Canada

Technical Aspects of the Canadian Wave Measuring Program

JCOMM Technical Workshop on Wave Measurements from Buoys – New York, U.S.A
October 2 & 3, 2008

Mark Blaseckie – Technical Field Services
AXYS Technologies Inc. – Sidney, BC, CANADA

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Canada

Canadian Buoy Network

- Locations of Environment Canada Buoys
- Platform Types
- Mooring Types
- Sampling
- Processing

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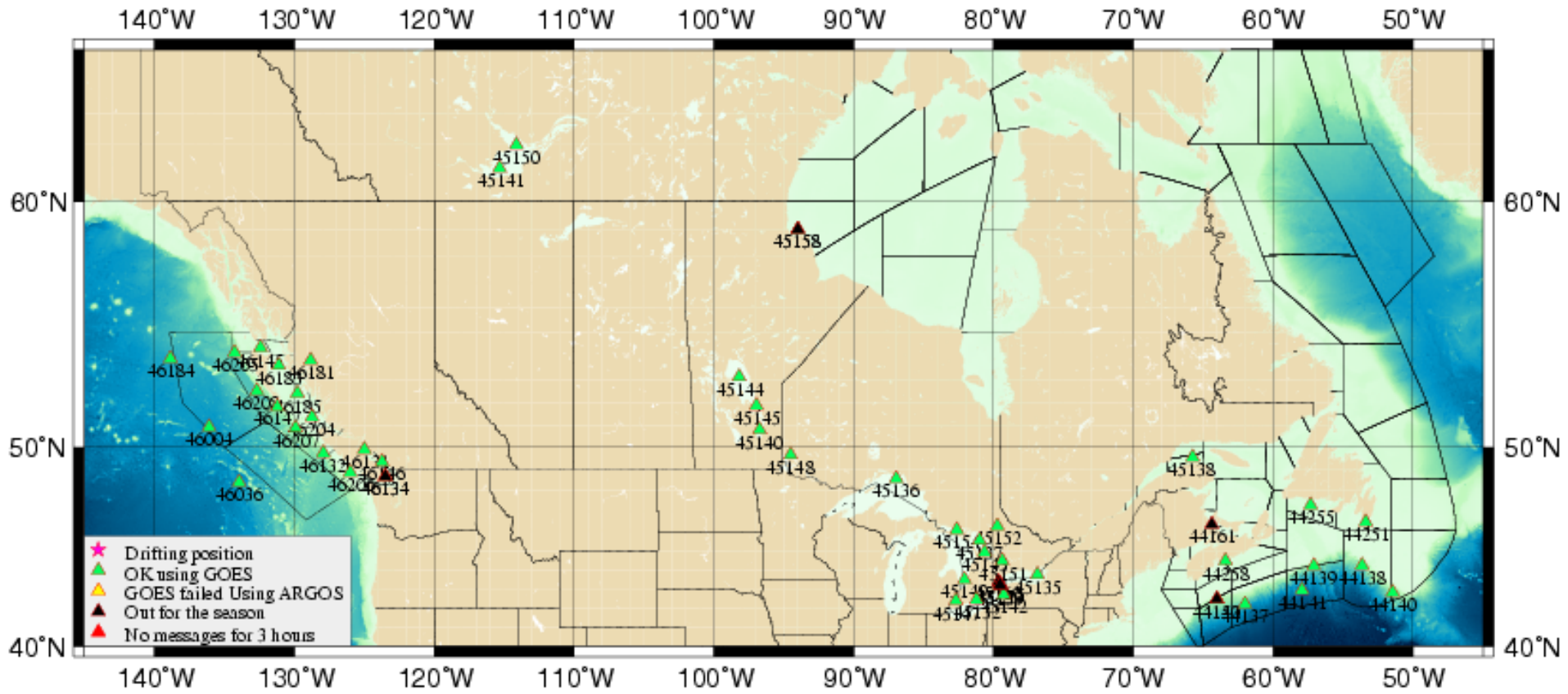
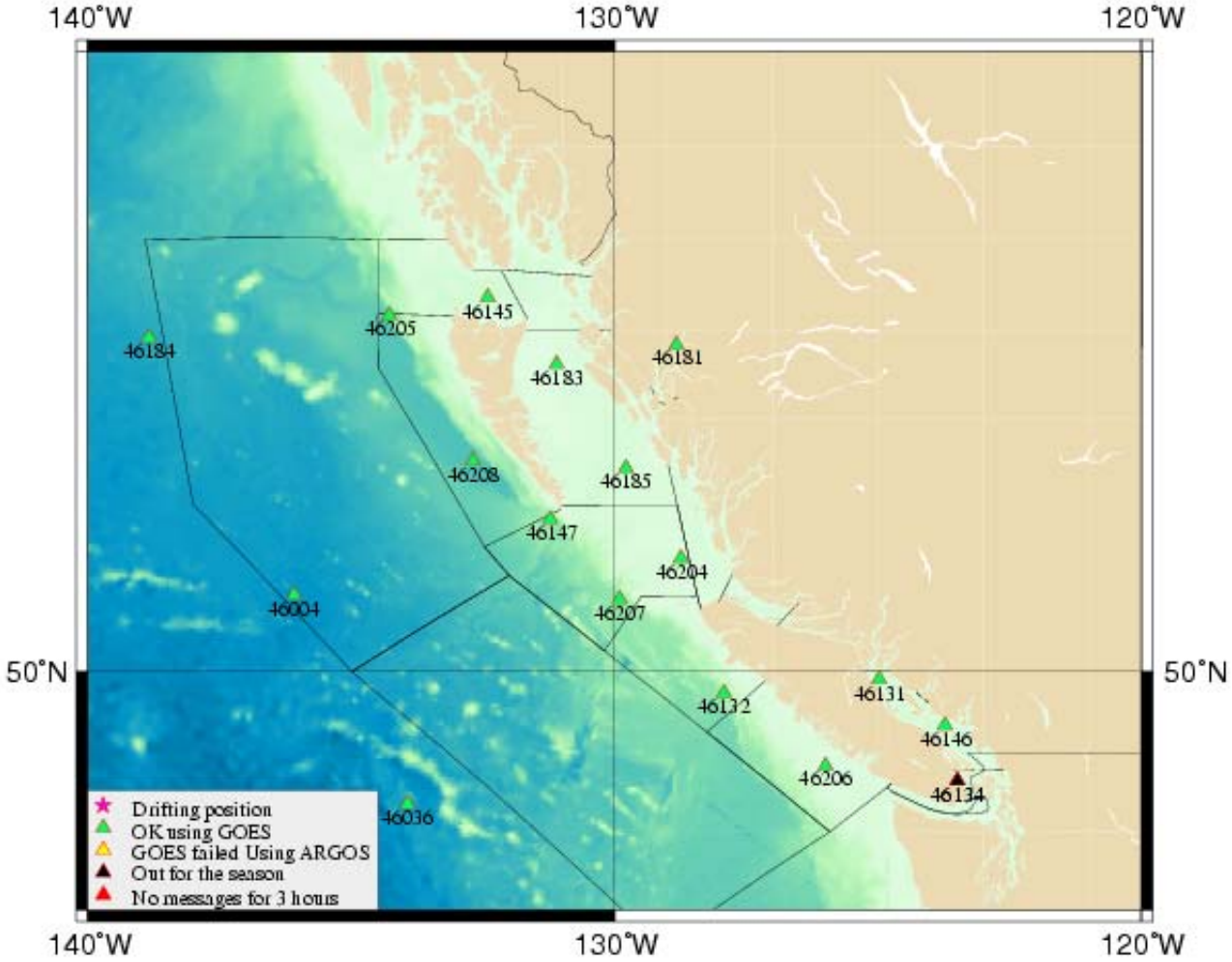
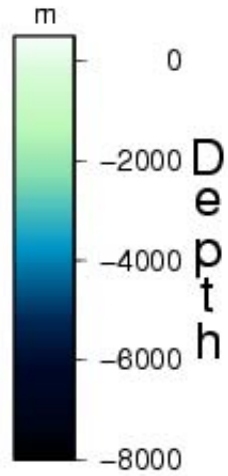
Canadian Moored Buoys



