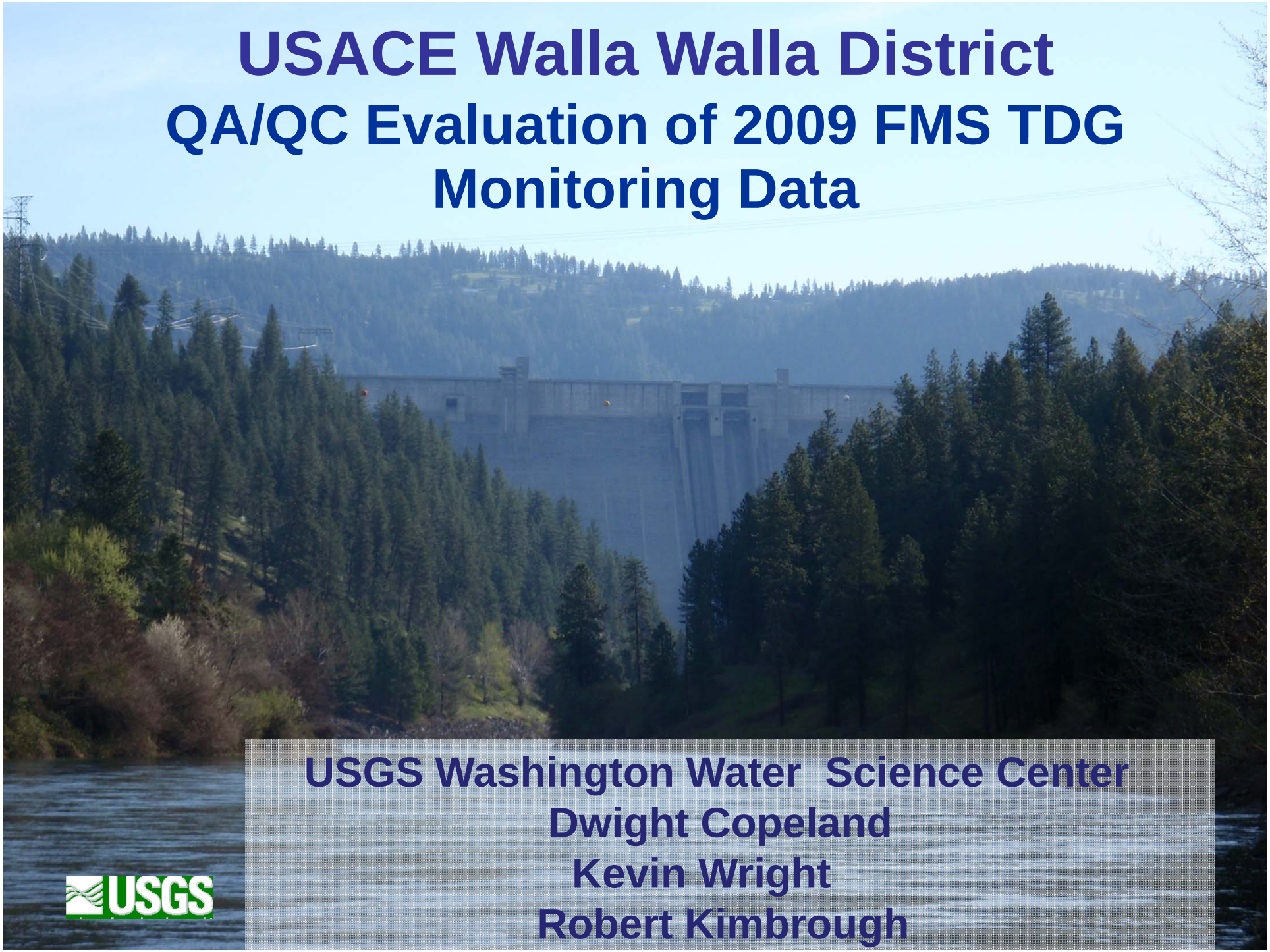
USACE Walla Walla District
QA/QC Evaluation of 2009 FMS TDG Monitoring Data



USGS Washington Water Science Center
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Presentation Outline

- Station locations
- Instrumentation
- Data completeness
- QA/QC
  - Pre and post calibration comparisons to primary standards
  - Sensor comparisons to secondary standards
- Summary

