

US Bureau of Reclamation
Total Dissolved Gas Fixed
Monitoring System
2013

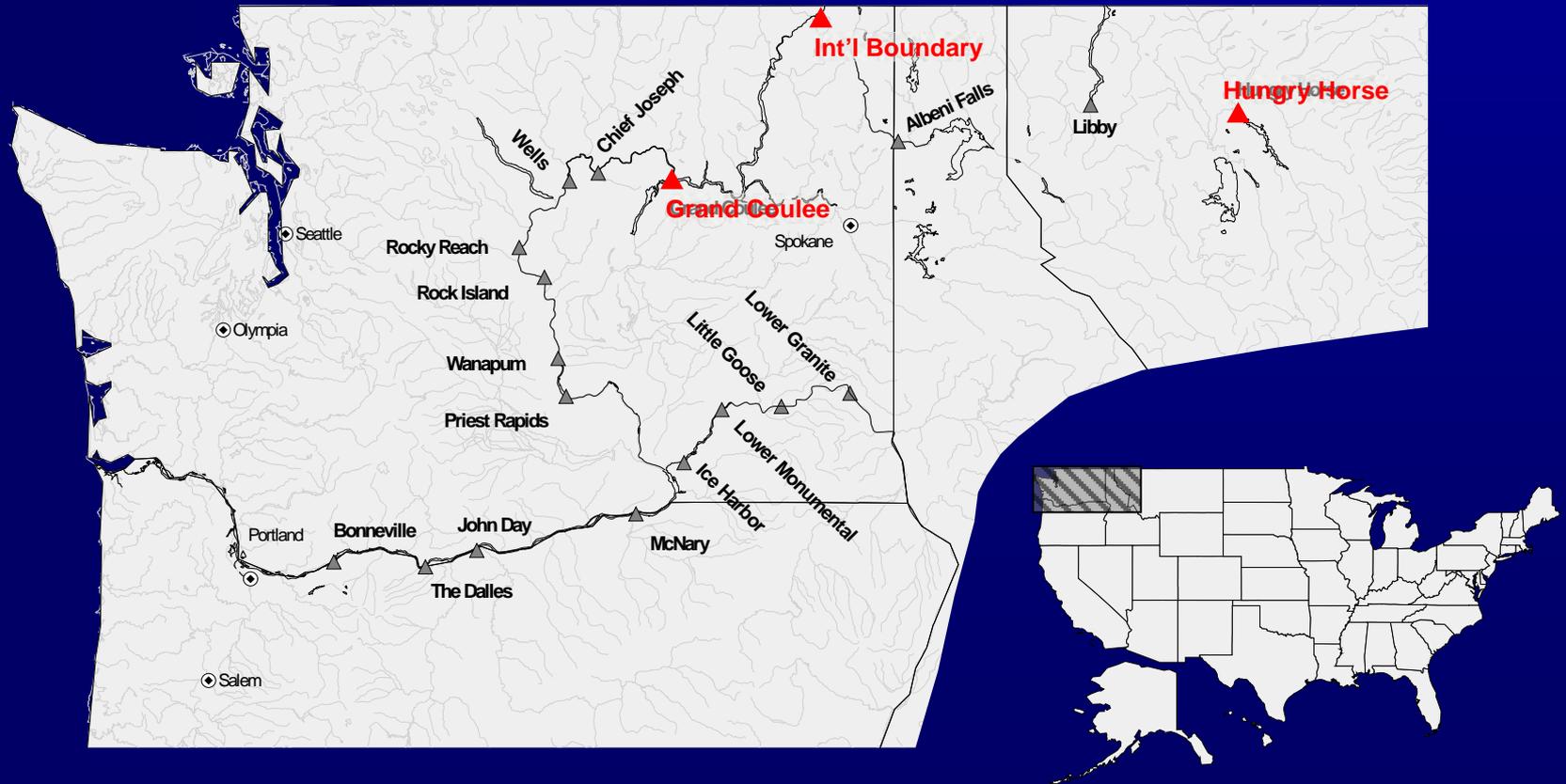




Grand Coulee

Hungry Horse

Drainage Area:	74,700 sq mi	1654 sq mi
Normal Full Pool:	1290.0 ft MSL	3560.0 ft MSL
No. Main Units:	24	4
Hydraulic Capacity:	280,000 cfs	8,900 cfs





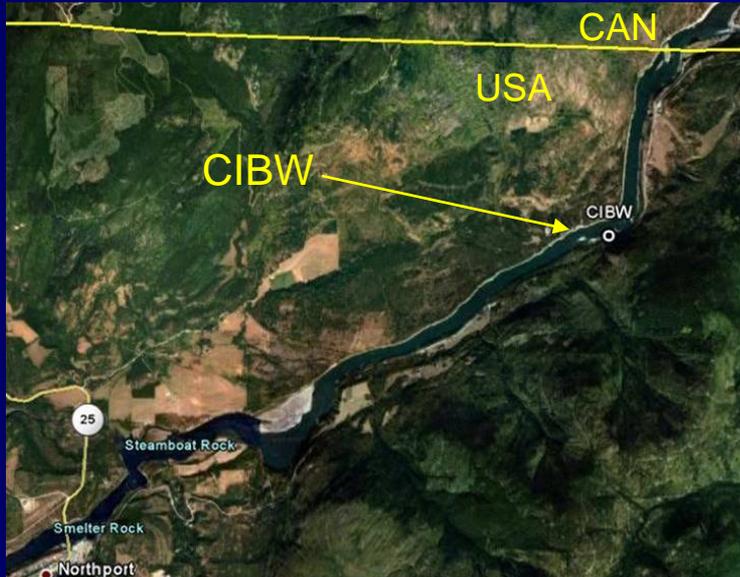
Hungry Horse Tailwater (HGHM)

Established: 1998

Dates in Operation: March - September

Calibration Frequency: Bi-weekly





International Boundary (CIBW)

Established: 1984

Dates in Operation: Year round

Calibration Frequency: Bi-weekly (Mar-Oct)
Monthly (Oct-Mar)