Pacific Moored Buoys





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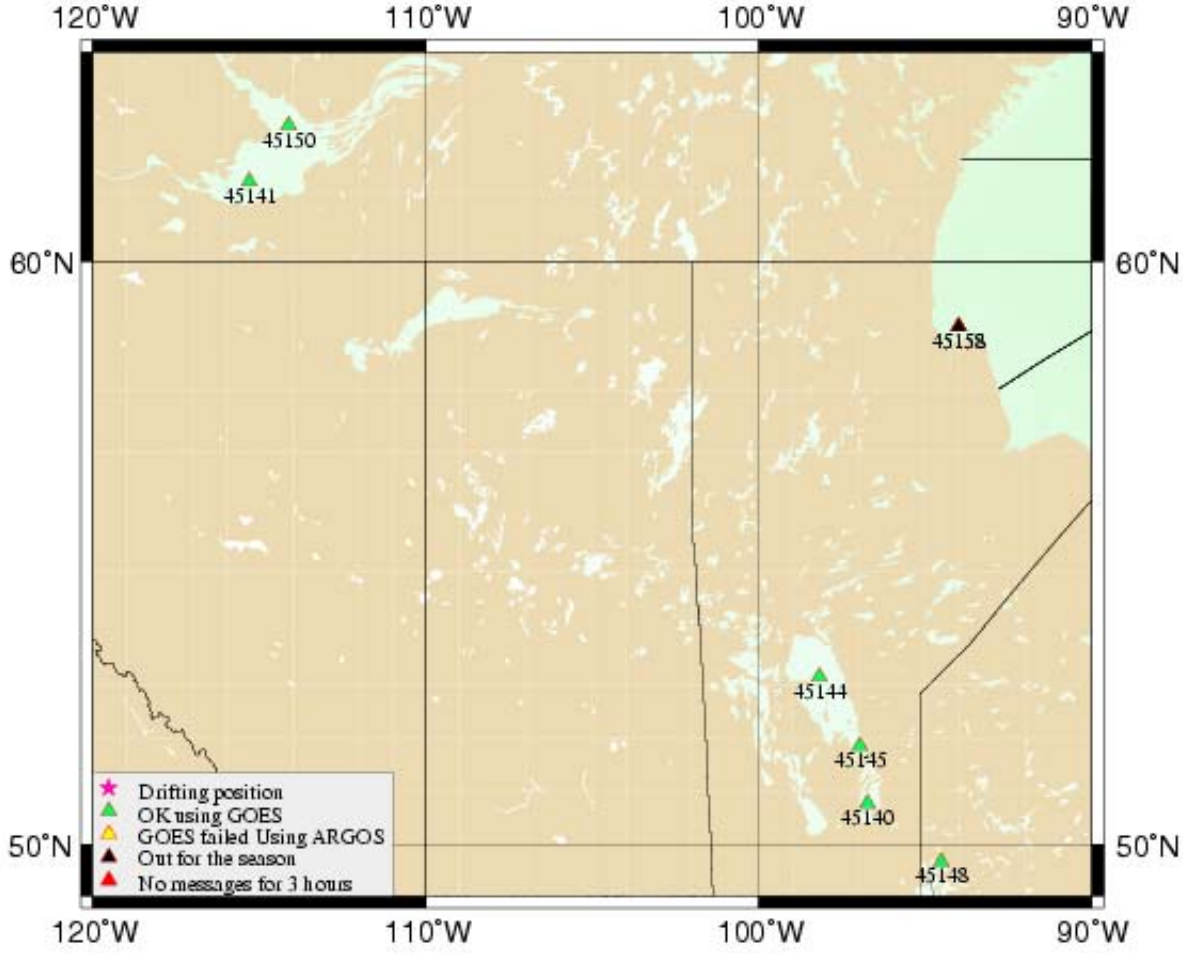
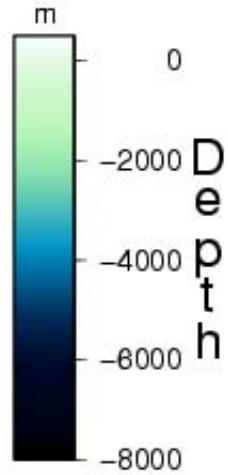
Prairies and the North Moored Buoys





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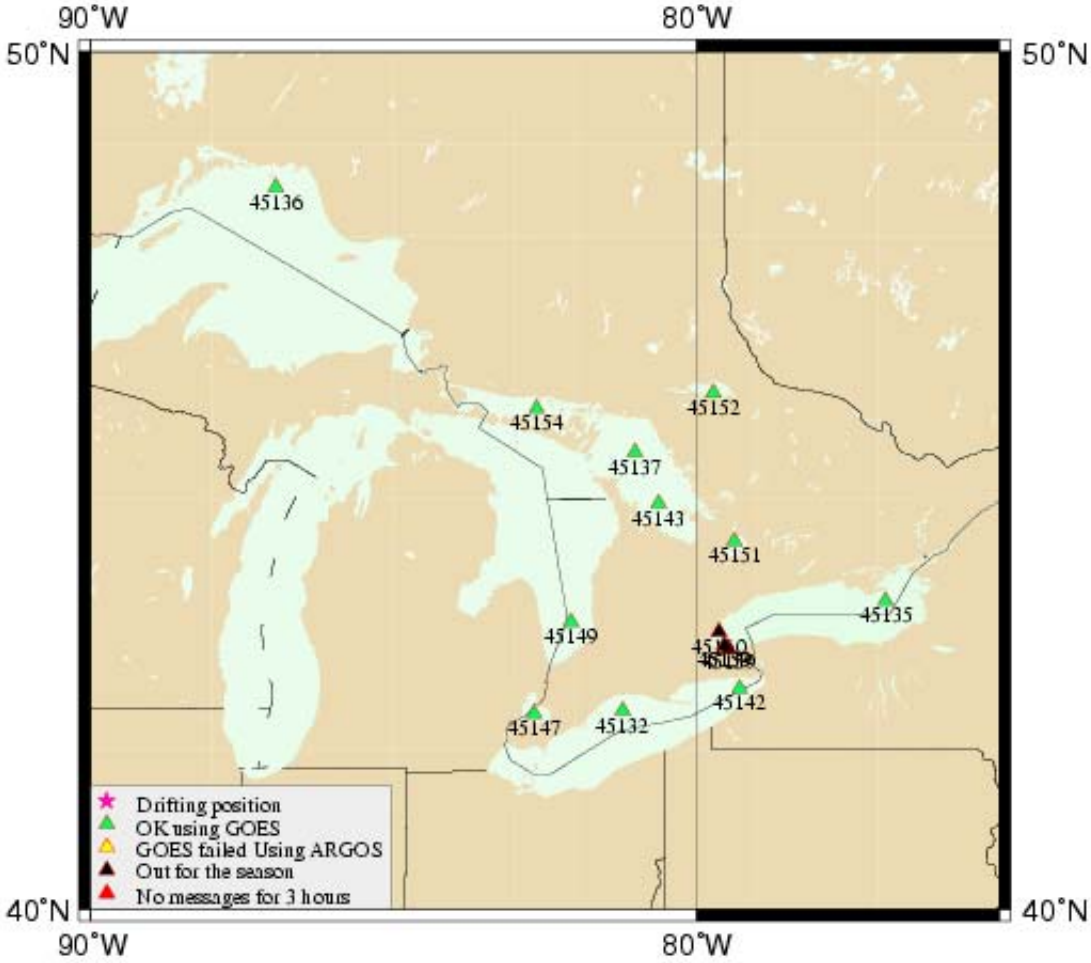
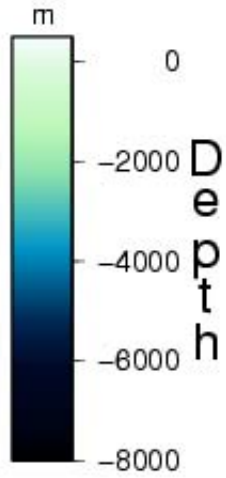
Great Lakes Moored Buoys





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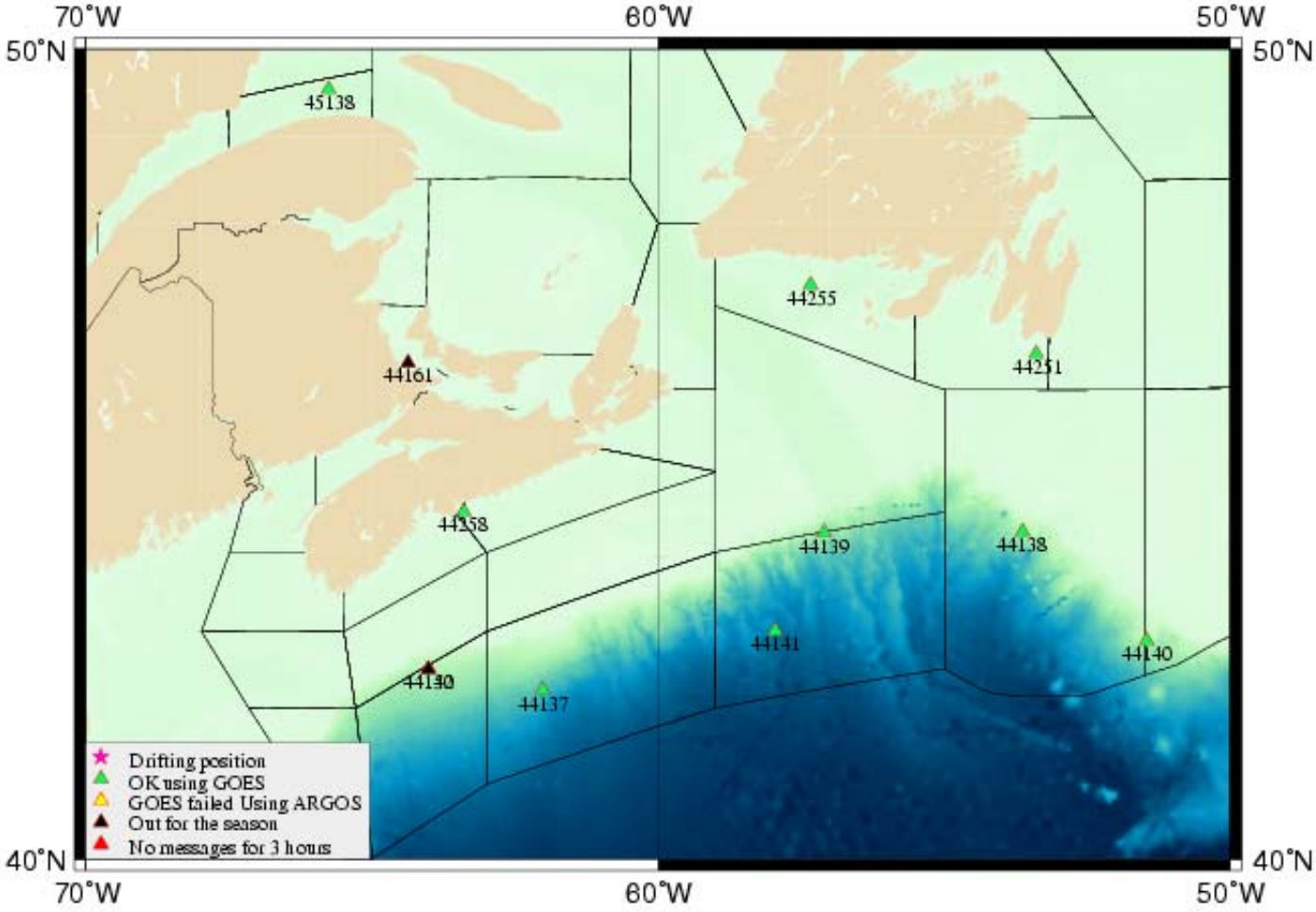
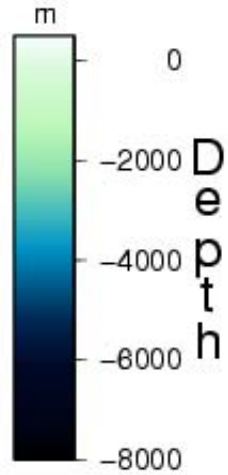
Atlantic Moored Buoys