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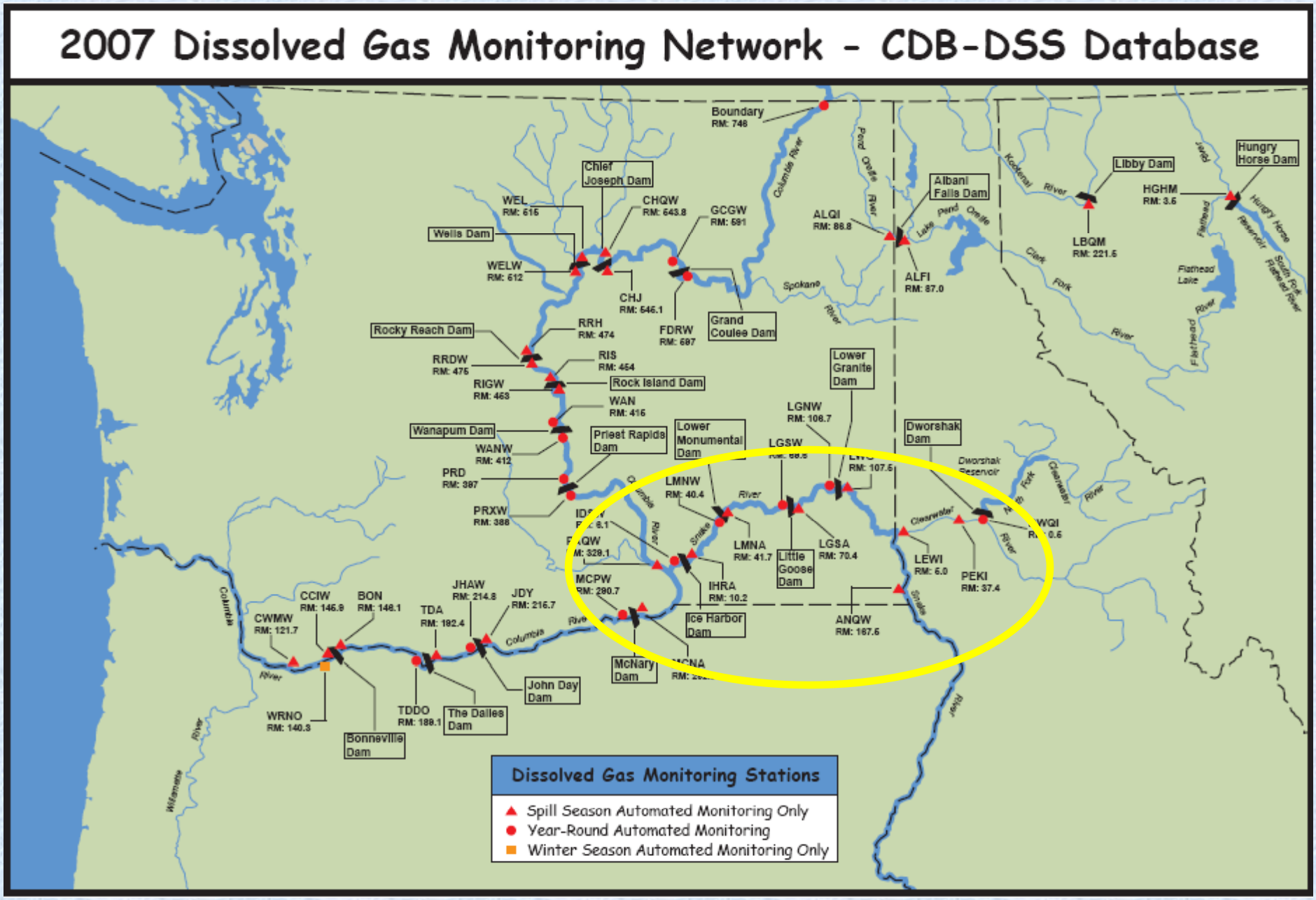
2007 Dissolved Gas Monitoring Network - CDB-DSS Database



FMS's

- 15 sites: 6 year-round sites, 9 seasonal sites
- 5 Forebay sites, 6 Tailwater sites, 4 Riverine sites
- All 15 sites visited every three weeks during spill season and 6 tailwater sites every four weeks outside spill season

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Field equipment

- 34 sondes
- Mostly Hydrolab Mini 4, 4a, and Mini 5 sondes
- Sutron digital barometers
- 14 Sutron Satlink 2 HDR DCP’s plus one Sutron 8210 HDR DCP.
- NovaLynx hand-held digital field barometer, Surveyor 4 internal barometer

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Field equipment for 2009

- All Sutron digital barometers at FMS's
- Replaced DWQI LDR with Sutron 8210 HDR DCP.
- Purchased 50 new TDG Membranes and two Surveyor 4 from Hach Environmental.
- Three new MS 5 purchased by USGS
- Six new MS 5 purchased by USACE

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Lab equipment

- Heise calibrated digital pressure gage
- Ashcroft calibrated digital pressure gage
- Two Barnant digital thermometers
- ParoScientific digital barometric pressure Digiquartz Laboratory Standard.

  Model 745 purchased this year

Data Completeness

During the Spill Season April 1 to Sept. 30.
99.9% of the BP, 99.5%TDG
data and 99.9% of the WT data
were received in real-time
and passed provisional QA/QC review.

For the whole reporting period
99.8% of the BP, 99% TDG and 99.8% of the WT data

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Missing/ Anomalous BP and TDG Data

1061 Hours or 1.2% of Total for 2009

Hours	Percent	Reason
400	37.8	Bad membrane
216	20.3	DCP failure
193	18.2	Bad Communication Cord
151	14.2	Bad Sonde
46	4.3	Missing
43	4.0	Inspection
11	1.0	Spike
2	0.2	Missed transmission
0	0	Other

Unusable BP/TDG data

- Worst Sites: IDSW 272 hours, LGNW 291 hours and DWQI 428 hours where unusable
  - Mostly due to Cable and DCP failure, Bad Membrane and Bad Sonde.
- Best sites: MCNA, IFRA, LMNA, LWG and LEWI: 0 hours unusable
- Some examples of what caused unusable data.

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Changing Comm Cord

Barge and floating bulk head was moved next to communication cable and damaged cable.

