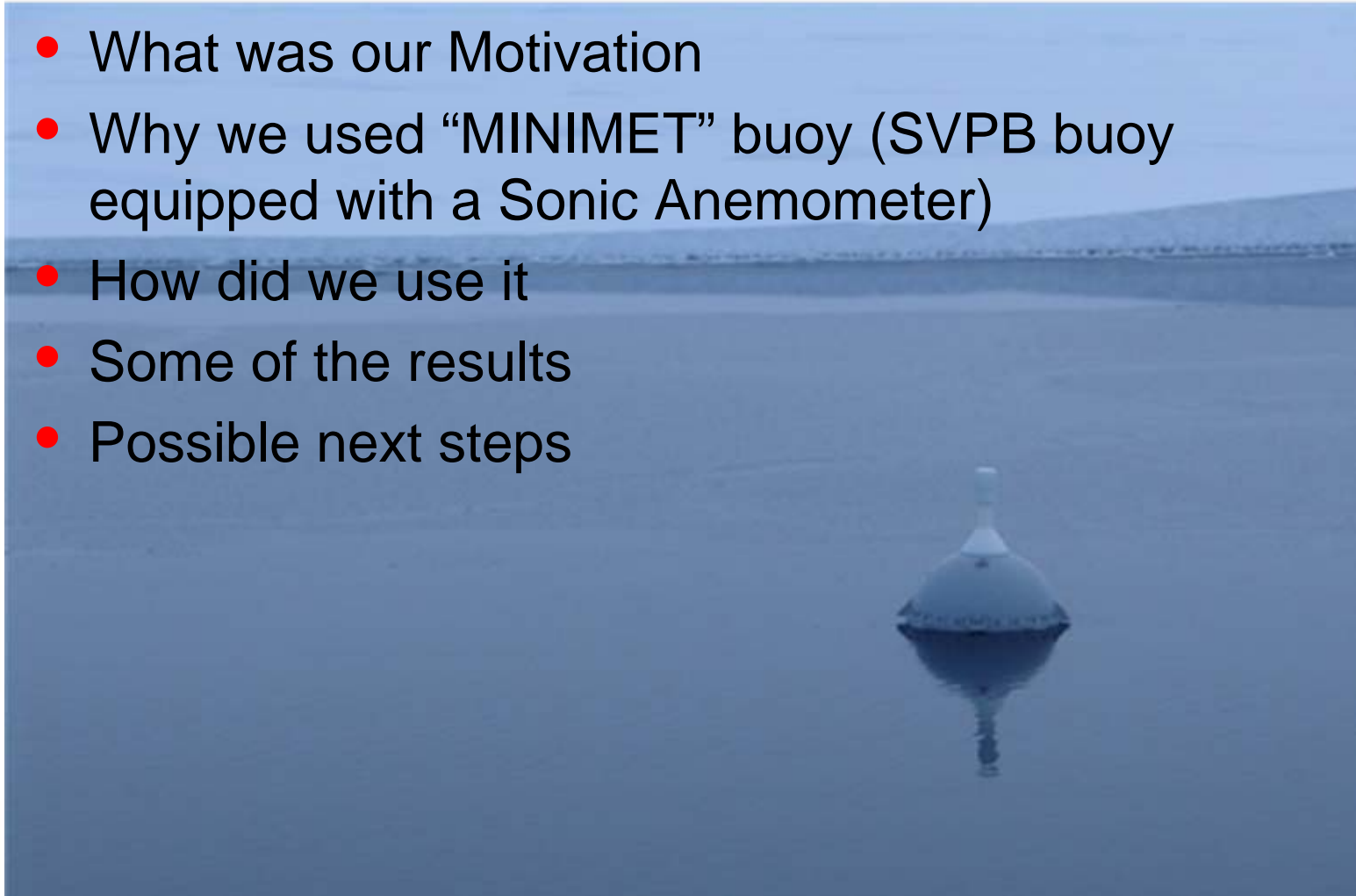
Evaluation of a Low cost Drifting Buoy equipped with a Sonic Anemometer

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National Manager of Marine Monitoring**

**Findings first presented at CMOS Conference,
Montreal by Champika Gallage
June 01, 2012**

Outline

- What was our Motivation
- Why we used “MINIMET” buoy (SVPB buoy equipped with a Sonic Anemometer)
- How did we use it
- Some of the results
- Possible next steps