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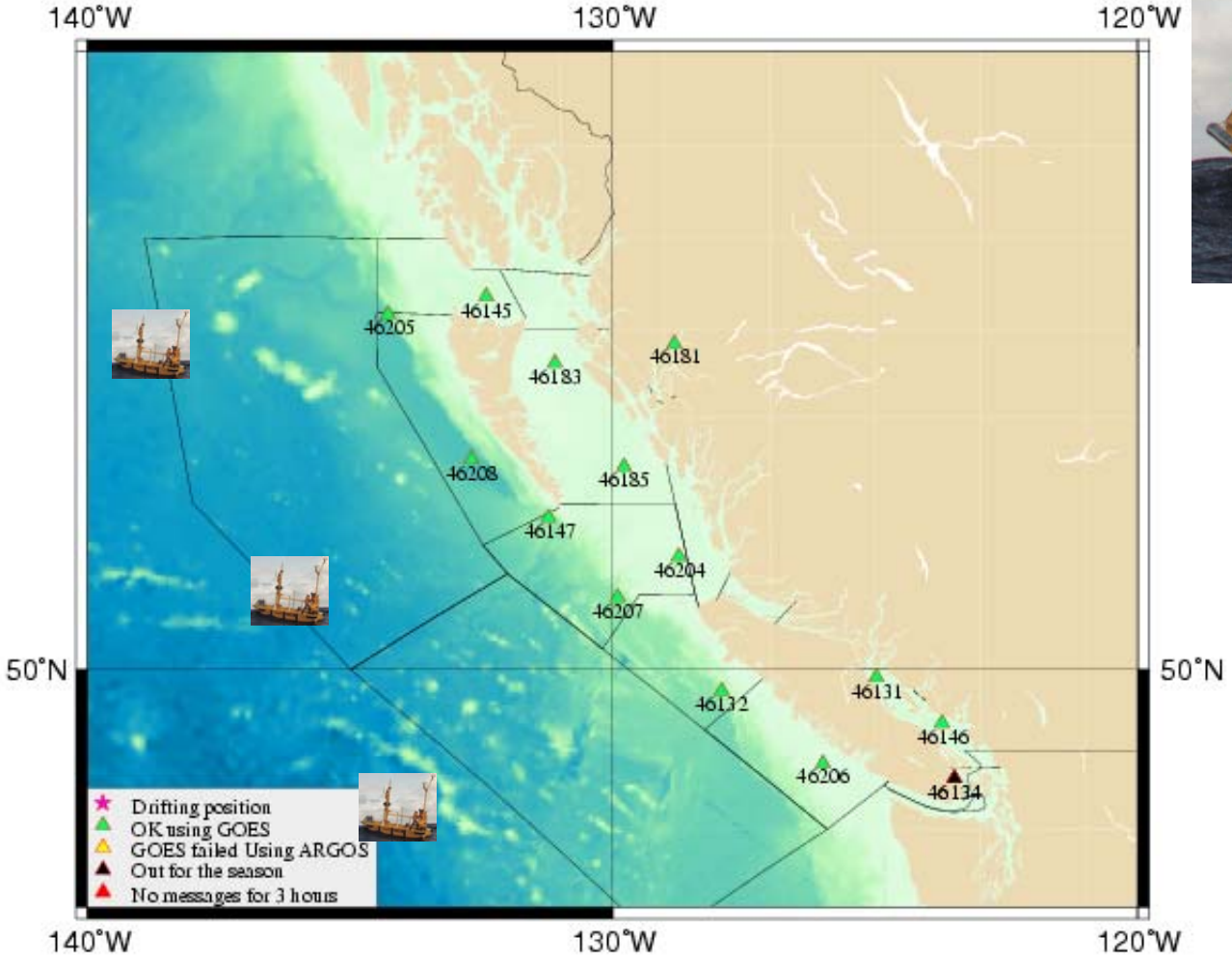
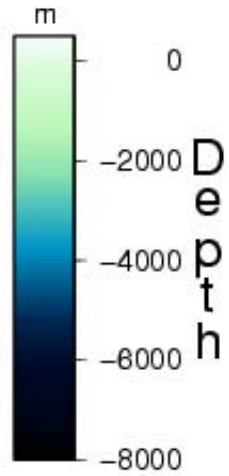
Pacific Moored Buoys





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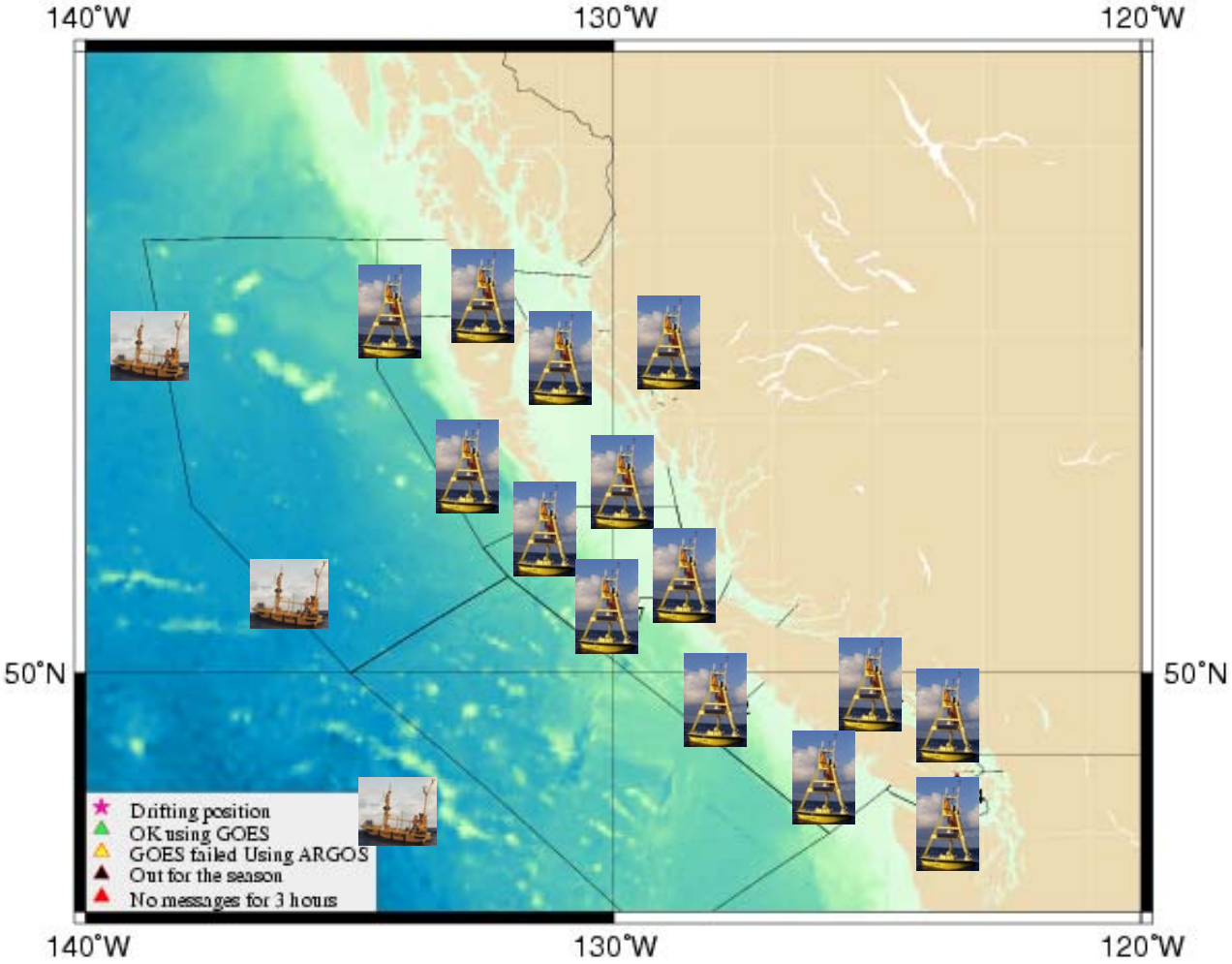