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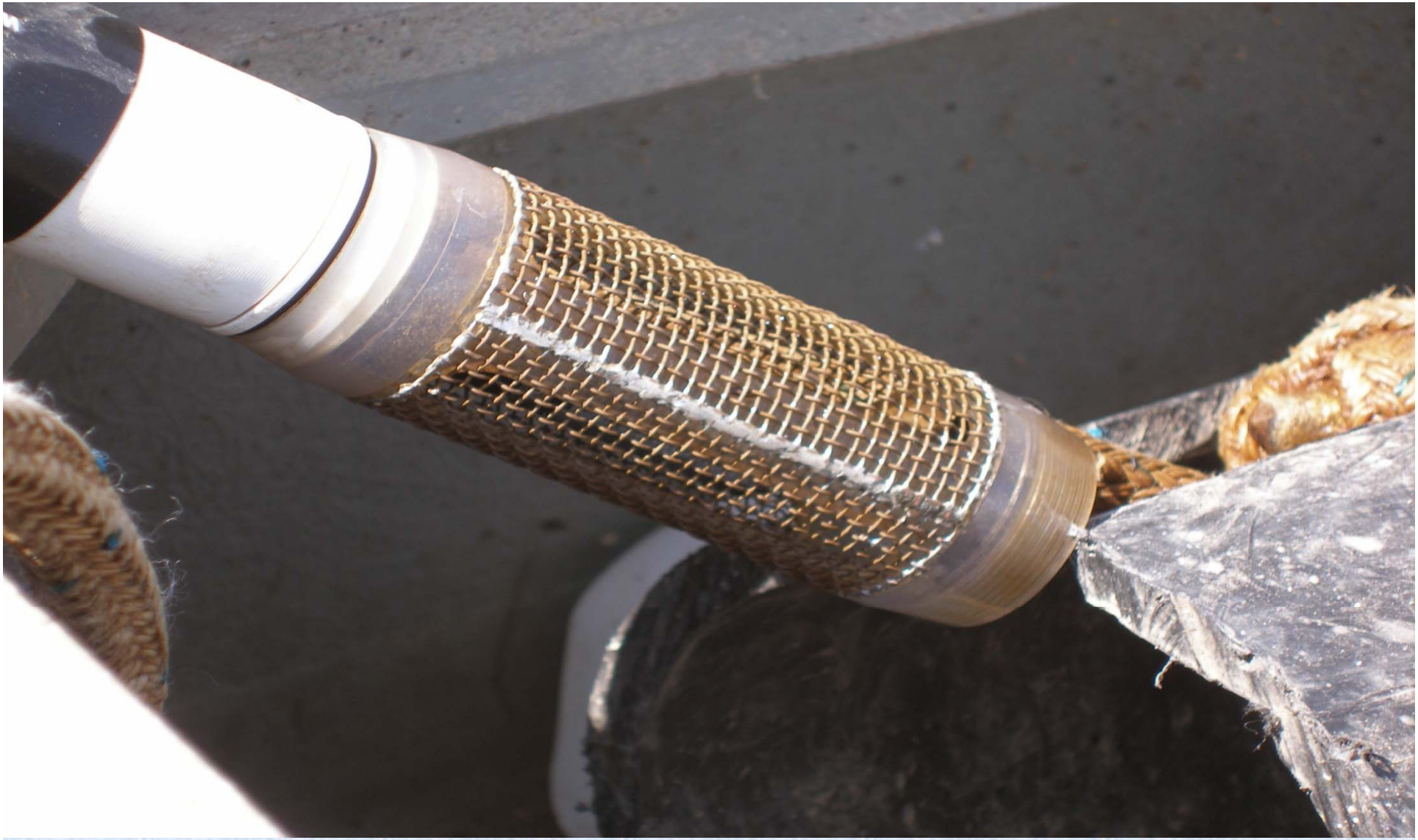
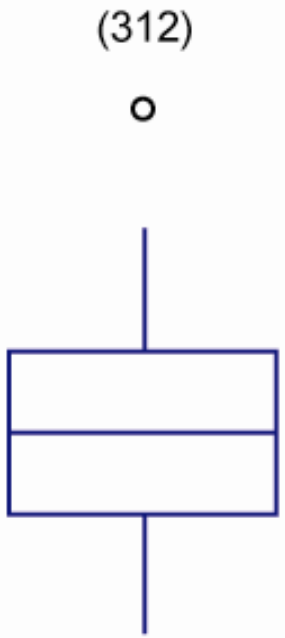


Mesh guard to help stop the little critters from getting in.