Grand Coulee Dam TDG Monitoring Locations

GCGW

GCGW

Grand Coulee Dam
FDRW

FDRW

Grand Coulee

Image U.S. Geological Survey

2.40 mi Electric City

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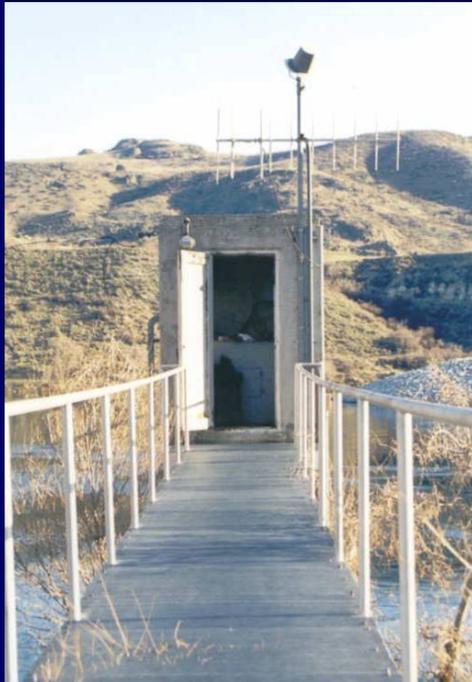
Grand Coulee Forebay (FDRW)



Established: 1997
Dates in Operation: Year round
Calibration Frequency: Bi-weekly (Mar-Oct)
Monthly (Oct-Mar)

Grand Coulee Tailwater (GCGW)

Established: 1983
Dates in Operation: Year round
Calibration Frequency: Bi-weekly (Mar-Oct)
Monthly (Oct-Mar)

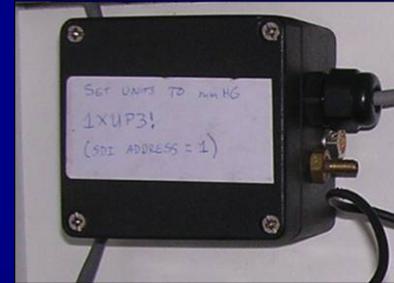


Monitor Equipment

Sutron SatLink 2



Sutron Accubar BP Sensor
+/- 0.5 mmHg



Hydrotech TDG/Temperature Sensor
Temperature +/- 0.1 °C
TDG +/- 1.0 mmHg

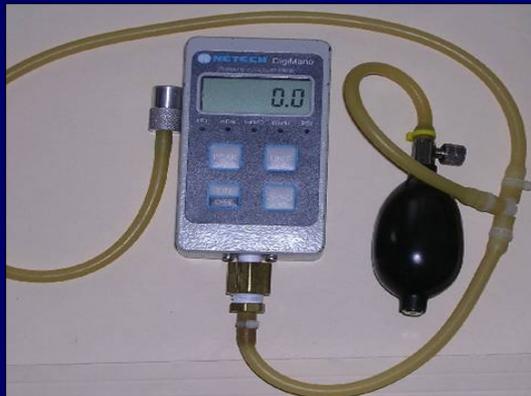
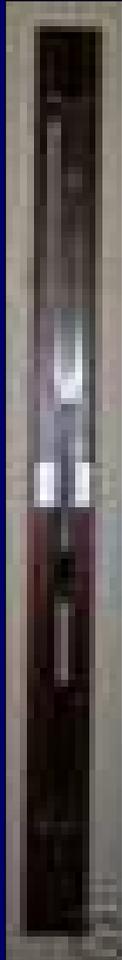
Alpha Designs TDG/Temperature Sensor
Temperature +/- 0.1 °C
TDG +/- 1.0 mmHg



Quality Assurance / Quality Control

In the lab, probes are calibrated to known standards.

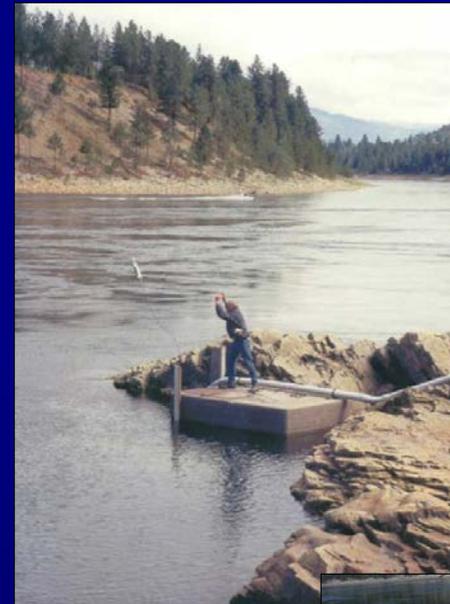
In the field, a secondary standard probe is deployed for comparison.



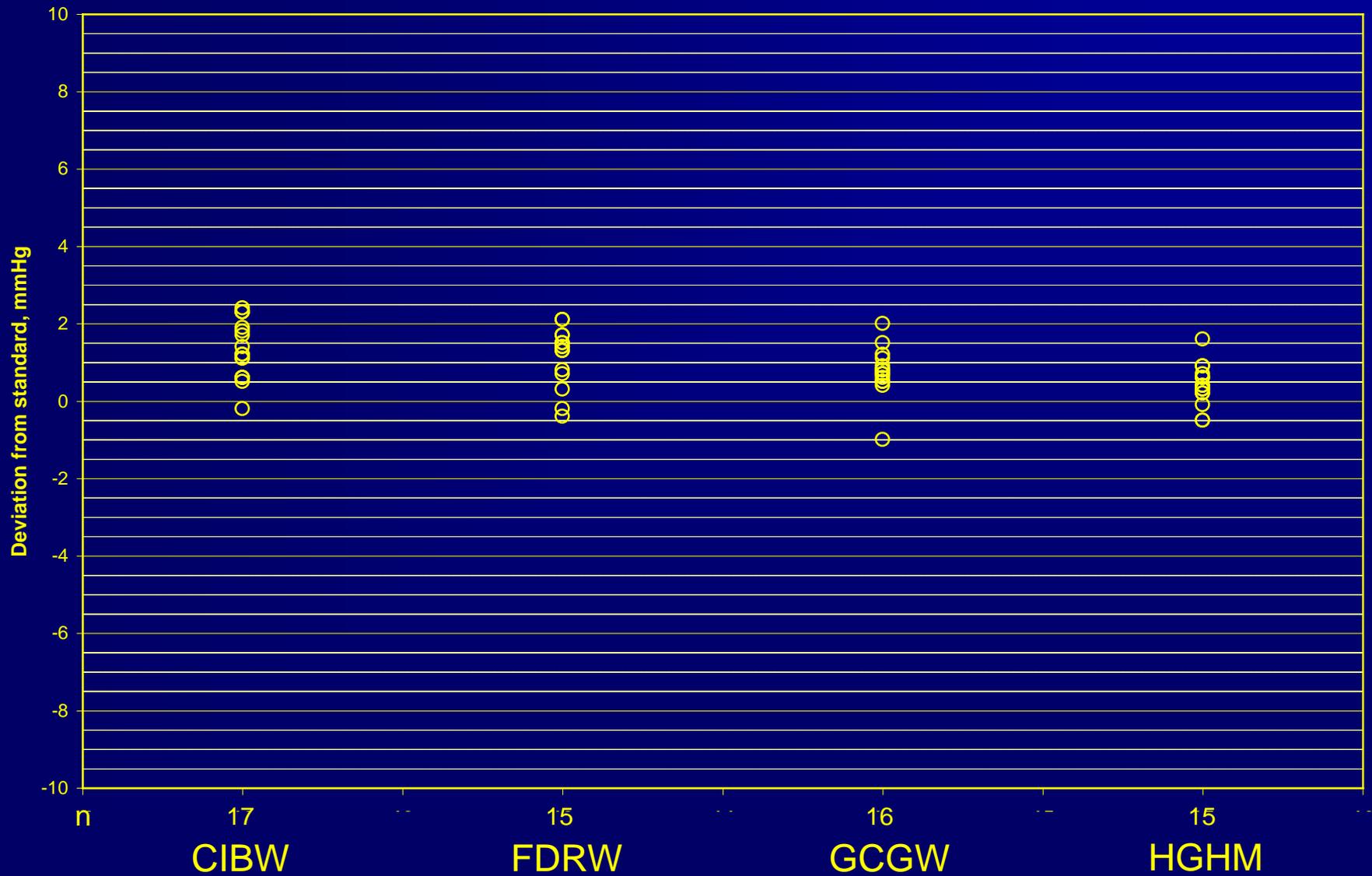
Pressure sensor calibrated to mercury barometer
+/- 0.9 mmHg