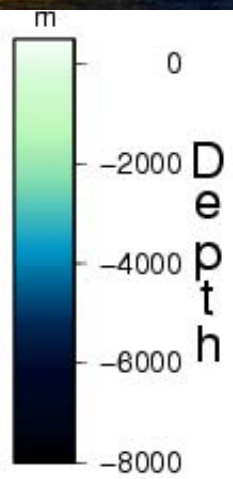

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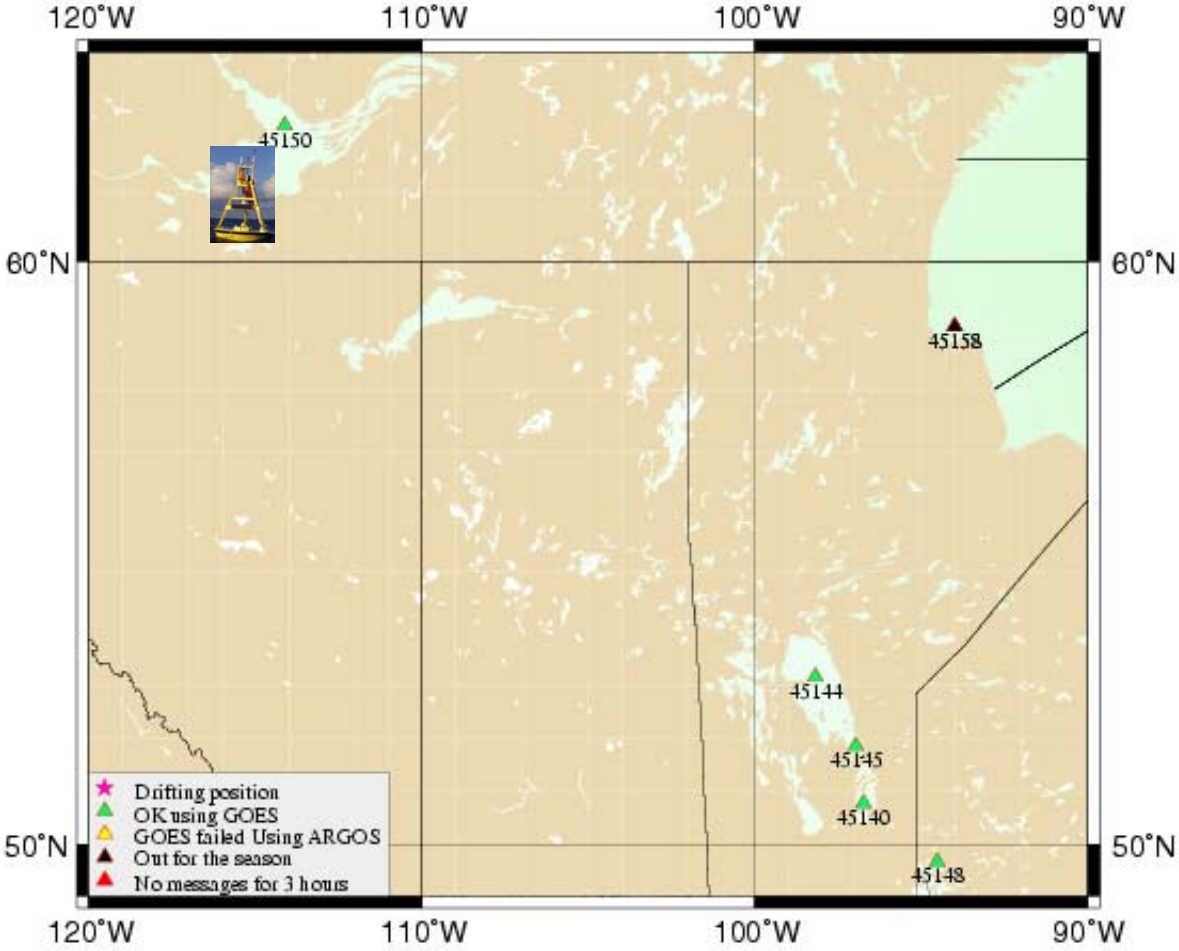
Prairies and the North Moored Buoys



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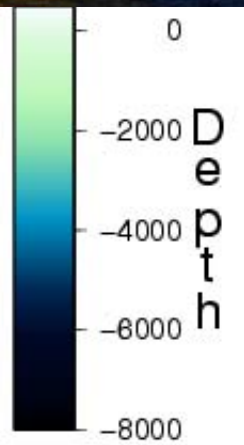

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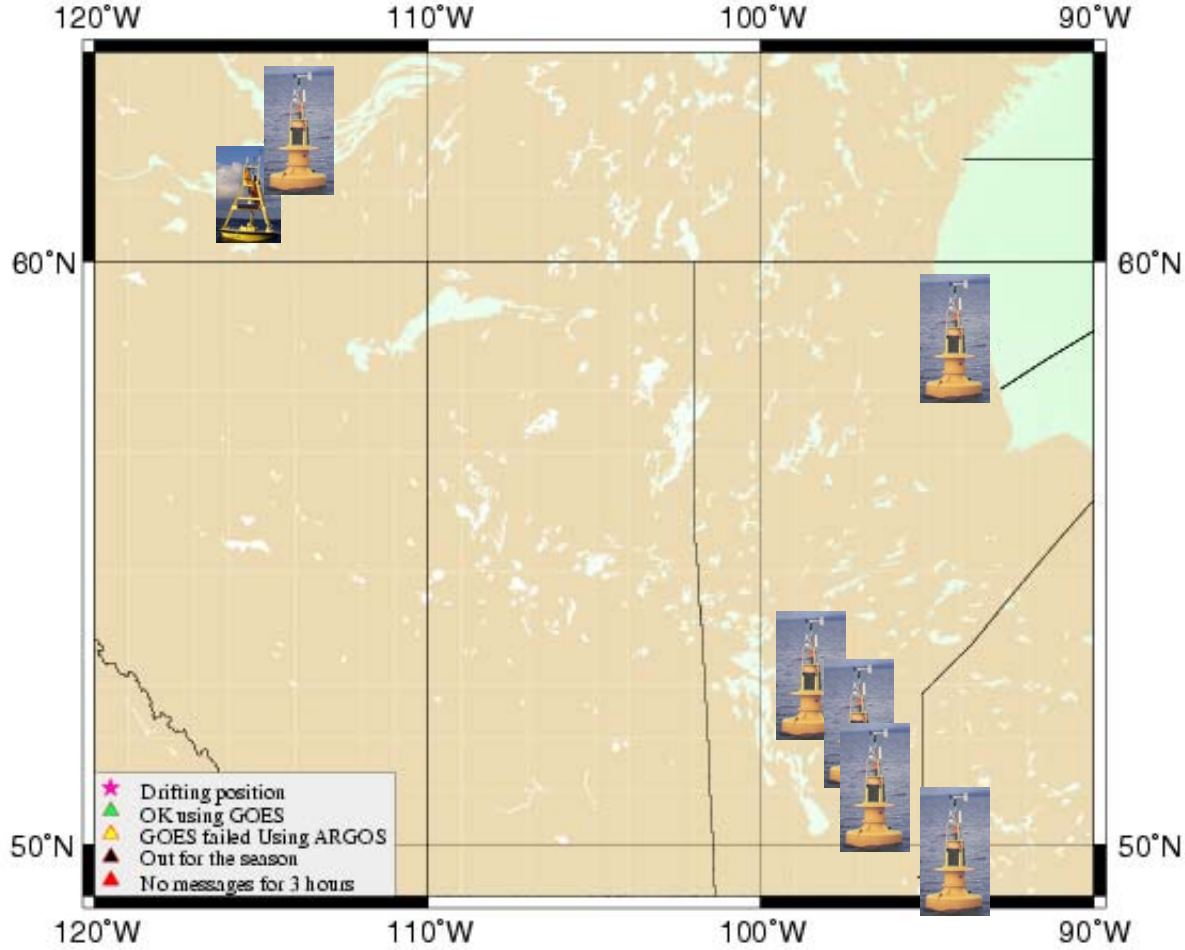
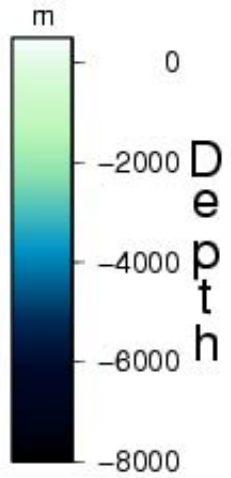
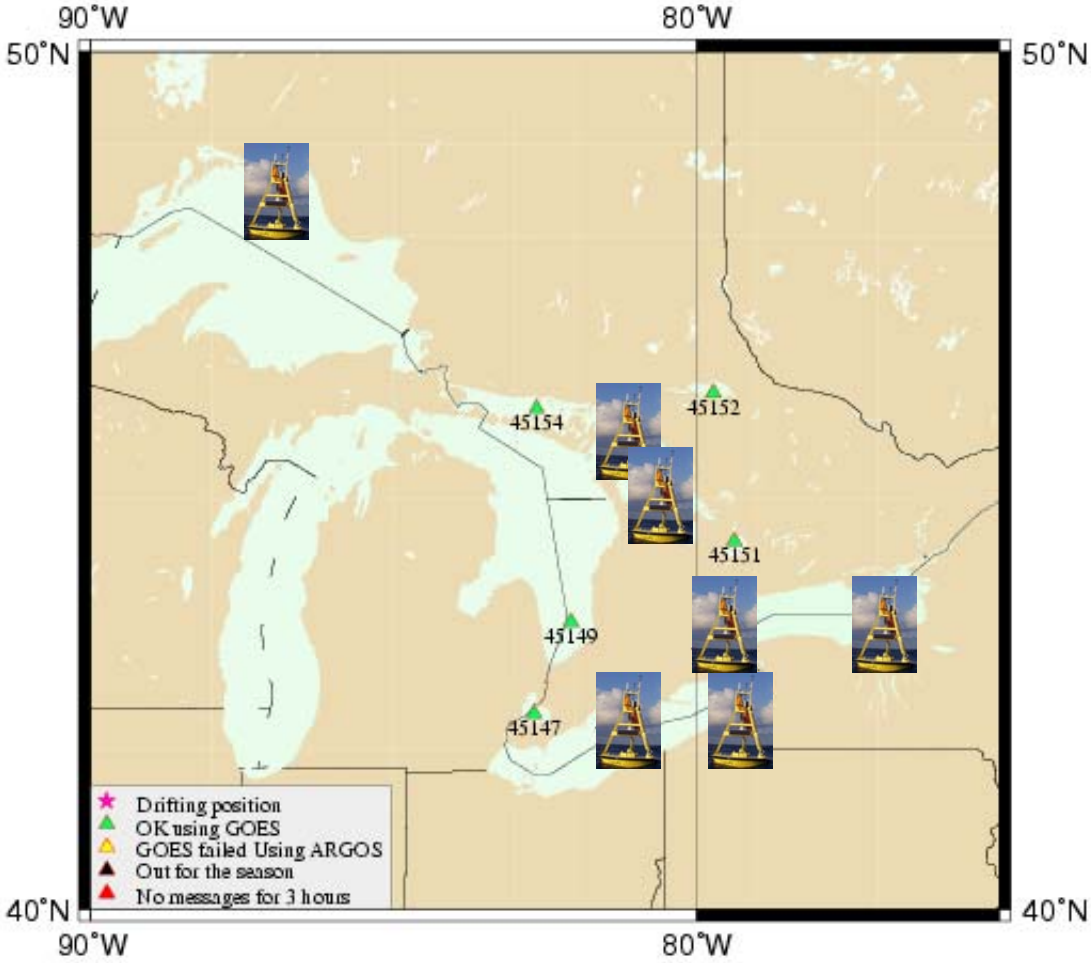