Explanation of a Boxplot



(312) Number of observations

Data values outside the 10th and 90th percentiles

90th percentile

75th percentile

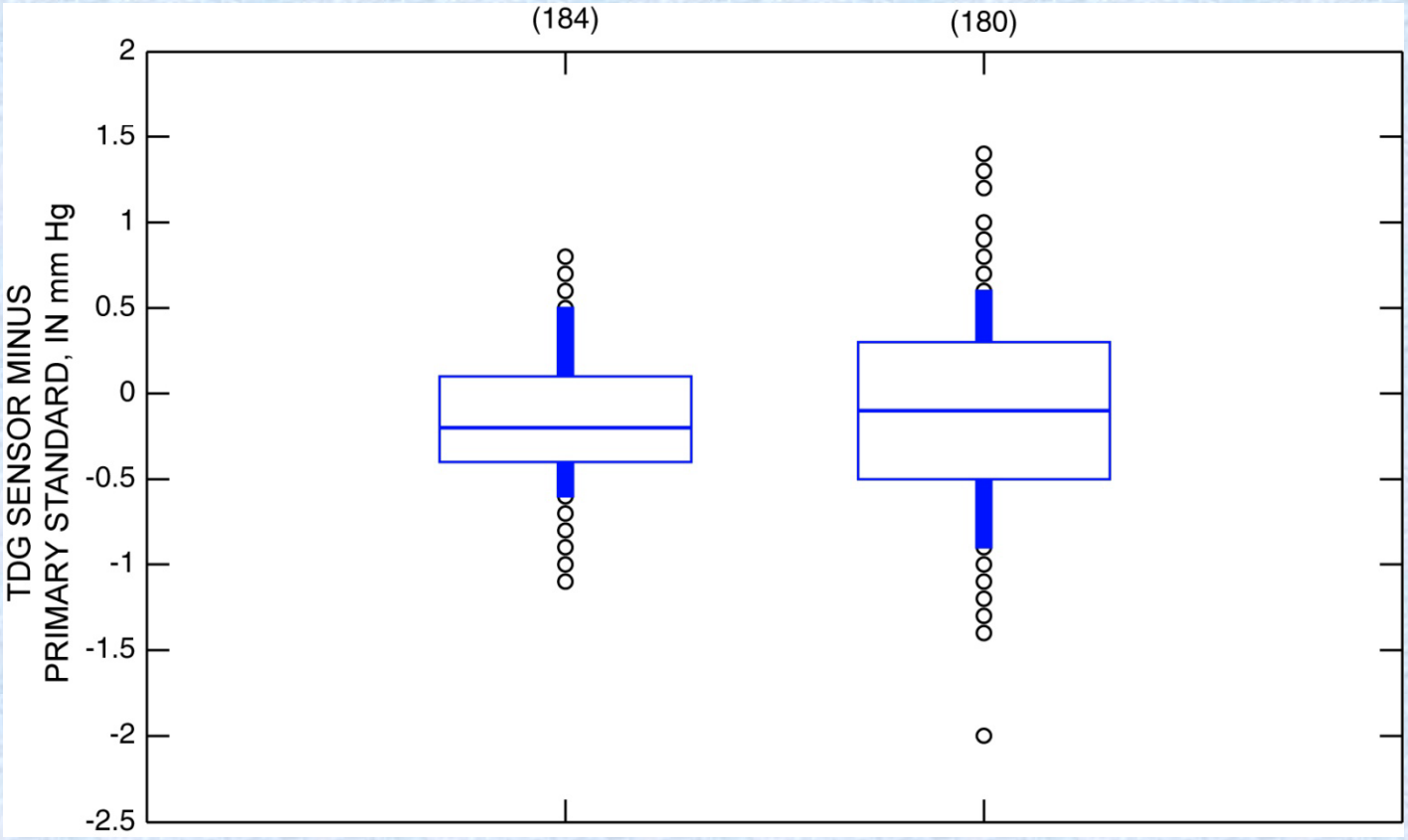
Median

25th percentile

10th percentile

TDG Sensor vs Primary Standard

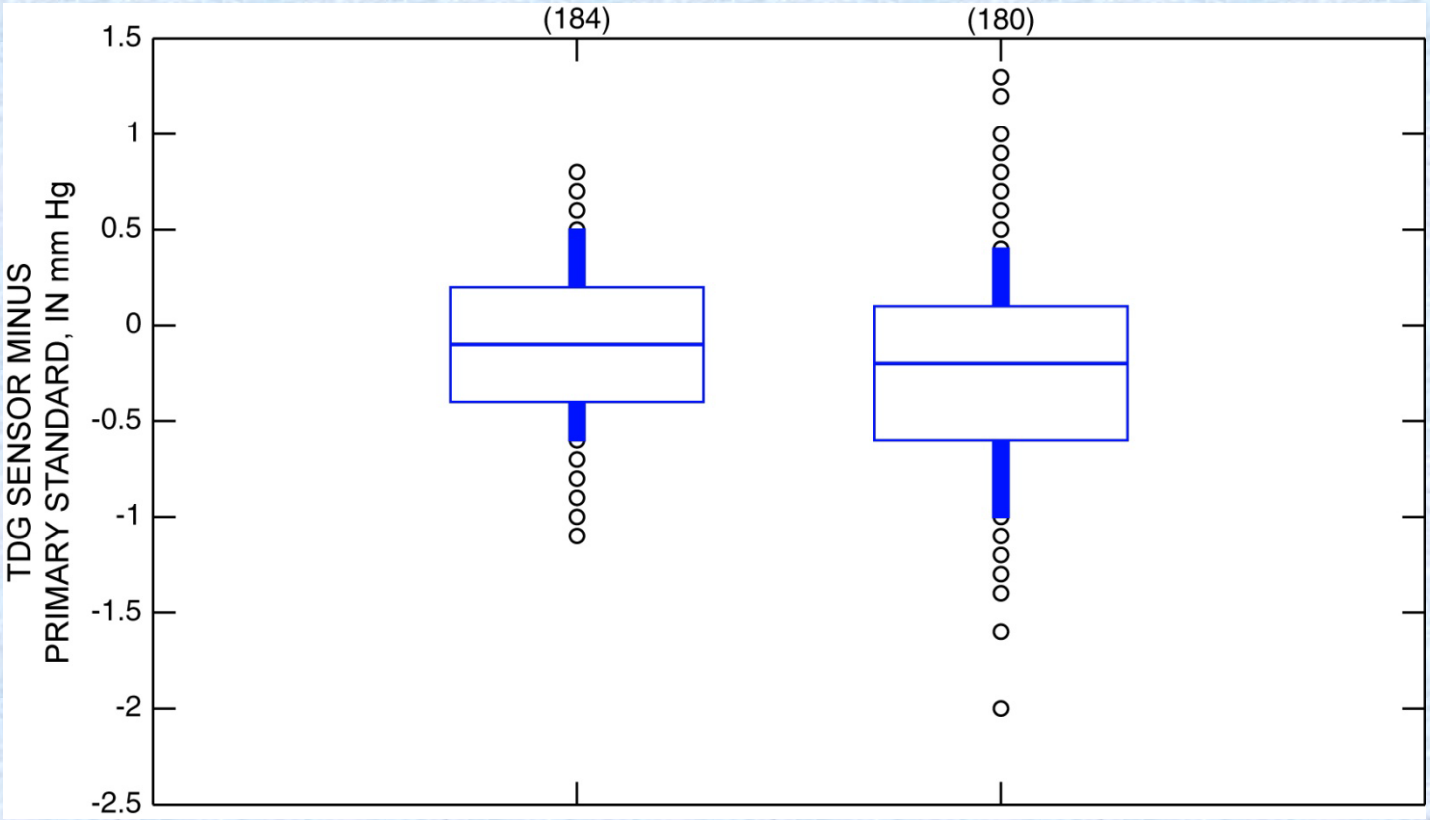
Barometric Pressure