Different types of Drifter Buoys



AXI Buoy

Buoys presently used by Environment Canada in the Arctic

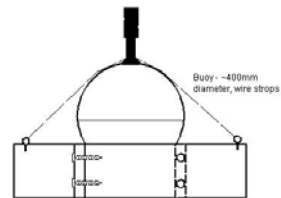
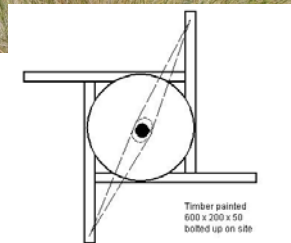
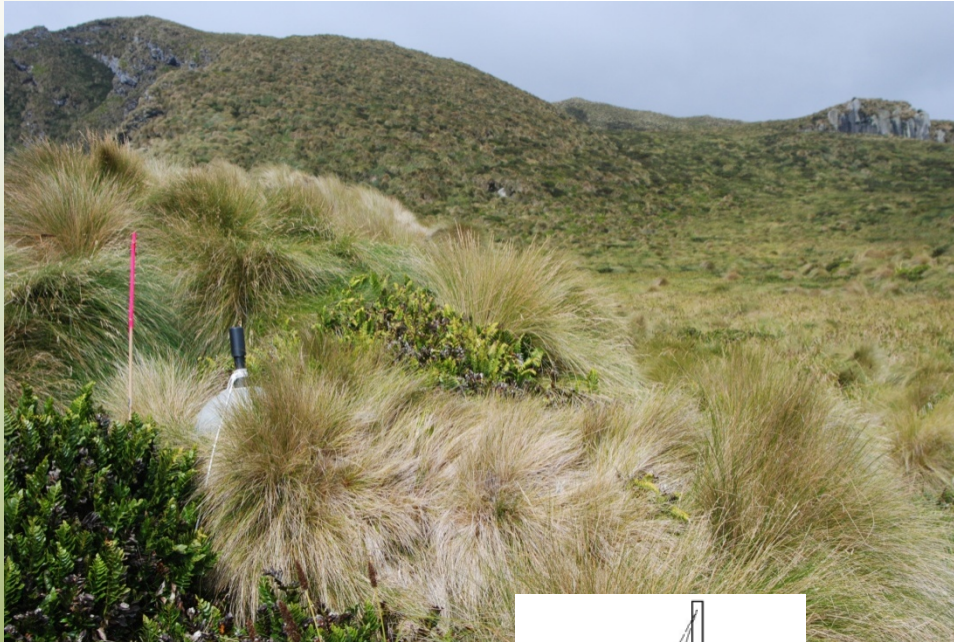


Polar SVP Buoy

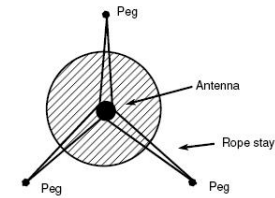
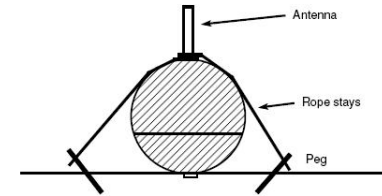


ICEX Buoy

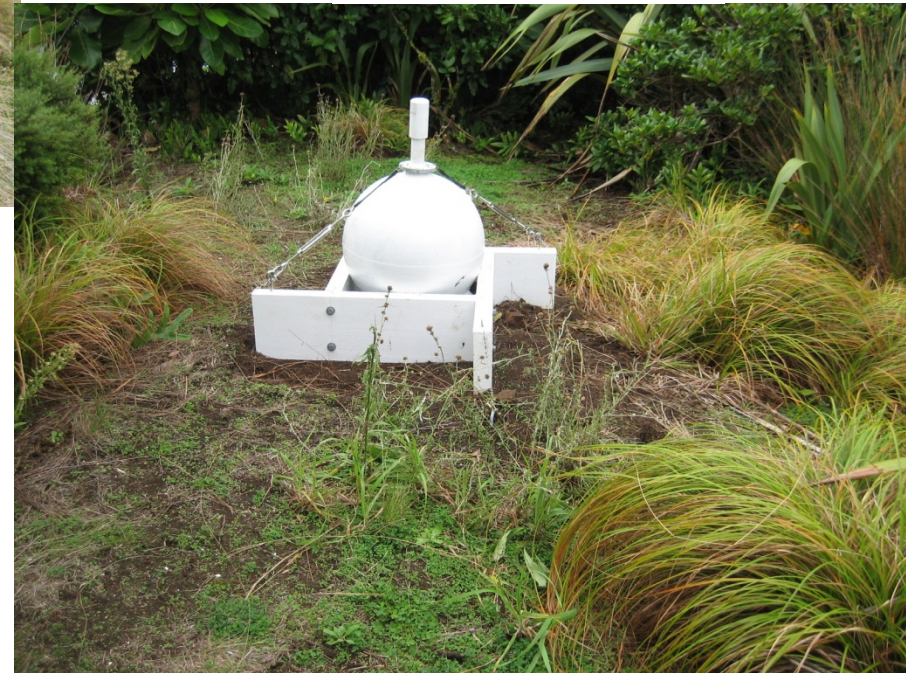
Why this technology?