Great Lakes Moored Buoys



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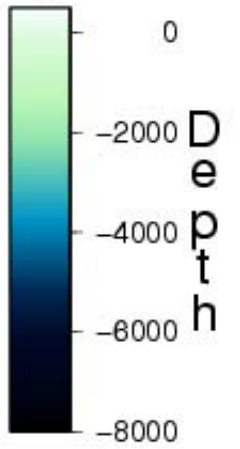

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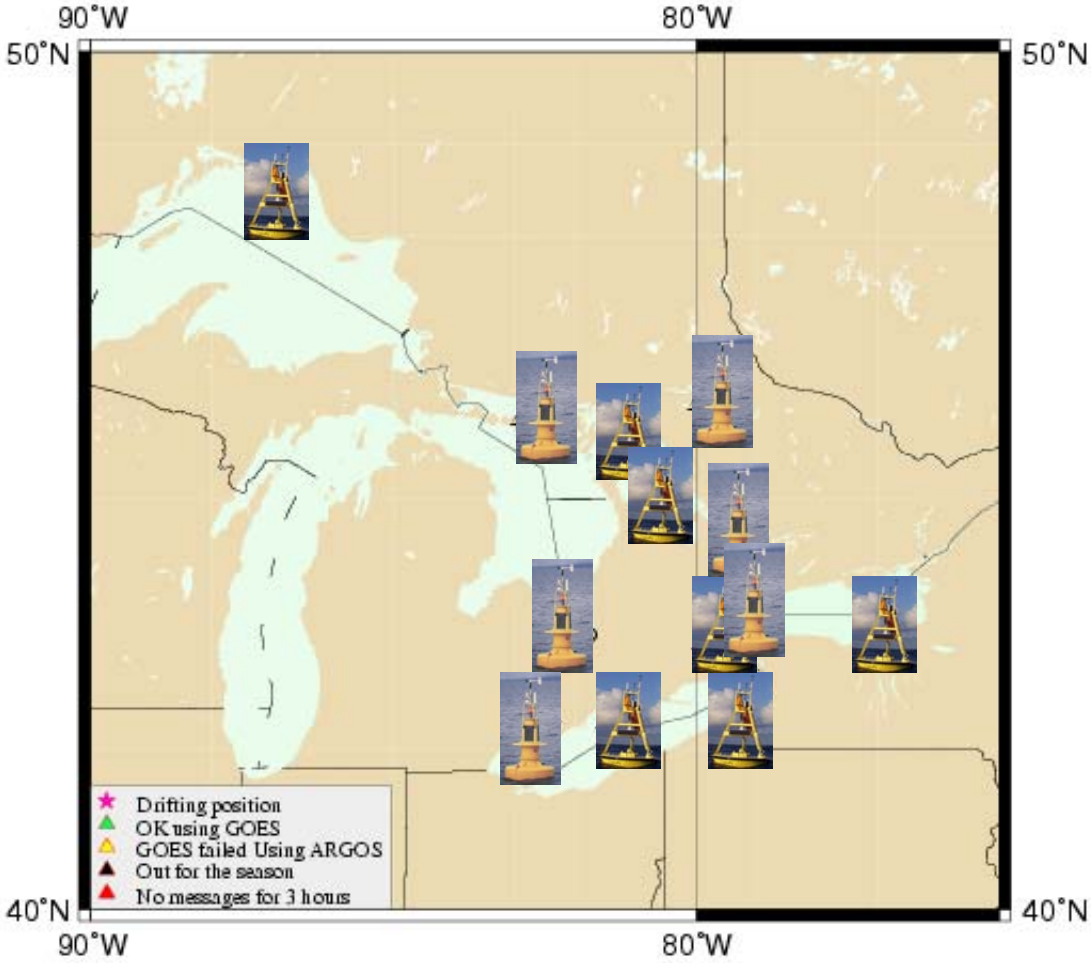

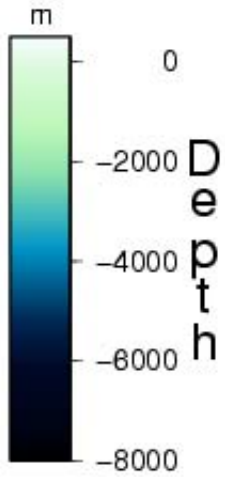

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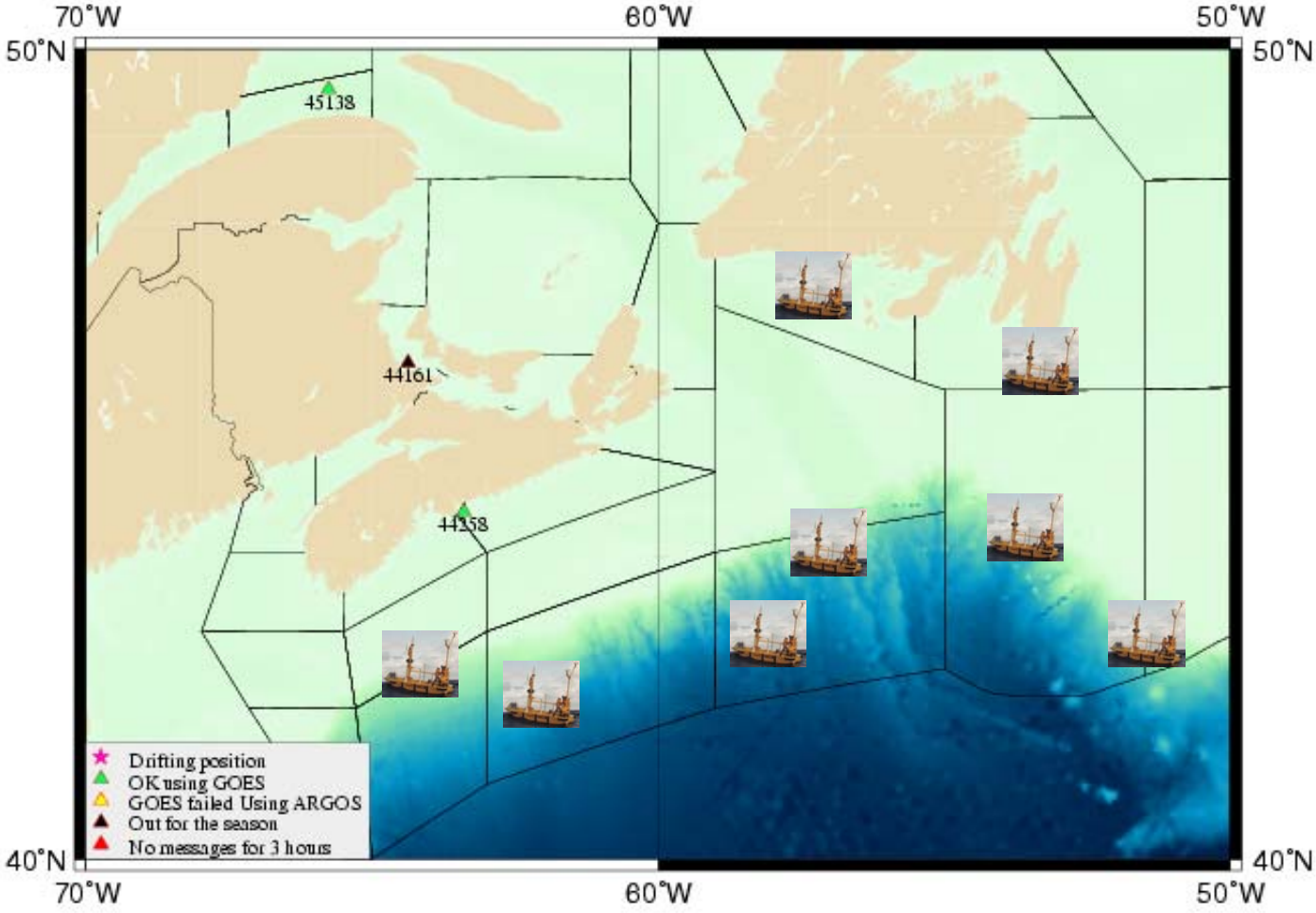