Pre deployment **Post deployment**

TDG Sensor vs Primary Standard

Barometric Pressure + 300 or 100 mm Hg



Pre deployment (+300 mmHg)

Post deployment (+100 mg Hg)

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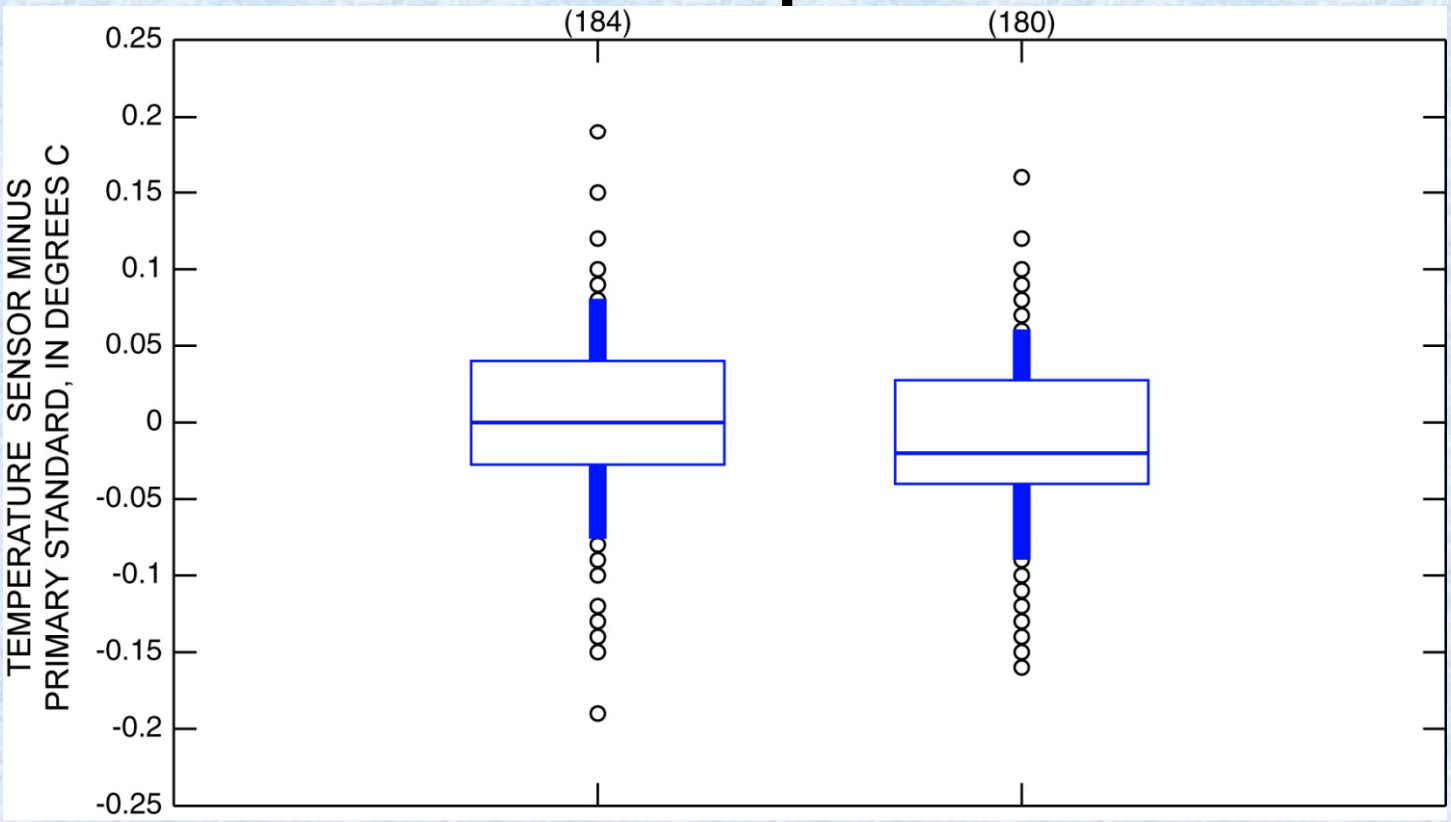
Temperature Sensor vs Primary Standard

