MSM-37 CORK Pressure Data Summary

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Maria S. Merian cruise MSM-37 to the North Pond area west of the mid-Atlantic Ridge was funded by a combination of ship-time support from the German Science Foundation and Jason dive support from the National Science Foundation Division of Ocean Sciences. A primary objective of the NSF-funded Jason dives on MSM-37 was recovery of long-term formation and seafloor pressure data from three "CORK" subseafloor hydrogeological observatories in North Pond, specifically supported under NSF grant OCE-1060855 (K. Becker PI). These include two CORK-II hydrological observatories installed in fall 2011 in Holes U1382A and U1383C during IODP Expedition 336 (see Edwards et al., 2012 for details) and a "CORK-Lite" observatory installed in spring 2012 in Hole U1383B during MSM-20/5 (Wheat et al., 2012).

The pressure-monitoring instrumentation in the three CORK's was procured under a prior NSF grant (OCE-0946795, K. Becker PI). Each CORK pressure monitoring instrument system included 2-4 Paroscientific 8B7000-2 Digiquartz absolute pressure gauges, a data logger produced by E. Davis and colleagues at the Geological Survey of Canada with expected battery lifetime of 10-20 years depending on sampling rate, and a separate temperature sensor on the inside wall of the data logger pressure case. The Paroscientific gauges include internal temperature sensors allowing for temperature compensation of the basic frequency response in converting to pressure. All the gauges are mounted on the wellhead instrument assembly. Each North Pond installation included a seafloor reference gauge plus 1-3 formation gauges connected by ¼" tubing to sampling screens at independent formation depths isolated by downhole packers (tabulated below). The line format for each data file consists of: date and time (UTC), data logger temperature (°C), and pressure gauge temperatures (°C) and pressures (kPa) in sequence from the deepest formation zone gauge up to the seafloor gauge.

During normal data recovery operations, logger clock drift is assessed, and at operator discretion the clock may be reset to UTC. In addition, the relative offsets among the gauges may be checked with wellhead valves that allow each gauge to be switched to a seafloor input for a specified time. Finally, at operator discretion, the logger memory may be cleared at the end of the communications. During MSM-20/5 in 2012, the initial ~6-month data records from the two CORKs installed in fall of 2011 were recovered and hydrostatic checks were conducted, but the clock drift checks were invalid because of a problem with the laptop used for the transfer so the clocks were not reset. The data were left in memory, so the data files recovered during MSM-37 in 2014 included all the data since original CORK installations. During MSM-37, hydrostatic calibrations were conducted again, the clock drift was successfully assessed, and the clocks were reset.

The table below summarizes the relevant parameters for the accompanying data files. PLEASE NOTE that NO hydrostatic corrections or clock drift corrections have been applied to these data files, as different users may choose to use different methods in applying such corrections. The files are given a data quality designation of 1 because temperature compensation was applied in converting raw gauge frequency data to pressures.

Edwards, K.J., Wheat, C.G., Orcutt, B.N., Hulme, S., Becker, K., Jannasch, H., Haddad, A., Pettigrew, T., Rhinehart, W., Grigar, K., Bach, W., Kirkwood, W., and Klaus, A., Design and deployment of borehole observatories and experiments during IODP Expedition 336, Mid-Atlantic Ridge flank at North Pond, Proc. IODP, 336: College Station, TX (IODP-MI), doi: 10.2204/iodp.proc.336.109.2012.

Wheat, C.G., Edwards, K.J., Pettigrew, T., Jannasch, H.W., Becker, K., Davis, E., Villinger, H., and Bach, W., CORK-Lite: bringing legacy boreholes back to life, Scientific Drilling, 14, 39-43, doi: 10.2204/iodp.sd.14.05.2012.

Summary of MSM-20/5 and MSM-37 North Pond CORK pressure data parameters

CORK	U1382A	U1383C	U1383B
Lat., Long.	22°45.3531′N 46°04.8911′W	22°48.1241′N 46°03.1662′E	22°48.1328′N 46°03.1556′W
Seafloor depth	4483 m	4425 m	4414 m
Installation date	11 Oct 2011	6 Nov 2011	29 April 2012
# of formation gauges	1	3	1
Formation pressure zones (screen depths in parentheses)	102-210 mbsf (158)	58-142 mbsf (100), 142-196 mbsf (163), 196-332 mbsf (203)	54-90 mbsf (no screen)
Sampling interval	2 min	2 min	2 min
2012 Hydrostatic calibration	22 Apr 15:52-16:44	20 Apr 15:30-16:20	23 Apr 19:20 – 29 Apr 15:08*
2014 Hydrostatic calibration	5 Apr 12:45-13:14	31 Mar 12:37-13:20	None
Download data time range (UTC)	7 Oct 2011 10:24 – 6 Apr 2014 11:12	2 Nov 2011 11:58 – 1 Apr 2014 12:16	23 Apr 2012 19:20 – 1 Apr 2014 13:50
Initial clock sync to UTC	7 Oct 2011, 10:05:12	26 Sept 2011, 15:33:35	15 Mar 2012, 19:41:52
Clock check	6 Apr 2014, 12:03:54, logger 353.9 s ahead	1 Apr 2014, 13:14:30, logger 302.03 s ahead	1 Apr 2014, 14:16:04, logger 171.76 s ahead
Clock reset and memory clear	6 Apr 2014, 12:04	1 Apr 2014, 13:20	1 Apr 2014, 14:17

* The data logger package was deployed to the U1383C platform six days before installation at U1383B; during those six days both gauges registered seafloor hydrostatic pressure.