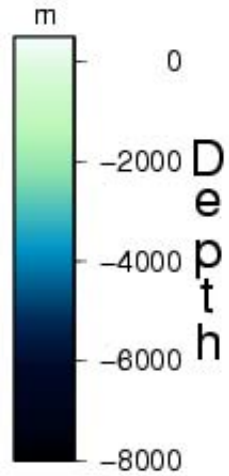

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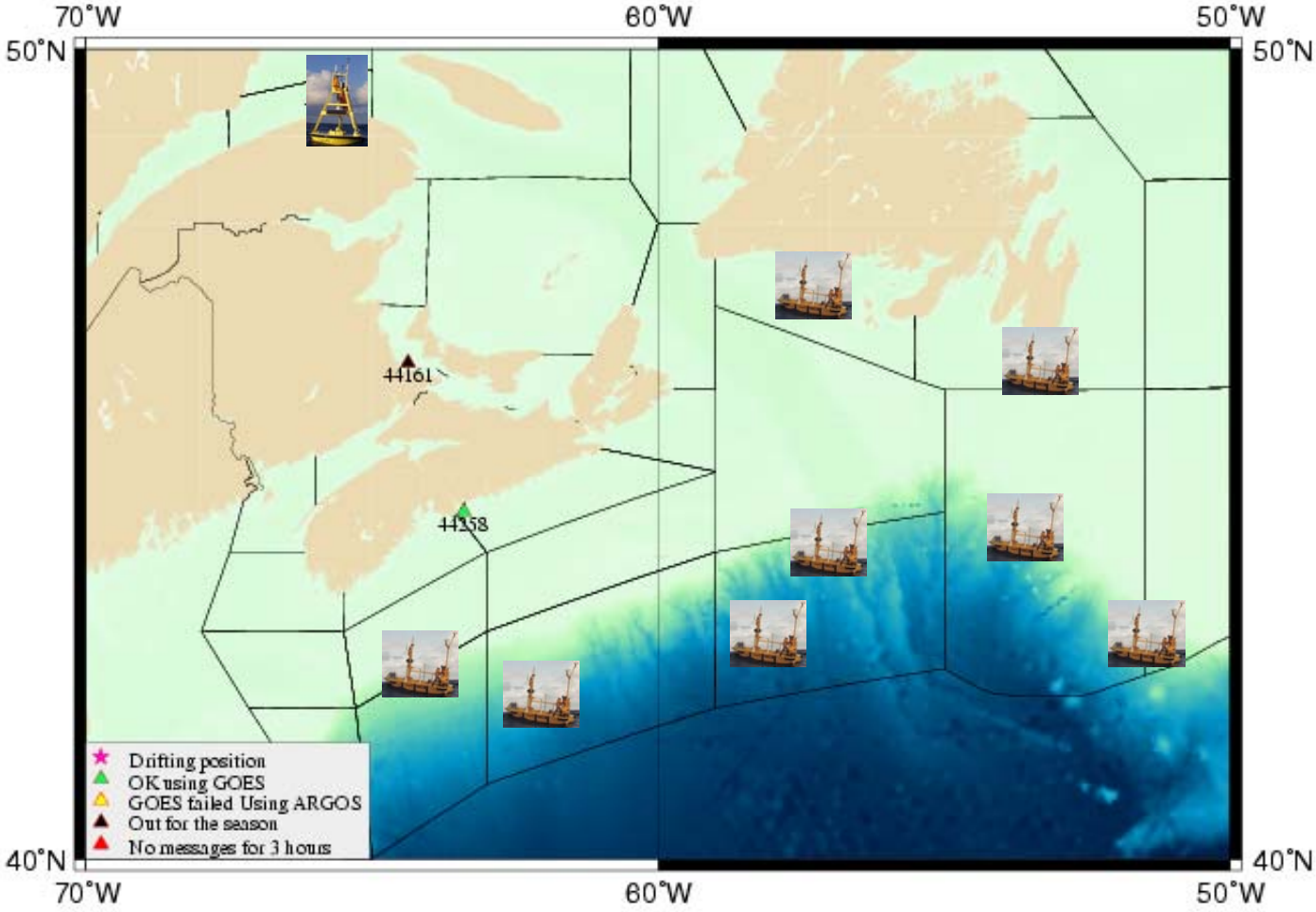

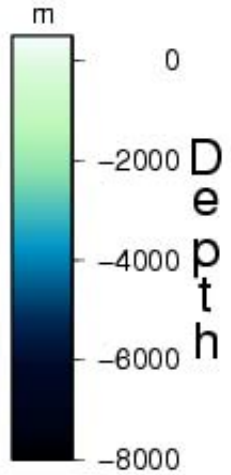

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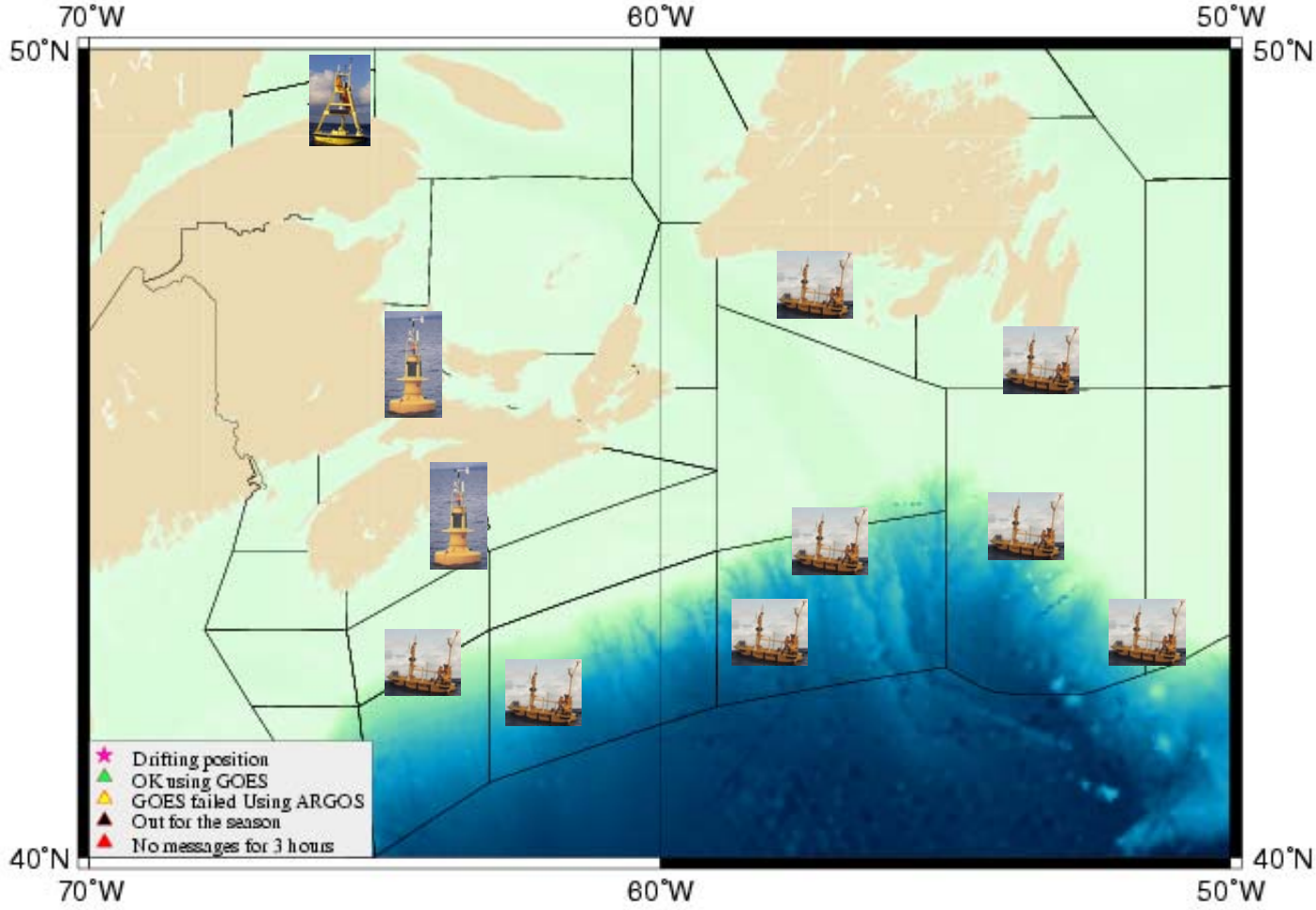

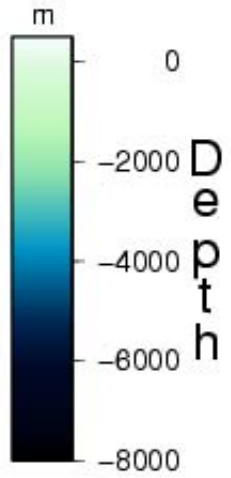

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Watchman 100 Payload

- Components are similar on all buoys
- Layout differs with platform

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Wave Sensors

- Strapped Down Accelerometer
  - Most Platforms
- TRIAXYS Direction Wave Sensor
  - Currently installed in two systems

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Strapped Down Accelerometer

- Jewell LCF-200-2G
- Accelerometer Interface PCB converts acceleration to displacement
- ± 15m

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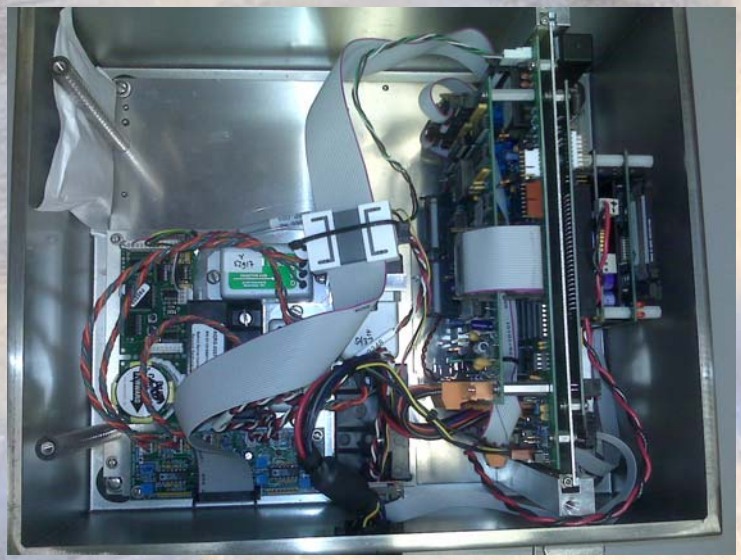
TRIAXYS Direction Wave Sensor



- 3 Accelerometers
- 3 Rate Gyros
- Fluxgate Heading Sensor

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TRIAXYS Direction Wave Sensor

Heave	
Range:	± 20 m
Accuracy:	better than 2%
Resolution:	1 cm
Period:	1.4 - 33 s
Wave Dir	
Range:	0 - 3600
Accuracy:	±1˚
Period:	1.6 to 30 s