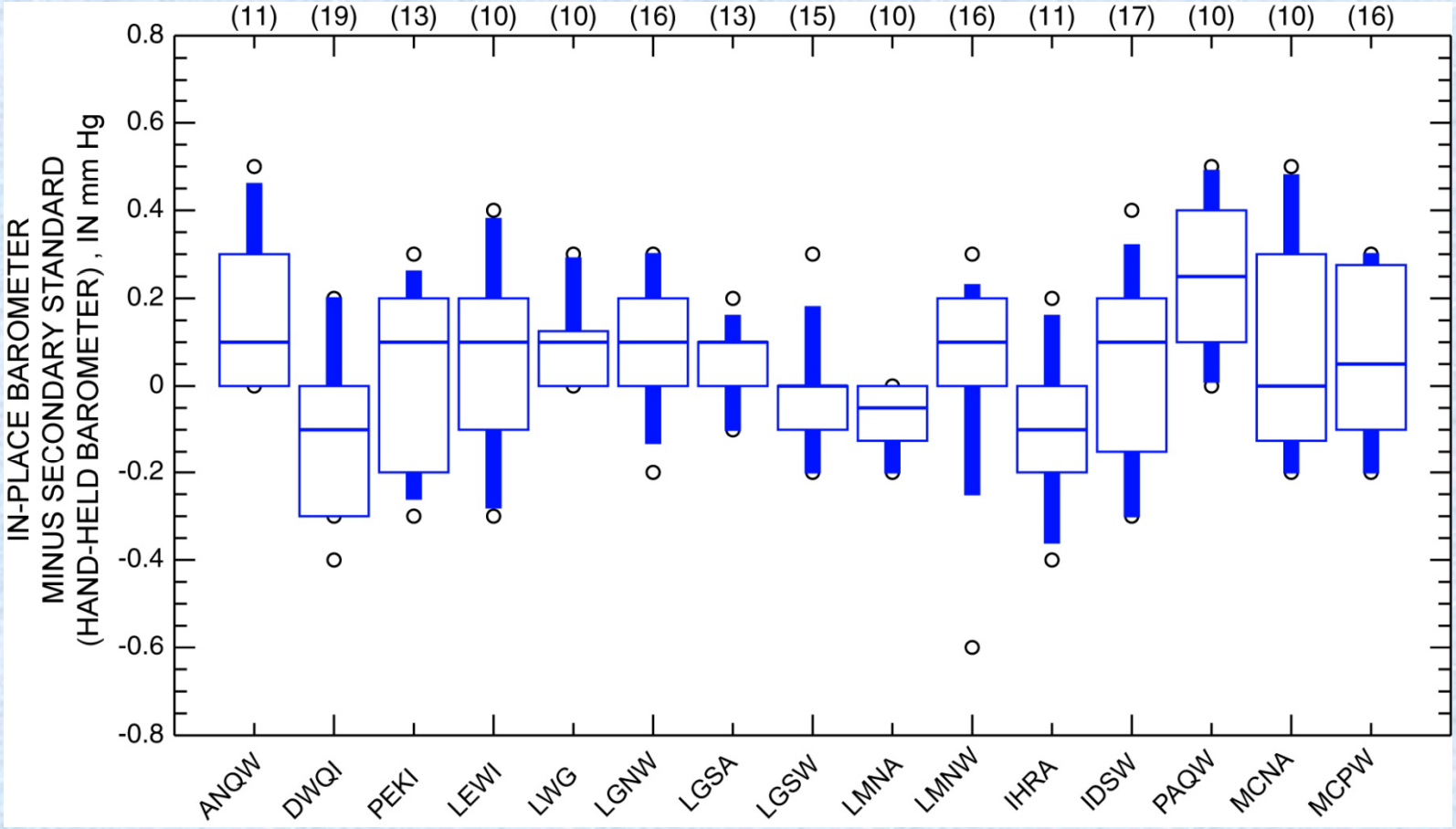
Water temperature



Pre deployment **Post deployment**

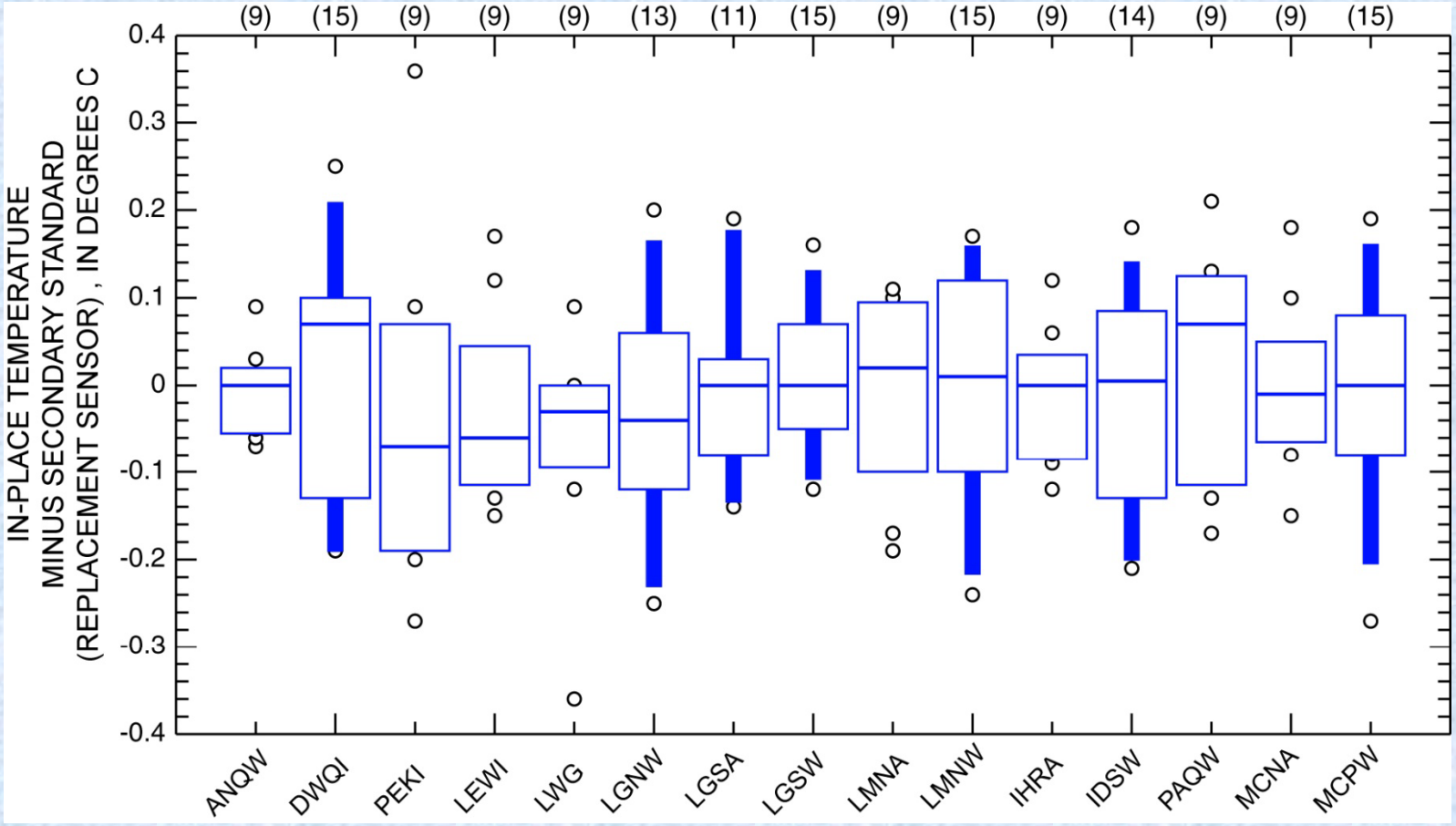