Suggested Pegging of Buoy



Plan view

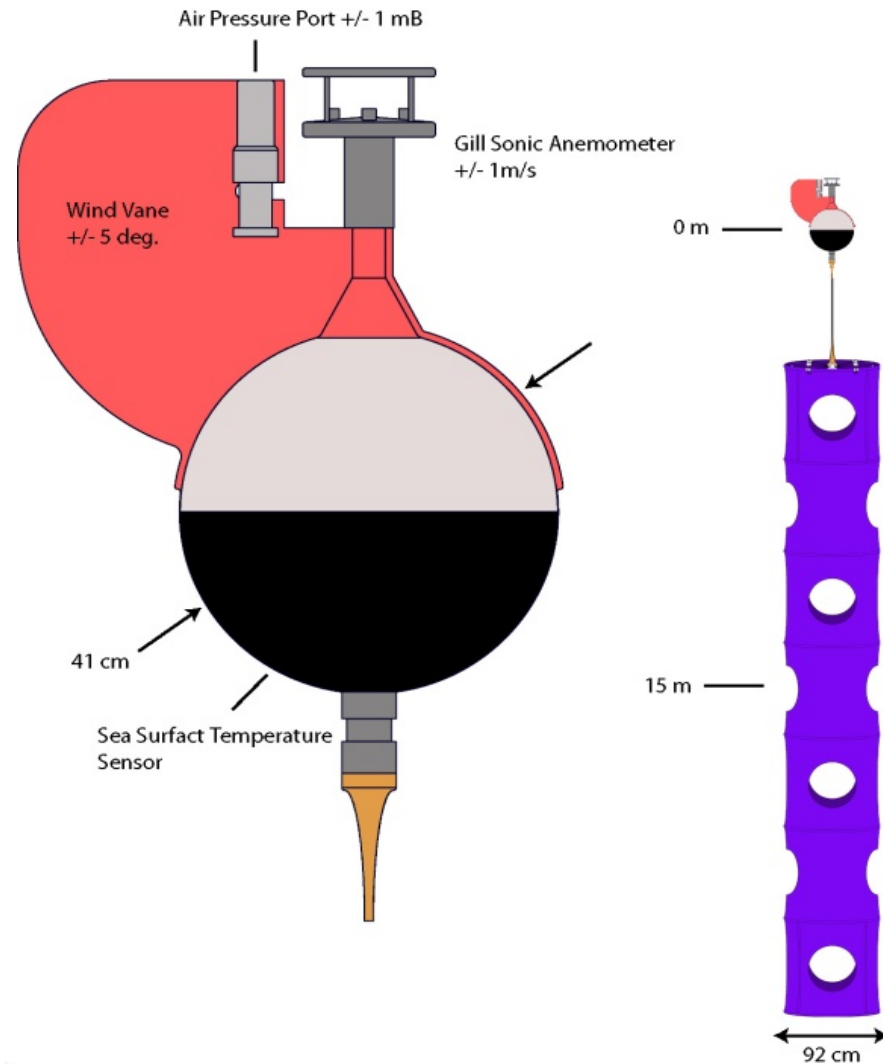


What is MINIMET



- Surface Velocity Program buoy fixed with a Sonic Anemometer
- Measures atmospheric pressure, Temperature, Winds and GPS location
- Buoy sphere diameter 41cm,
- Powered by Alkaline Battery pack