Netech DigiMano 2000 Pressure meter
+/- 0.5 mmHg

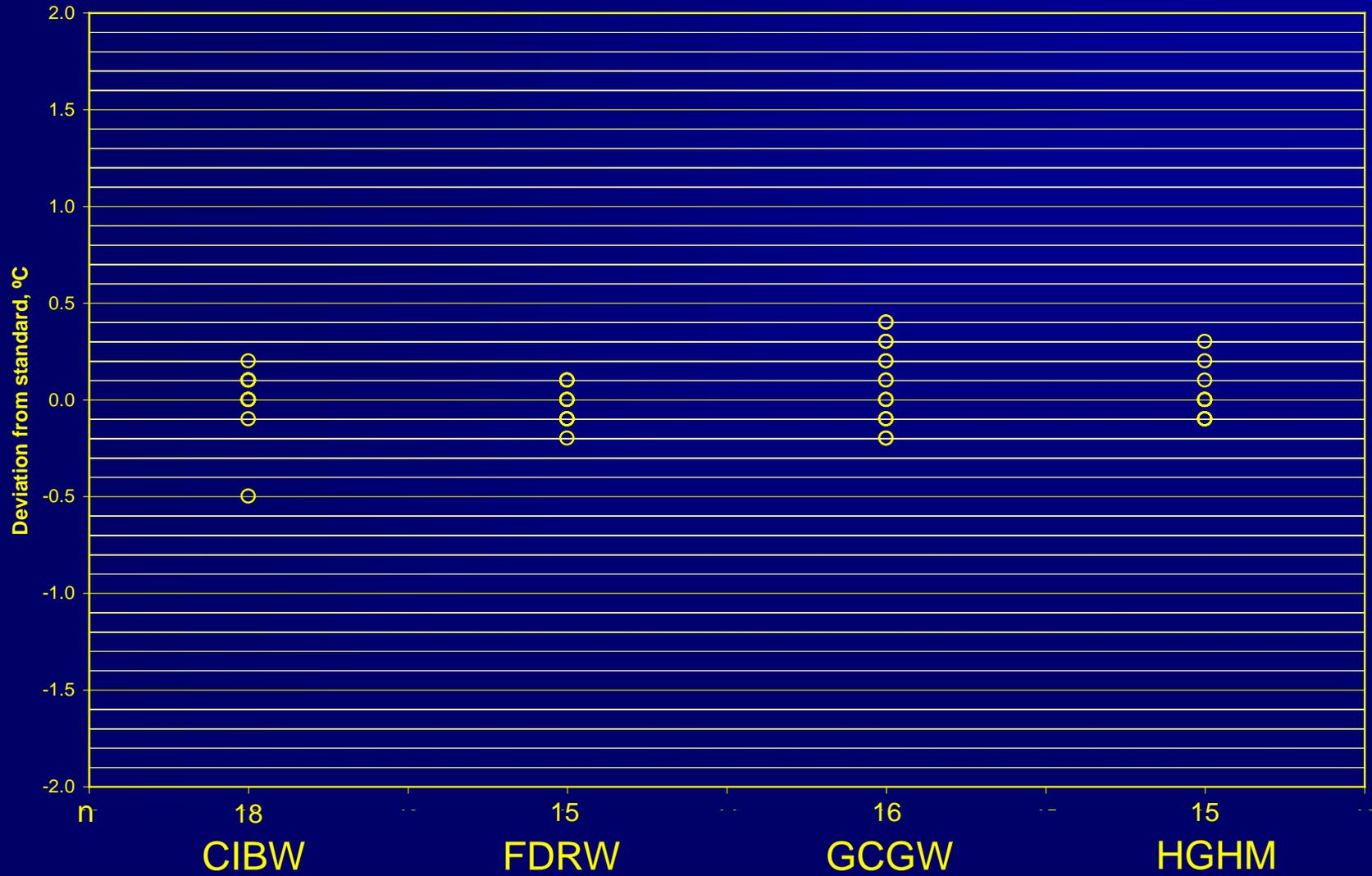
ThermoProbe TL1-A Digital thermometer
+/- 0.06 °C