In-Place Barometer vs Secondary Standard

Barometric Pressure



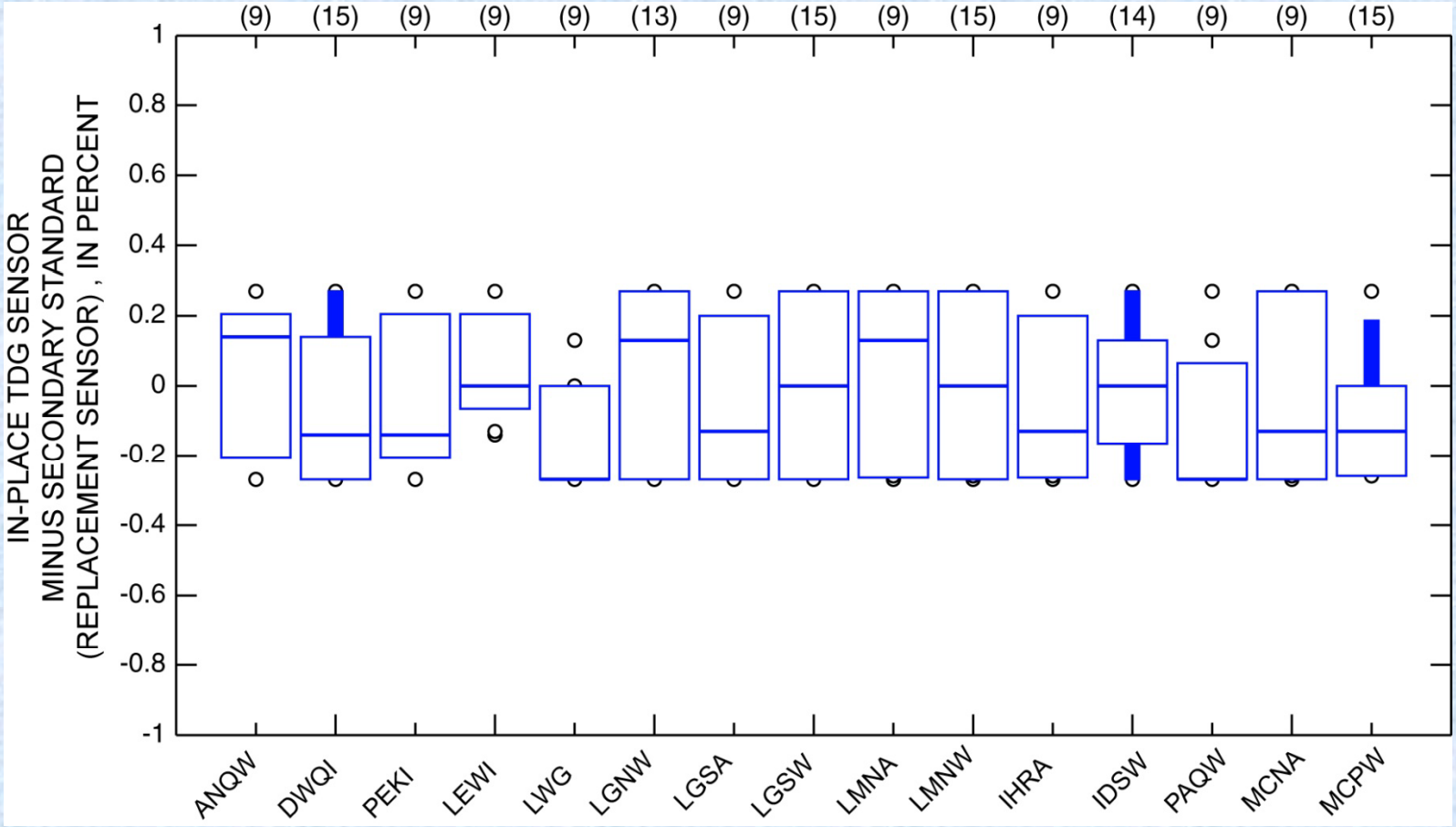
Temperature Sensor vs Secondary Standard