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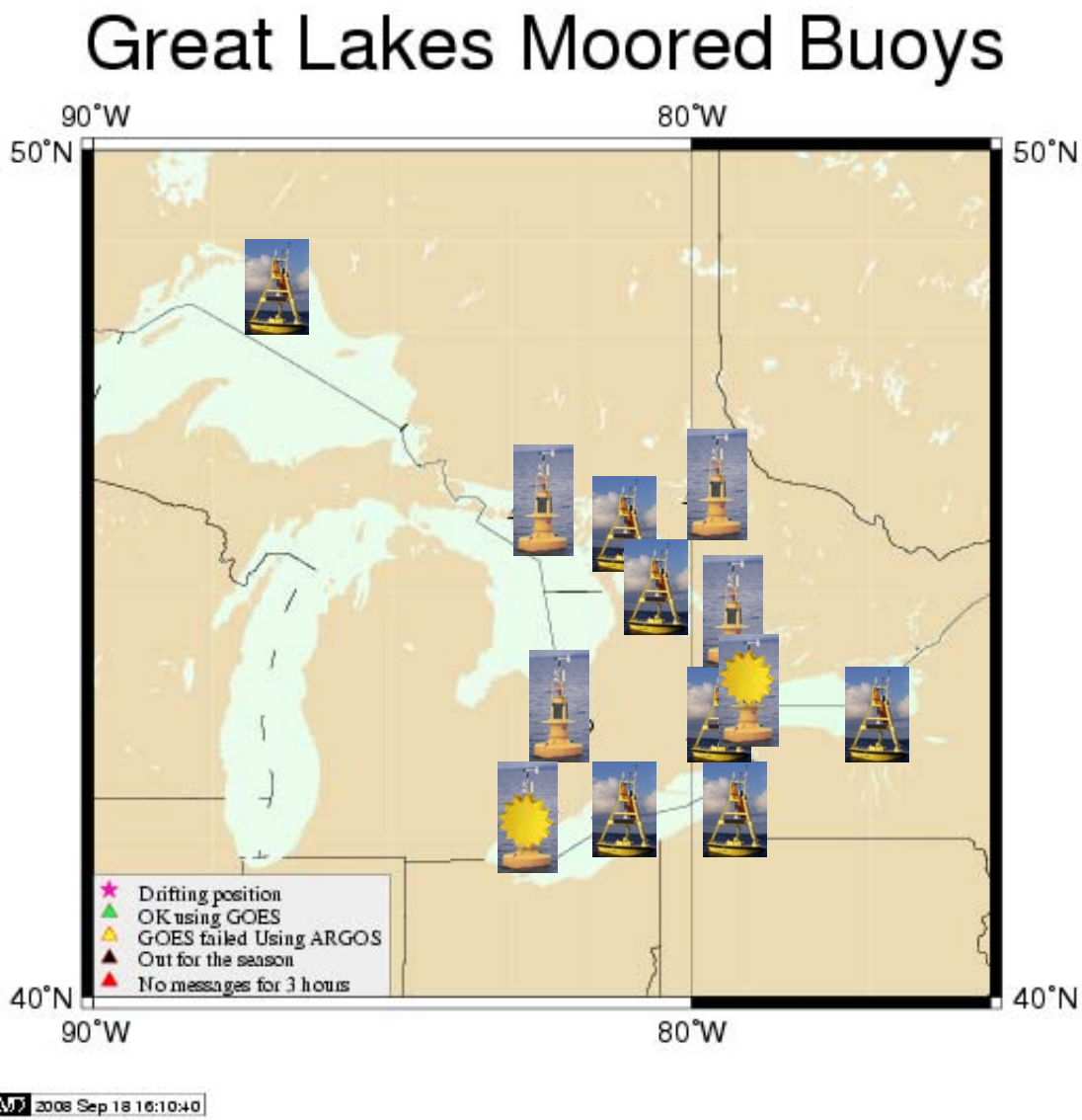
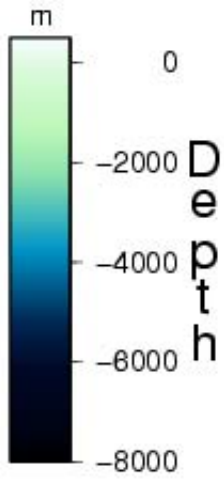


- One Operational platform with a TRIAXYS sensor
- One platform with a TRIAXYS sensor logging data in addition to a Strapped Down Sensor



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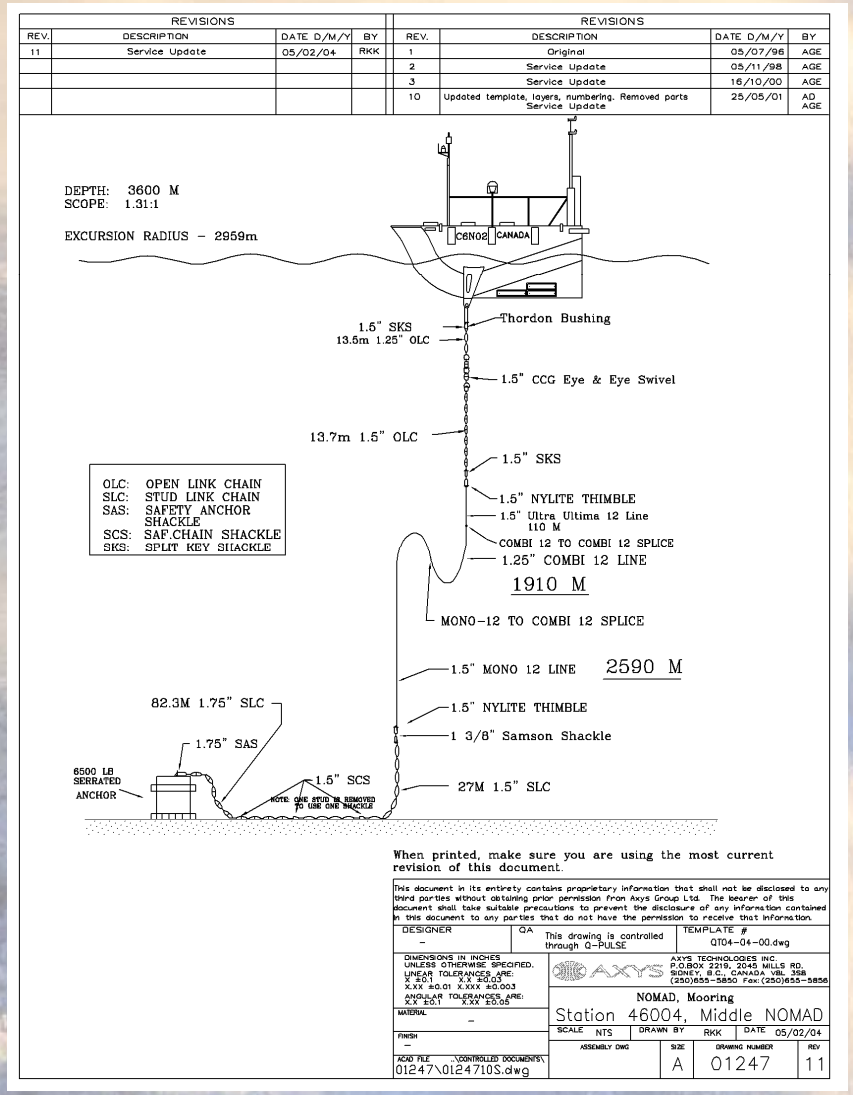
Deep Sea Mooring

- Typically 3500 m
- 2500m floating line
- 2000m sinking line



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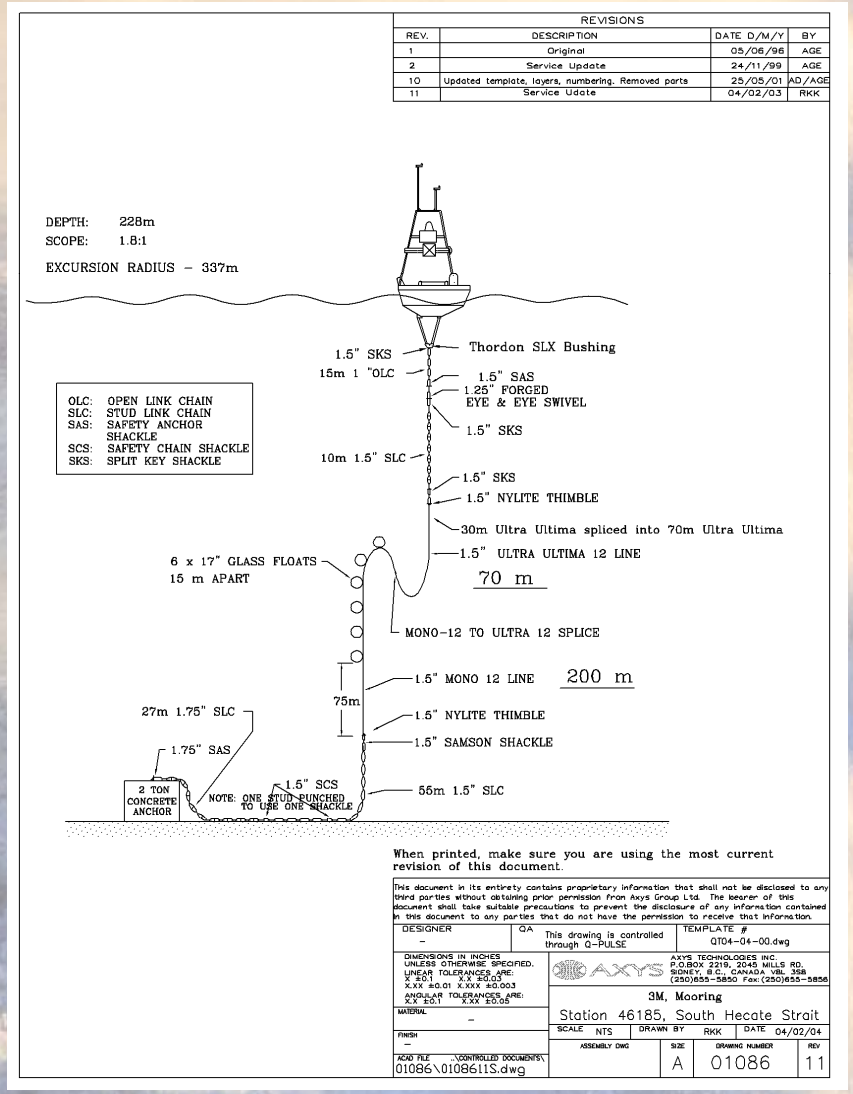
Coastal Deep Mooring