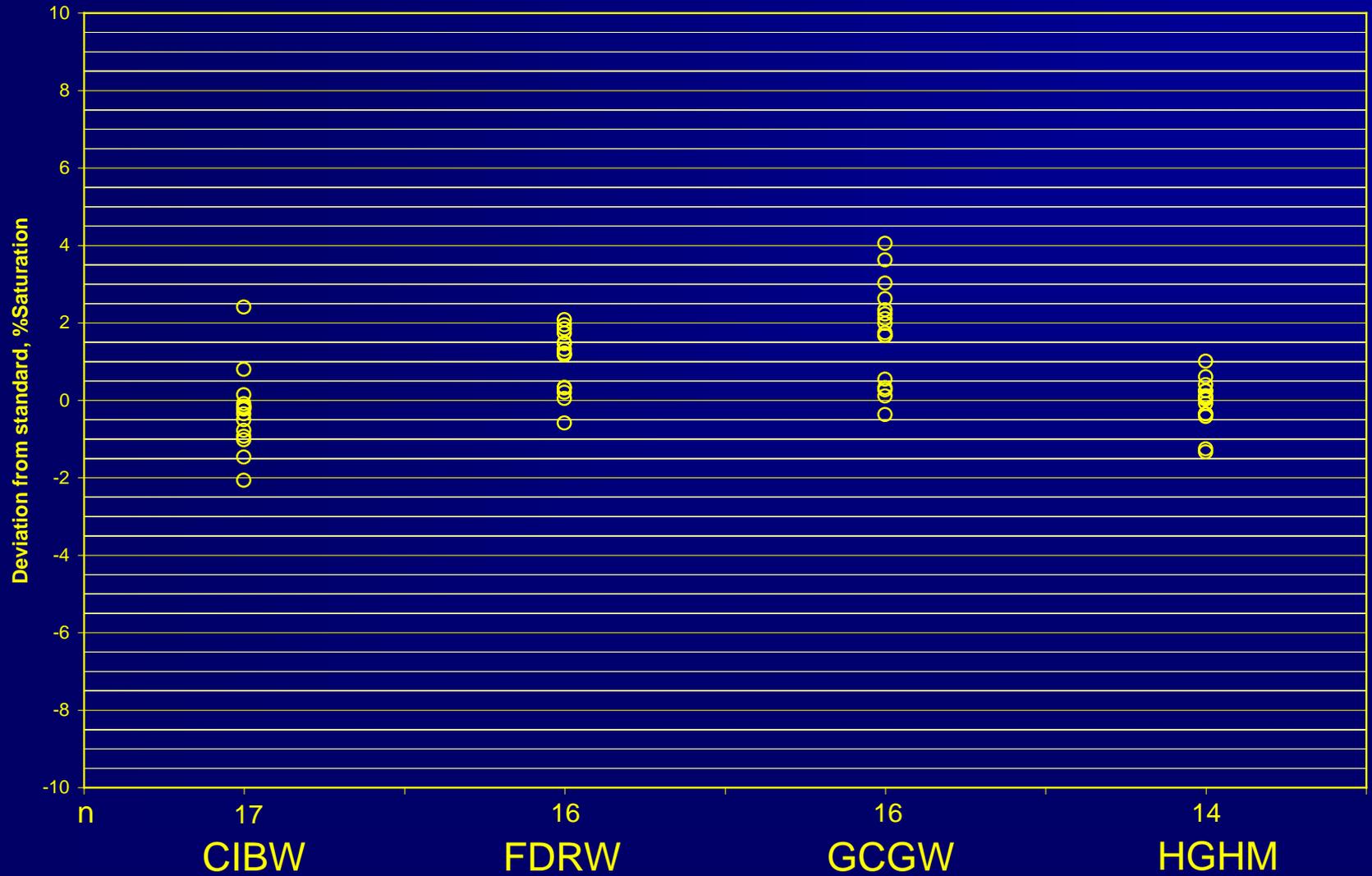
Field measurement comparisons – Atmospheric pressure



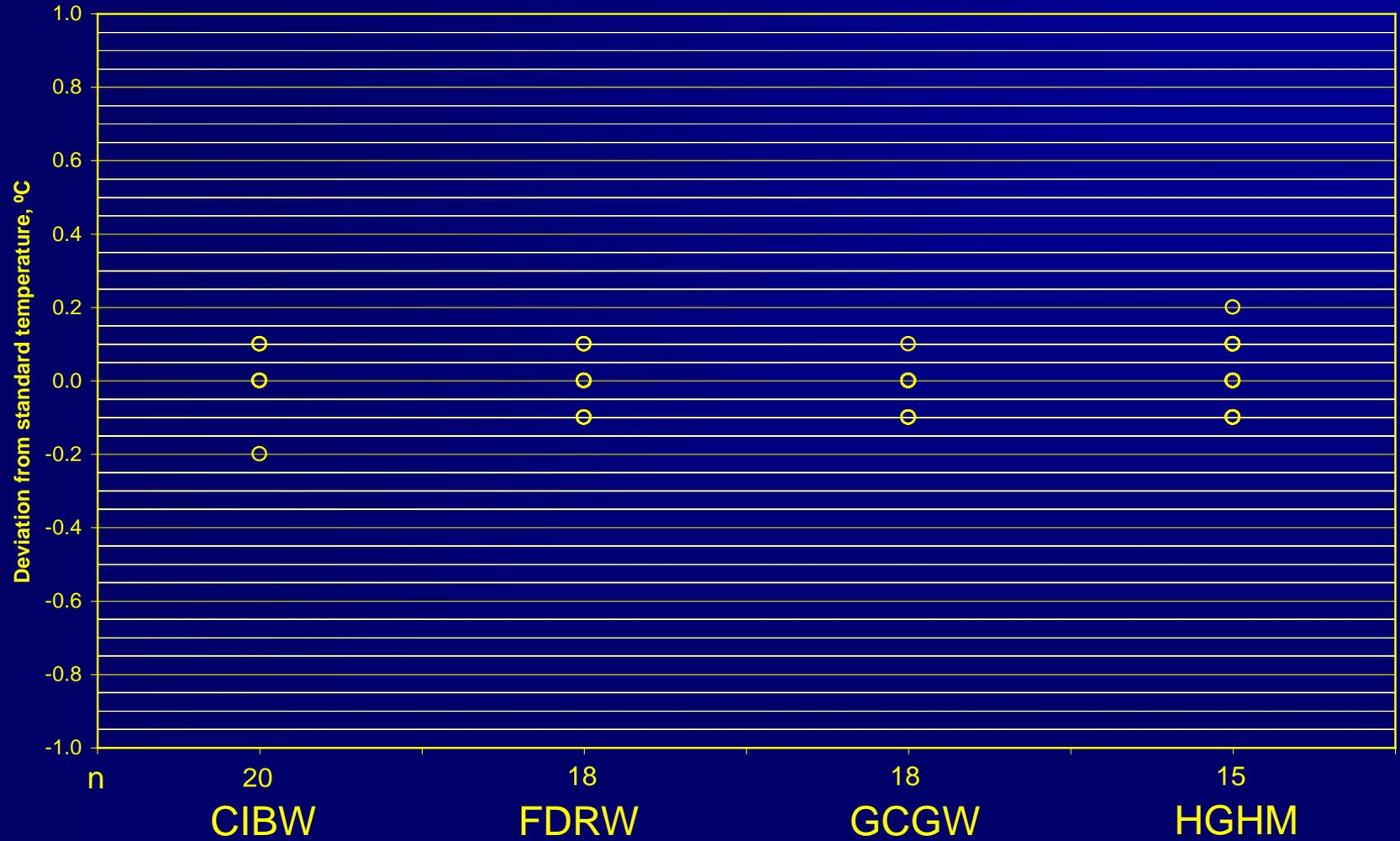
Field measurement comparisons - Temperature