Water Temperature



TDG Sensor vs Secondary Standard

Difference in TDG (Percent Saturation)



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Summary

- 15 sites: 6 year-round and 9 seasonal stations

- 1.4% missing/ anomalous data

Summary

Median differences between TDG Sensors vs. Primary Standards (performed in lab)

- **Barometric pressure**
  - Pre deployment: -0.2 mm Hg
  - Post deployment: -0.1 mm Hg

- **Water temperature**
  - Pre deployment: 0.00 ^{o}C
  - Post deployment: -0.02 ^{o}C

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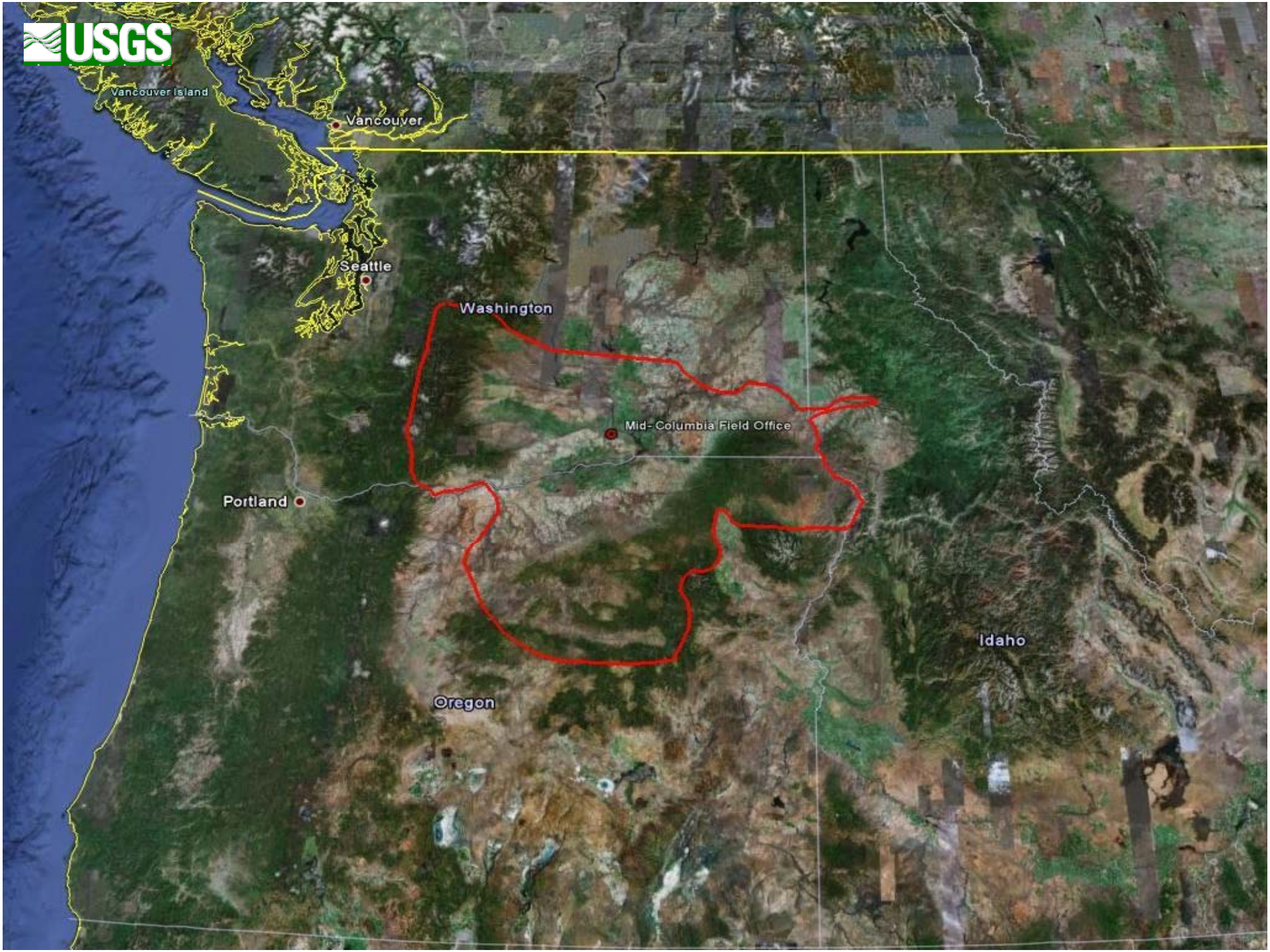
Summary

Median differences between TDG Sensors vs. Secondary Standards (performed in field)

Barometric pressure: 0.0 mm Hg

Water temperature: 0.00 ^{o}C

TDG, in percent saturation: -0.13%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