- Typically 200 m
- 200m floating line with extra floatation
- 100m sinking line



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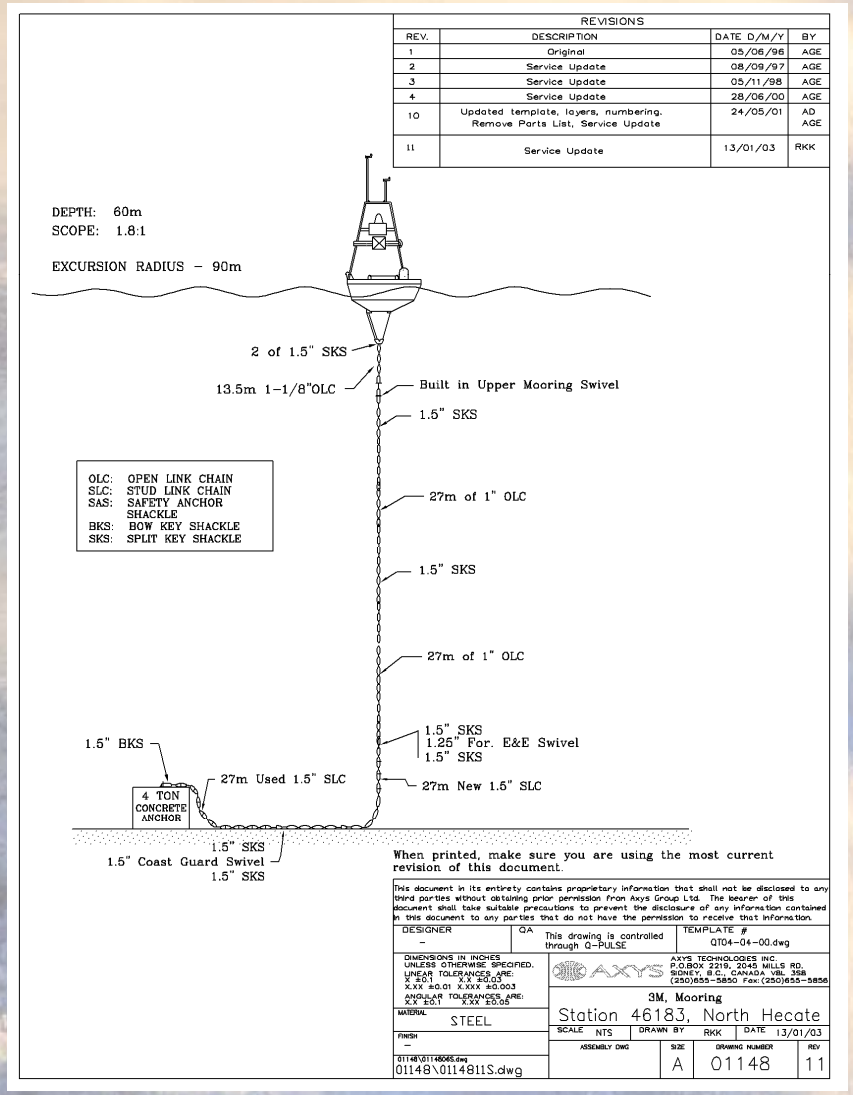
All Chain Mooring

- Less than ~100 m



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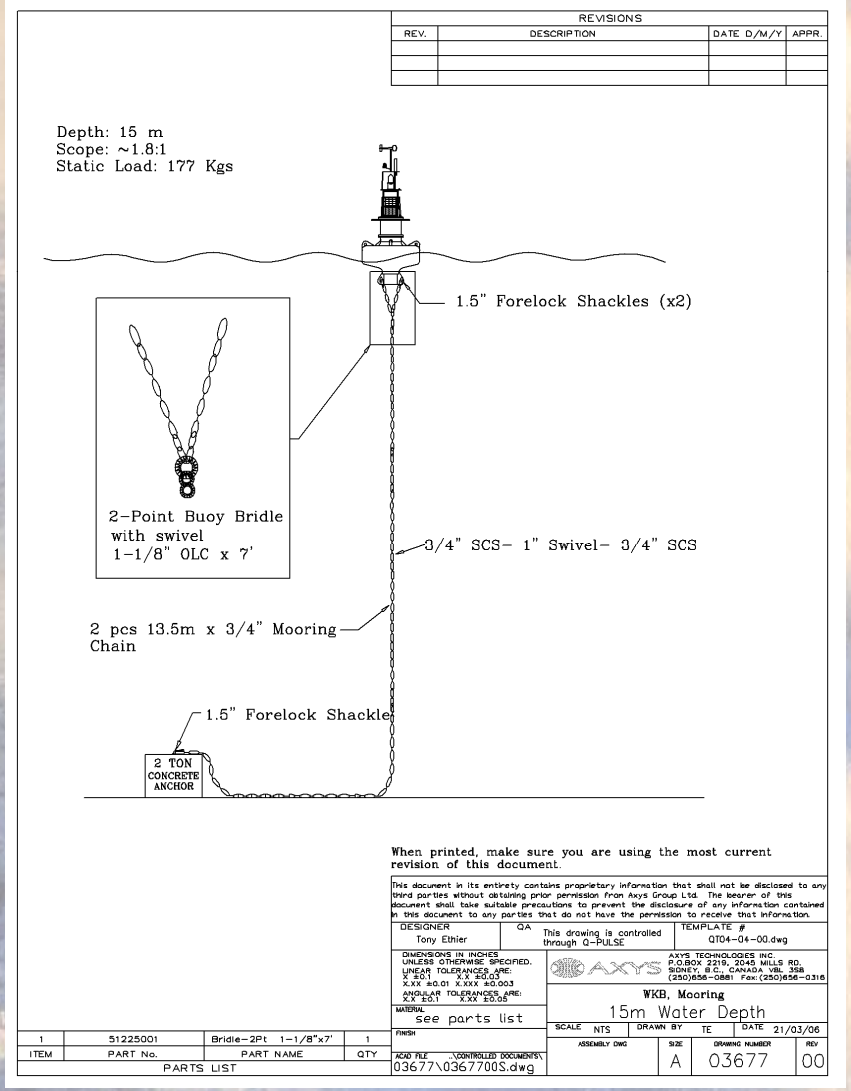
Shallow WatchKeeper Mooring



- Shallow water presents special problems
- Trade off stability for wave following

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Sampling Scheme

- Different for two Wave Sensors since
  - Watchman samples and processes Strapped Down Sensor
  - TRIAXYS is a smart sensor

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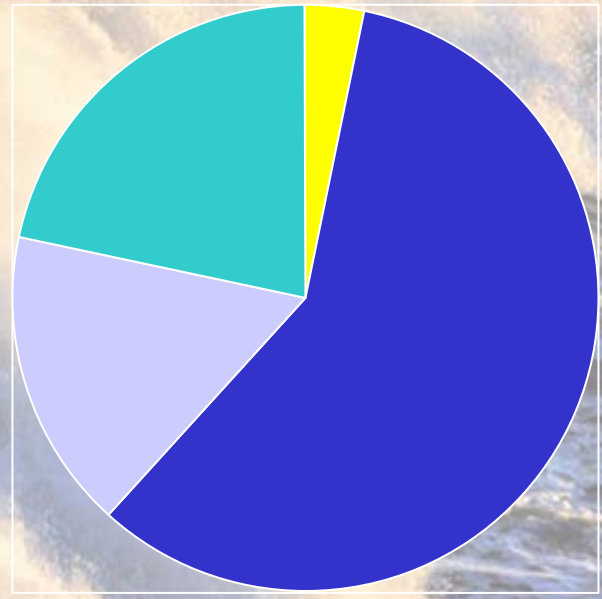
“Strapped Down” Data Acquisition Cycle

- 2 minute Wave Warm-up
- 35 minute Wave Sampling
- 10 minute Met Sampling
- 13 minute Sleep



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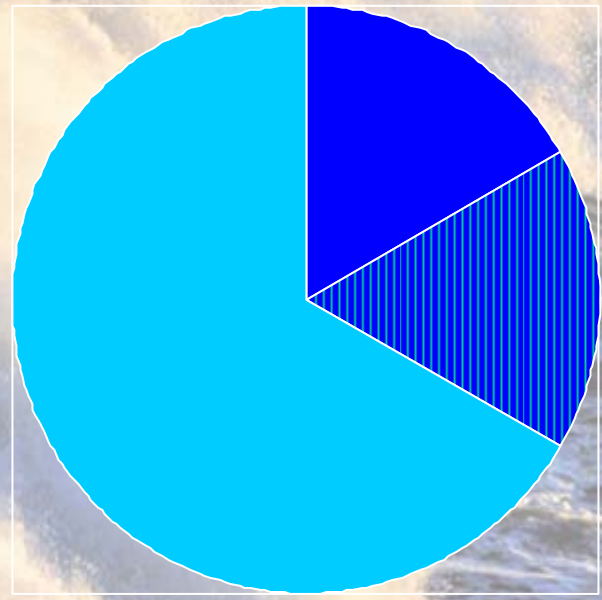
“TRIAXYS” Data Acquisition Cycle

- 10 minute Wave
- 10 minute Wave & Met Sampling
- 40 minute Sleep



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Watchman Wave Processing

- 8 * 256 one second samples taken
- Mean of the valid raw data is removed
- 10% cosine taper is applied
- FFT Calculated on the block
- Spectrum is Calculated
- Spectrum is corrected for the cosine taper
- Spectrum between 2 and 30 seconds is corrected for the transfer function of the heave sensor
- Band Averaging is done to reduce the number of spectral bands
- Hs and Tp are calculated (LFC is applied to shallow buoys)
- Results of the 8 blocks are averaged

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TRIAXYS Wave Processing

- 4 Hz sampling
- 20 minute Sample
- Data processing is performed in the sensor by proprietary software developed by the Canadian Hydraulics Centre (CHC) of the National Research Council of Canada.
- Can be mounted off centre
- Raw data can be logged on board
- Results are read by the Watchman and formatted for GOES transmission

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Thank You

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