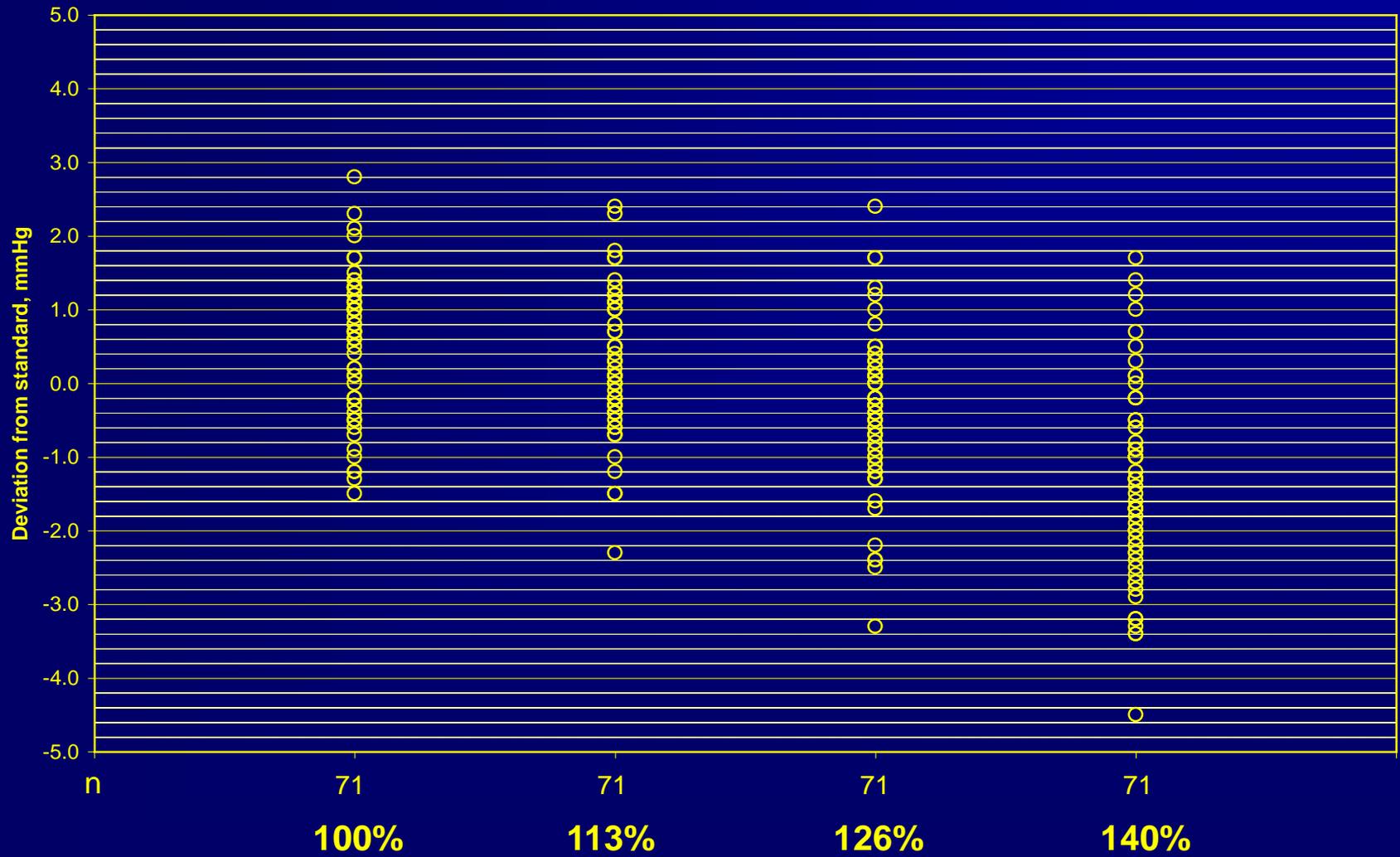
Field measurement comparisons – TDG Saturation