MINIMET Drifter Buoy

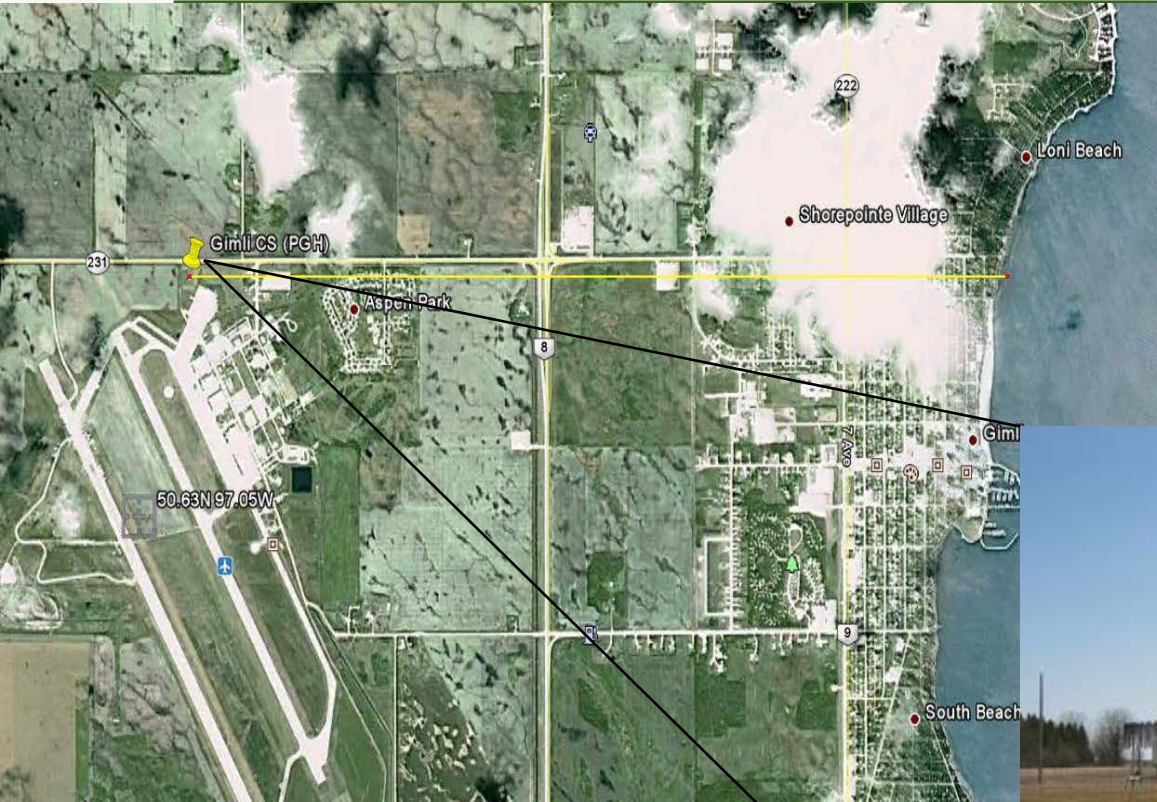


Sensor Specifications

Sensor	Make & Model	Accuracy	Lower limit	Upper Limit
Air Pressure	Honeywell HPB	+/- 1mB	850 mB	1054.7 mB
Wind Speed	Gill Sonic	2% of the reading	0 m/s	60 m/s
Wind Direction	PNI TCM	+/- 10 ⁰	0 Deg.	355 Deg.
SST	Pacific Gyre	+/- 0.1 ⁰ C	0 ⁰ C	35.88 ⁰ C
GPS	uBlox LEA	Standard	N/A	N/A
Battery Pack	Alkaline 12V (8x4)	N/A	N/A	N/A

Site selection - Gimli RCS station

Lat: 50.63, Lon: -97.03



Located 2.8 miles west of the western shore of the South Basin of Lake Winnipeg.