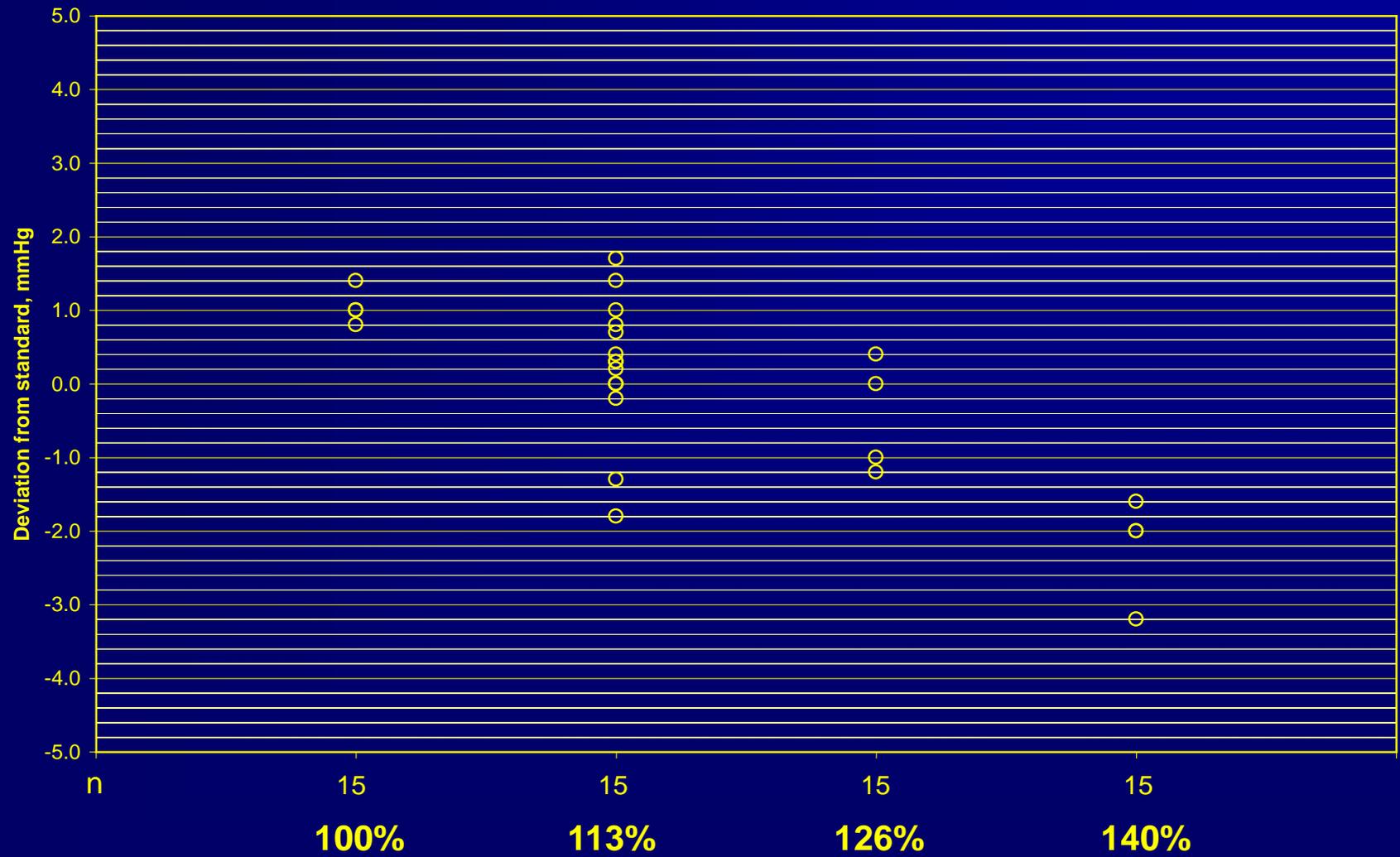
Temperature Calibration Data



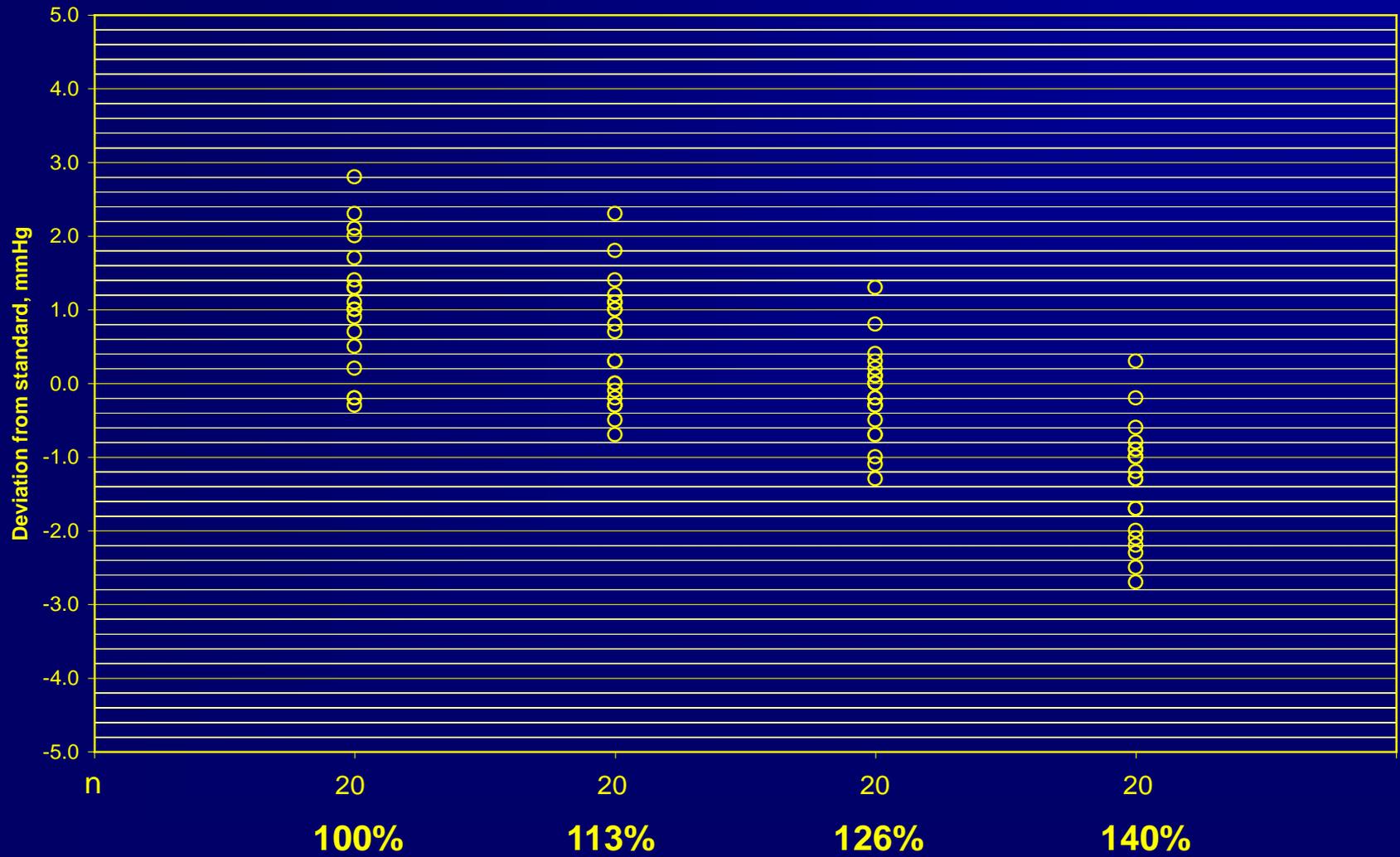
Total Dissolved Gas Calibration Data – All Data



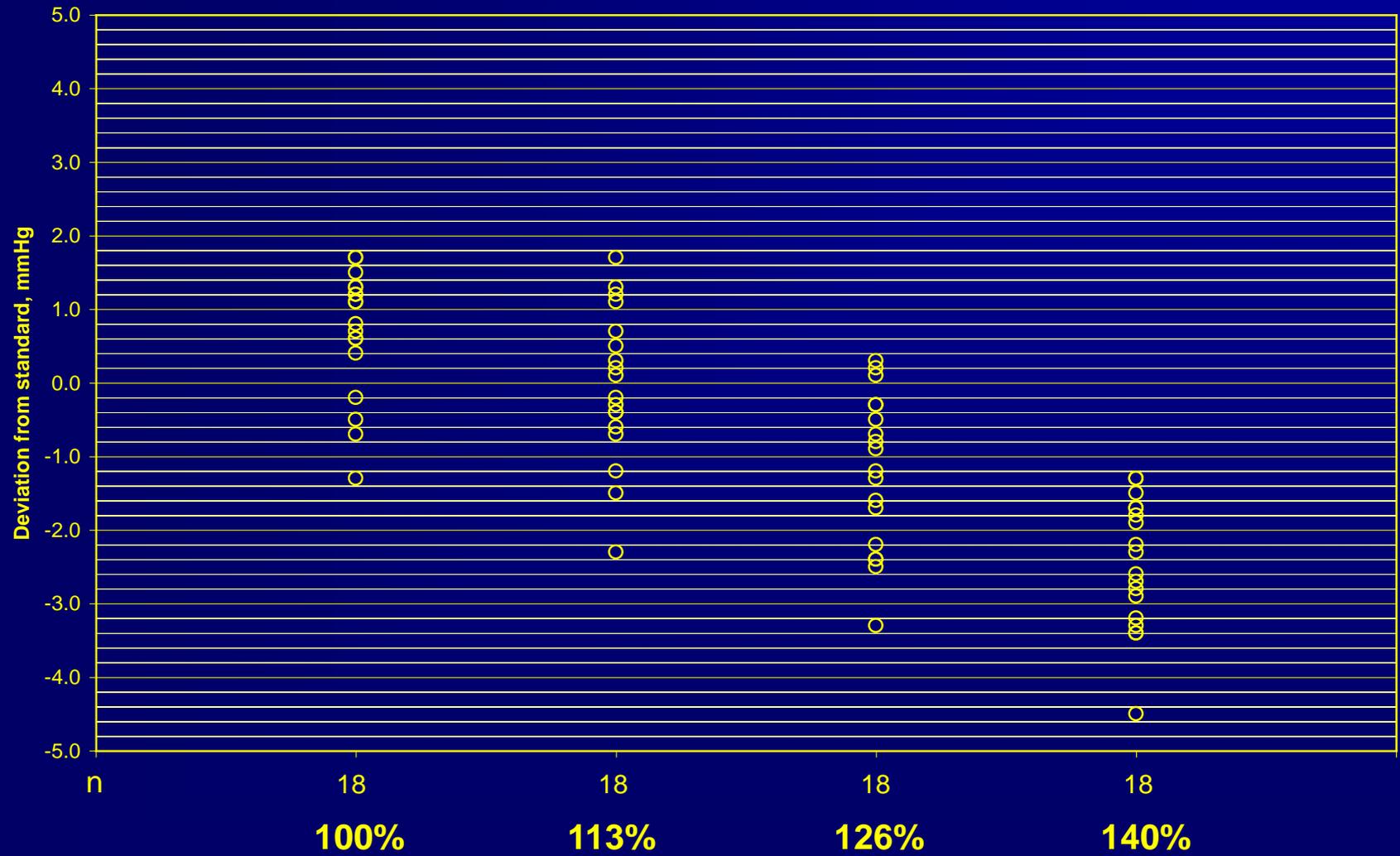
Total Dissolved Gas Calibration Data - HGHM



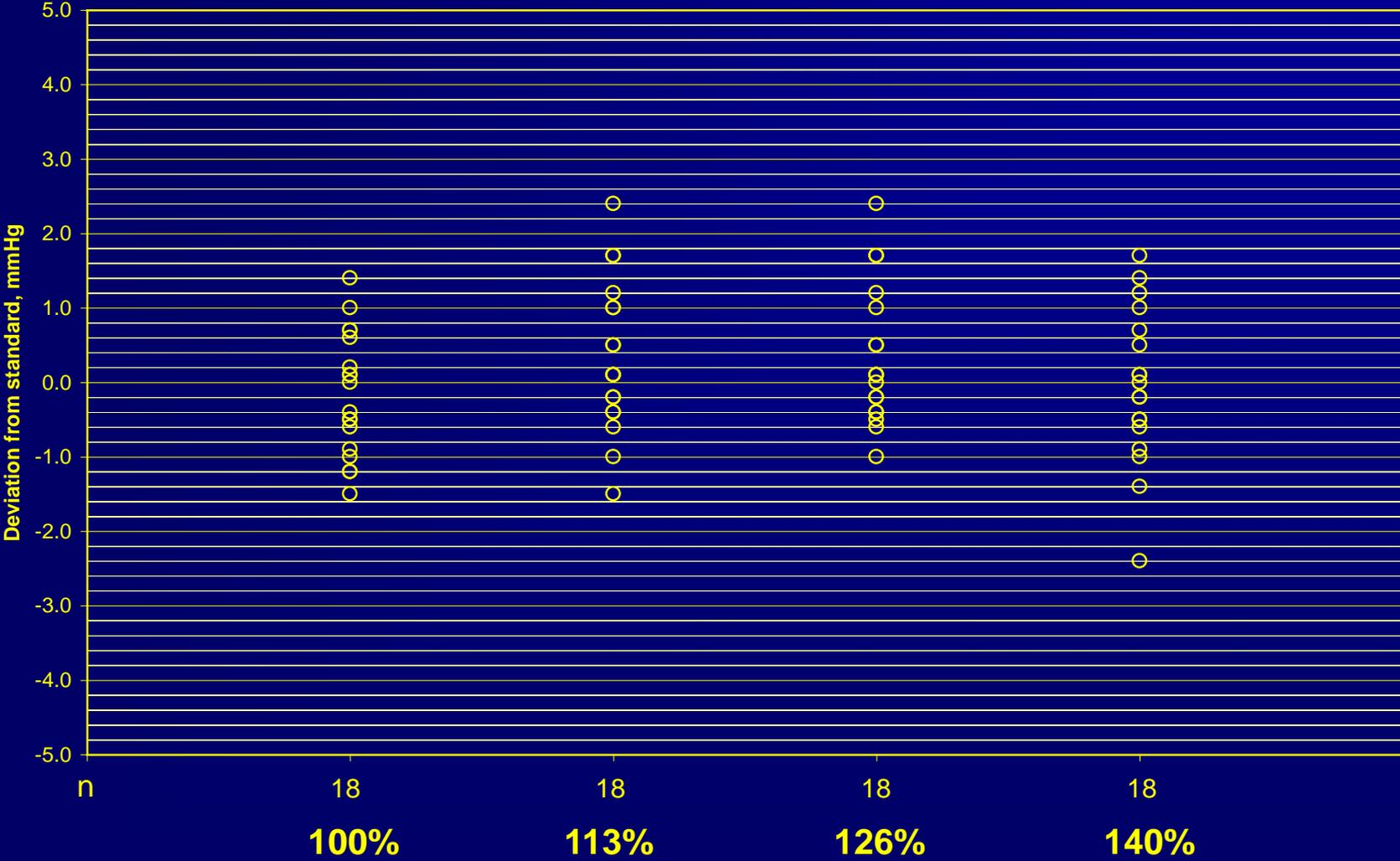
Total Dissolved Gas Calibration Data - CIBW