MINIMET Buoys on Gimli RCS station



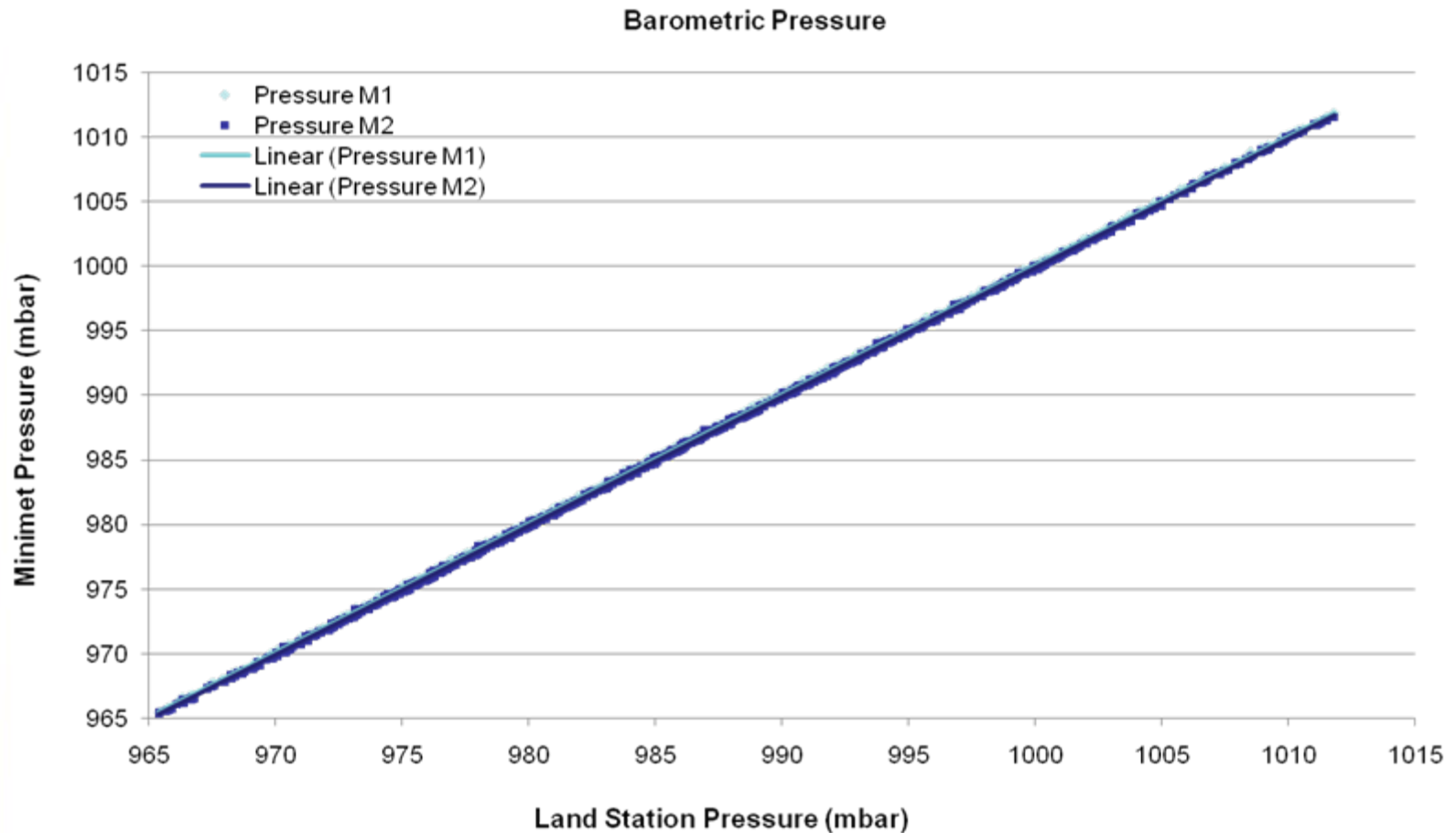
Buoy Operation

- **MINIMET 1 (M1)** – installed at 2M height above ground
- **MINMET 2 (M2)** – installed on the surface

- Battery Voltage stable throughout the testing period
- Temperature was <-20 deg C during mid-end of January – lack of cold winter a problem
- Data transmission from MINIMET buoys 100%. (with IRIDIUM SBD)
- Wind direction was not measured due to MINIMENT buoy mounting difficulties (wind vane rotates together with the sphere)

Station Pressure

January 5th to March 10th 2012



Excellent agreement between 2 MINIMET buoys and RCS station



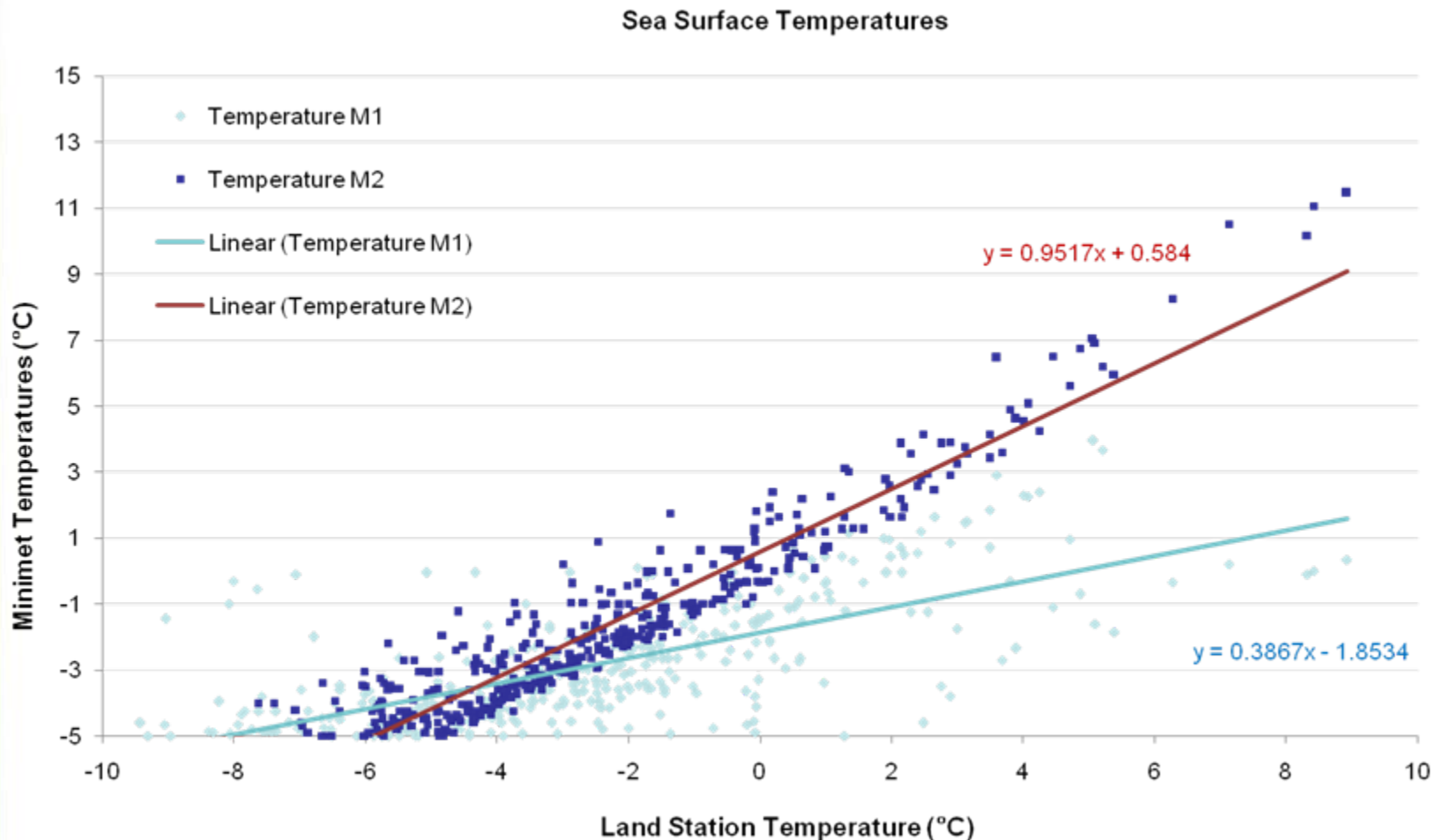
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Temperature