Total Dissolved Gas Calibration Data - FDRW



Total Dissolved Gas Calibration Data - GCGW

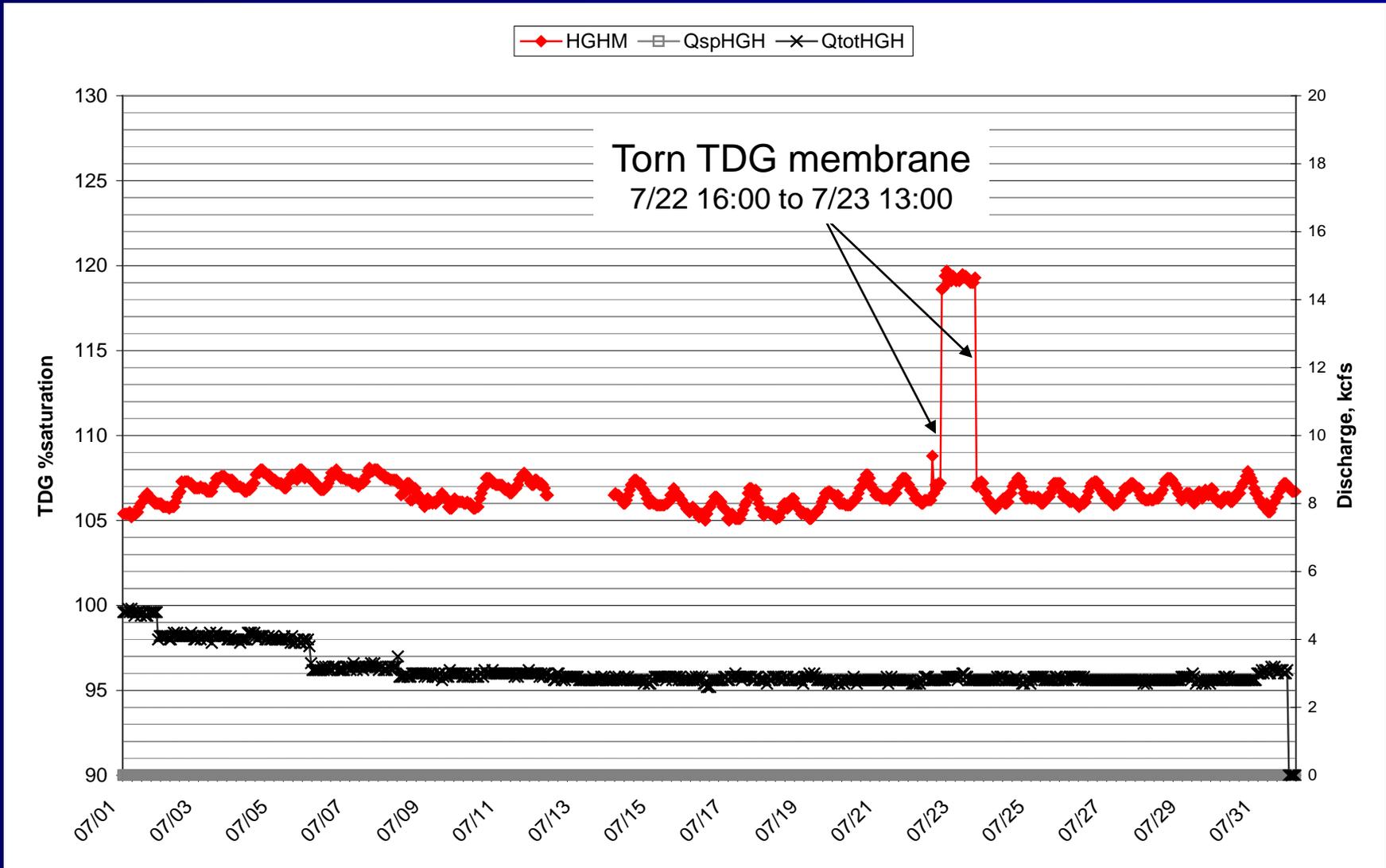


US Bureau of Reclamation 2013 Calibration Summaries

	Temperature (°C)	TDG Pressure, mmHg			
		100%	113%	126%	139%
Mean	-0.01	0.63	0.28	-0.31	-1.37
Median	0.00	0.80	0.20	-0.20	-1.30
Standard Deviation	0.08	0.94	0.95	1.04	1.29
Variance	0.01	0.88	0.90	1.09	1.68
Minimum	-0.20	-1.50	-2.30	-3.30	-4.50
Maximum	0.20	2.80	2.40	2.40	1.70
n	71	71	71	71	71

Problems in 2013

HGHM



Data from USACE CROHMS database.

<http://www.nwd-wc.usace.army.mil/tmt/wcd/tdg/months.html>

Problems in 2013 *continued*

- CIBW – DCP lock-up due to t-storm
(6/2 22:00 to 6/3 13:00)
- FDRW – DCP lock-up
(9/8 05:00 to 9/9 11:00)
- CIBW – DCP lock-up due to t-storm
(9/16 01:00 to 9/16 11:00)
- GCGW – DPC lock-up due to t-storm
(9/15 23:00 to 9/16 16:00)