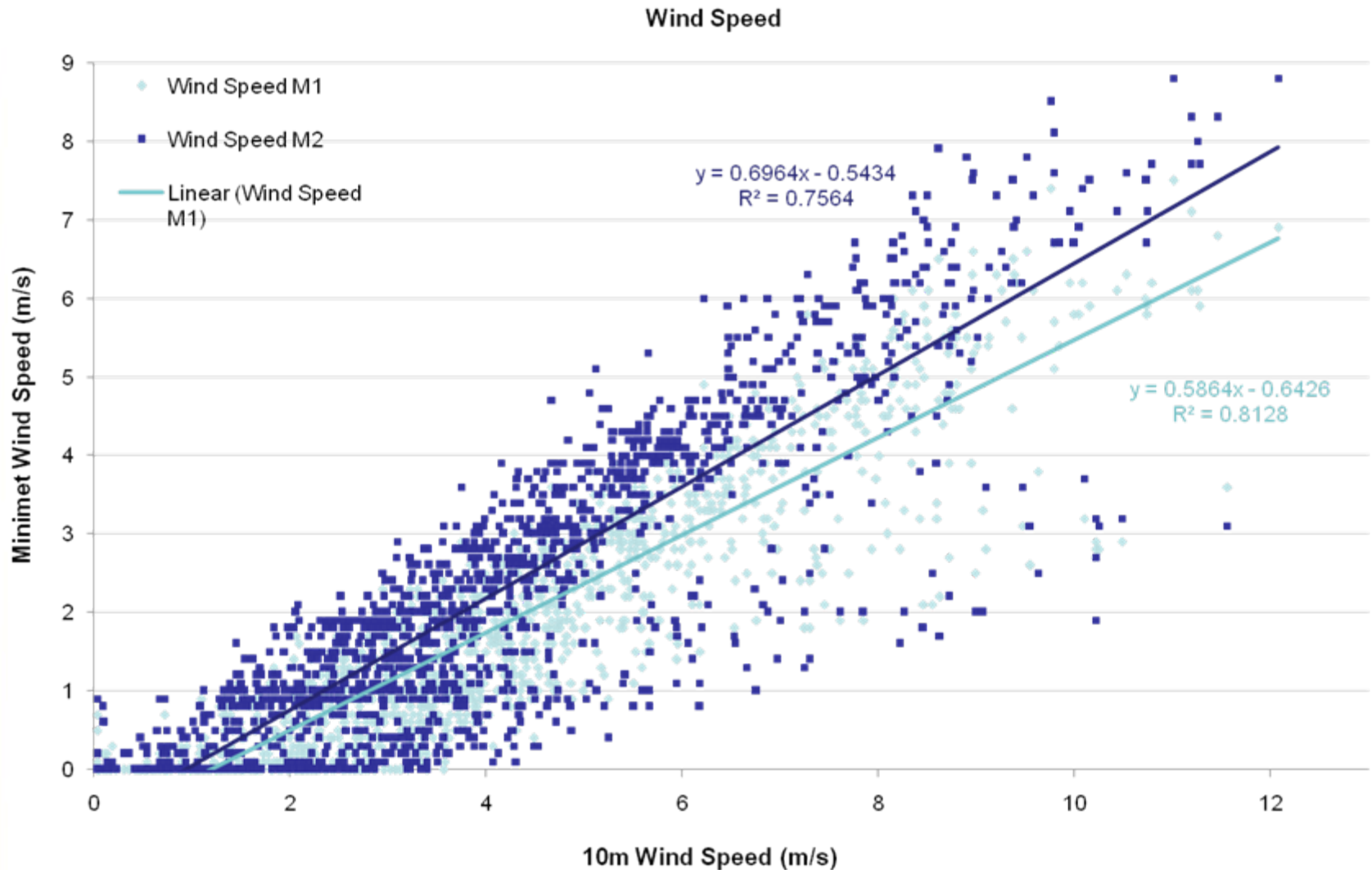
January 5th to March 10th 2012



MINIMET only reports SST down to -5C, also rather noisy dataset with black hull of buoy as well as influence of snow cover. Preferable to measure temperature at 1.5-2 M above surface.

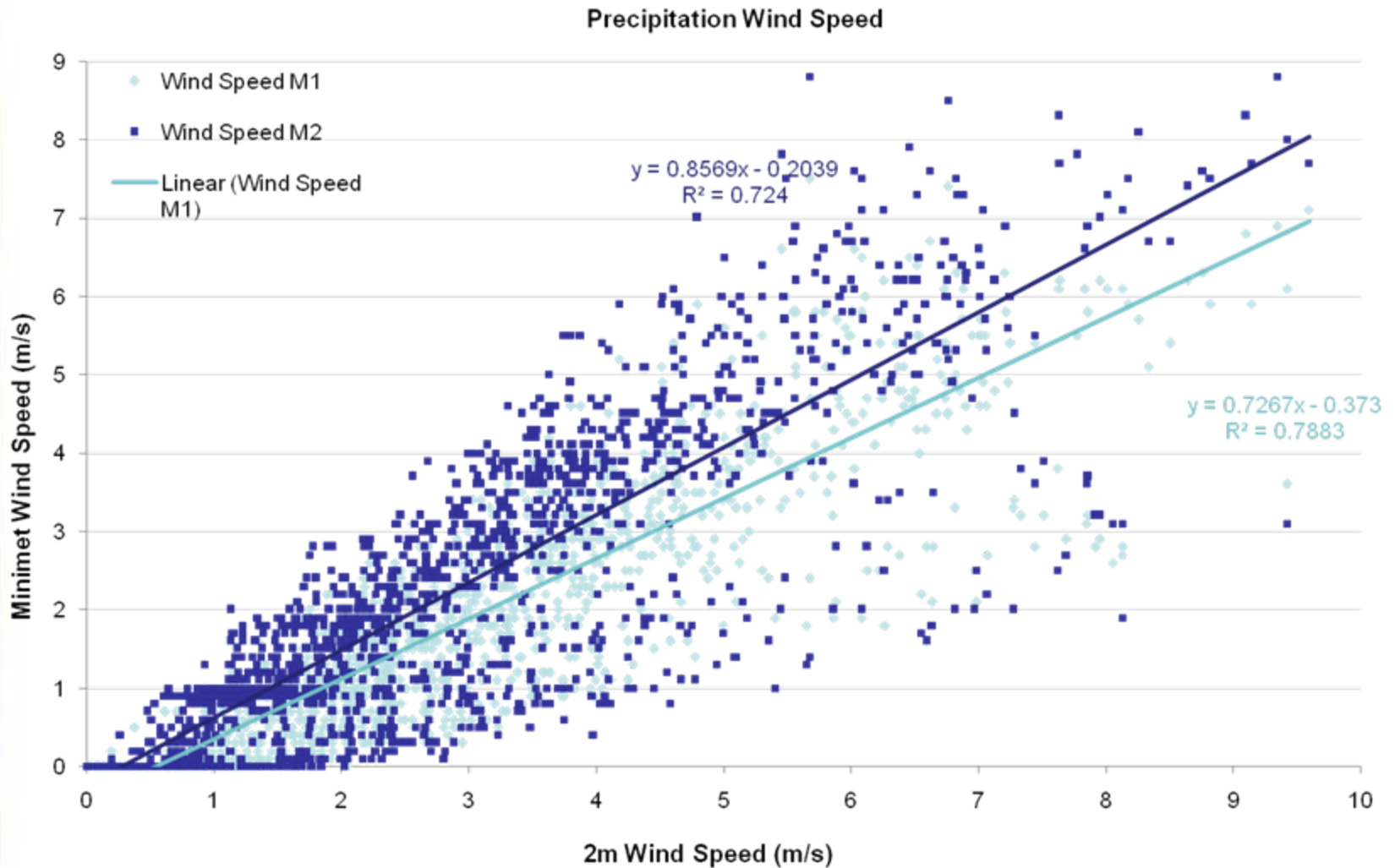
Wind Speed VS 10 M RCS wind

January 5th to March 10th 2012



Wind Speed VS 2 M RCS wind

January 5th to March 10th 2012



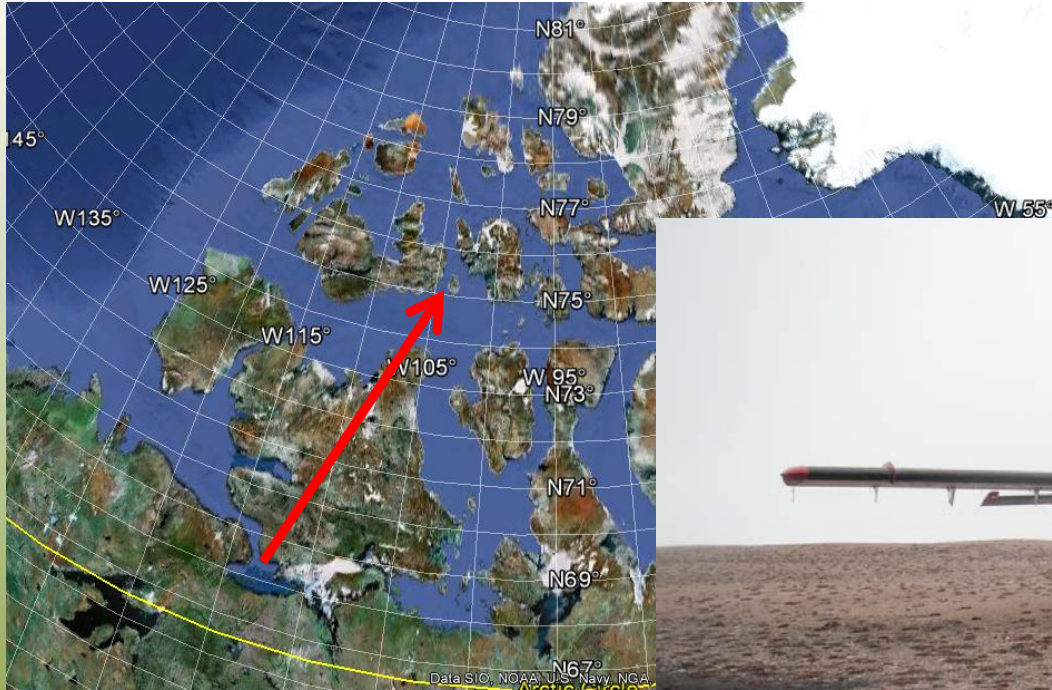
Summary of wind speed analysis

- Limited analysis due to short duration of sampling, and low wind speeds observed
- **MINIMET1** (2M) was ~ 1 m/s lower than RCS 2 M winds
- **MINMET2** (surface) was ~ 2 m/s lower than RCS 2 M winds
- No correlation found between air temperature and difference in wind speed measurements.
- Wind speed measurements seem to be in acceptable range for low-cost in-situ measurements. Cannot comment on in-water performance.

Next Steps

- MINIMET buoy has been deployed in Canadian High Arctic (Gateshead Island - collocated with EC coastal automatic weather station)
- Plan for 2nd deployment north of Fairbanks Alaska in buoy intercomparison planned by I. Rigor
 - Hope to assess performance of batteries at very cold temperatures.
 - Expect to obtain observations of higher wind speeds, with larger sample size
 - May consider deployment in NE Pacific, or Beaufort Sea to evaluate in-water performance

Gateshead Island, Nunavut



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Next Steps

- EC interested to work with vendors to transfer drifter technology to low-cost, self-powered mini-AWS (pressure, wind, temp) suitable for deployment in extreme environments such as High Arctic.
 - Ideally suitable for land or ice deployments.
- Prefer wind and temperature observations taken away from ground or ice surface (ideally at 2-5 M)
- Keep unit cost in \$5-10K range, with deployment/set-up less than one hour on ground or ice, and expected operation of 2-3 years.

Hoping the polar bears leave MINIMET alone!



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Contributors

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