Comparison of Argo float pressure sensor performance: Druck *versus* Kistler

February 2015

Abstract

Field performance of SBE 41/41cp Argo CTD pressure sensors manufactured by the Druck and Kistler corporations are compared. The motivation for this comparison is that Druck sensors are temporarily unavailable due to a fire at their factory in 2014. Sea-Bird expects to resume delivery of Argo CTDs with Druck sensors by September 2015. This event has neccessitated broader use of Kistler sensors in the Argo fleet in order to meet program deployment plans. Sea-Bird has fielded 1310 Kistler pressure sensors on Argo CTDs supplied since the beginning of the Argo program. Both types of pressure sensors exhibit drift in offset across their measurement range that is apparent in surface pressure data. The data set presented was downloaded from the Argo Global Data Assembly Center and is compiled from floats deployed by CSIRO after March of 2009 to avoid Druck sensors that may have experienced microleaks. It consists of surface pressures from 228 floats with Druck sensors and 19 floats with Kistler sensors. Based on the data presented, offset drift performance is very similar for both sensor types. Sea-Bird recommends customer consideration and acceptance of Kistler pressure sensors in Argo CTDs.

Methods

Argo float data collected by CSIRO was downloaded from the US GDAC for 640 deployed floats. Floats were excluded if their Druck sensors were deployed before April 2009, to avoid pressure sensors exhibiting microleaks as were floats with less than 50 profiles. This screening process leaves 228 floats with Druck pressure sensors and 19 with Kistler pressure sensors. Untruncated surface pressure values were extracted from the technical data files by searching for the technical parameter name "PRES_SurfaceOffsetNotTruncated_dbar". The resultant data set is used to examine drift at low pressure for each of type of sensor.

As a result of the "microleak" problem in Druck sensors, Sea-Bird routinely screens Druck Argo CTD pressure sensors for over 1500 hours at 4000 psia (30% over rated pressure) to detect manufacturing faults and to measure offset drift. Example data from this test for Druck and Kistler sensors is presented here to represent typical sensor drift at high pressure.

Results

Figures 1 and 2 show surface pressure readings from floats equipped with Druck or Kistler pressure sensors versus float cycle. Eight of the Druck sensors have some unexplained spiking in their surface pressure record and are plotted in gray as individual sensor performance is of less interest than fleet performance. The remaining 220 Druck sensors show lifetime drift within +/-1.5 decibars. The Kistler sensors have a smaller range of offset, +/- 0.5 decibars, but the number of floats included in the analysis is much smaller and these are younger floats than those shown in Figure 1. Both sensor types show a small negative offset trend as they age.

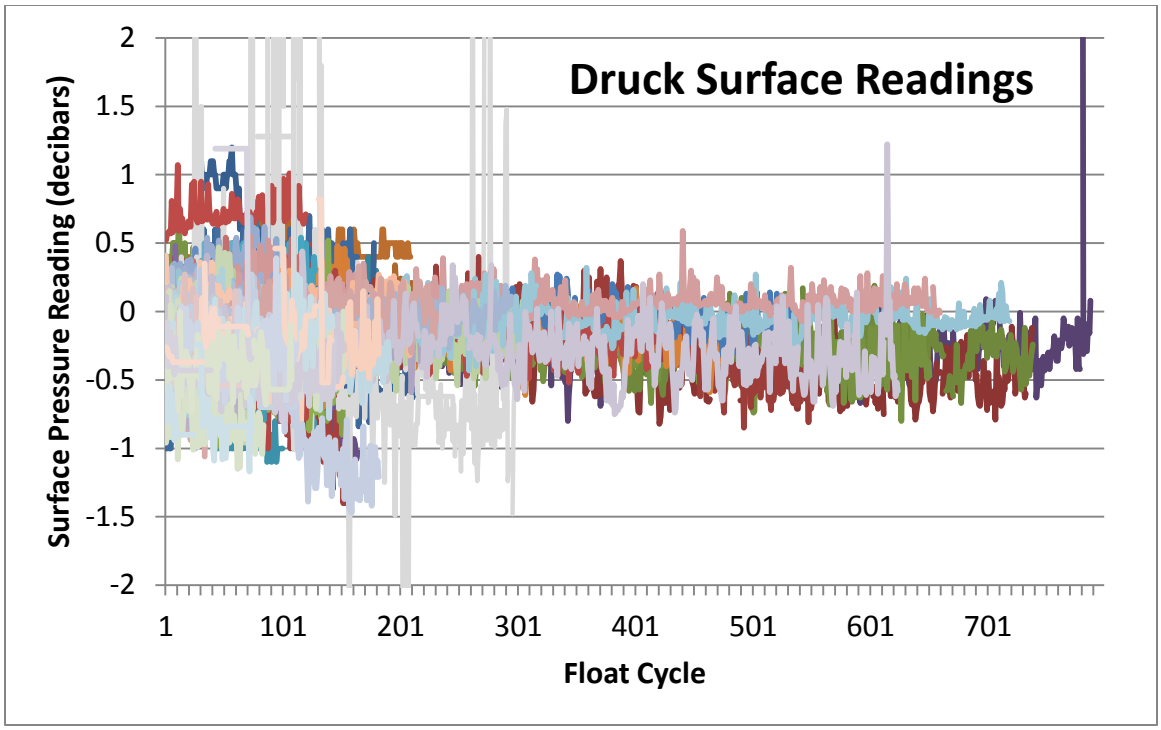

Figure 1. Surface pressure readings from Druck-equipped floats

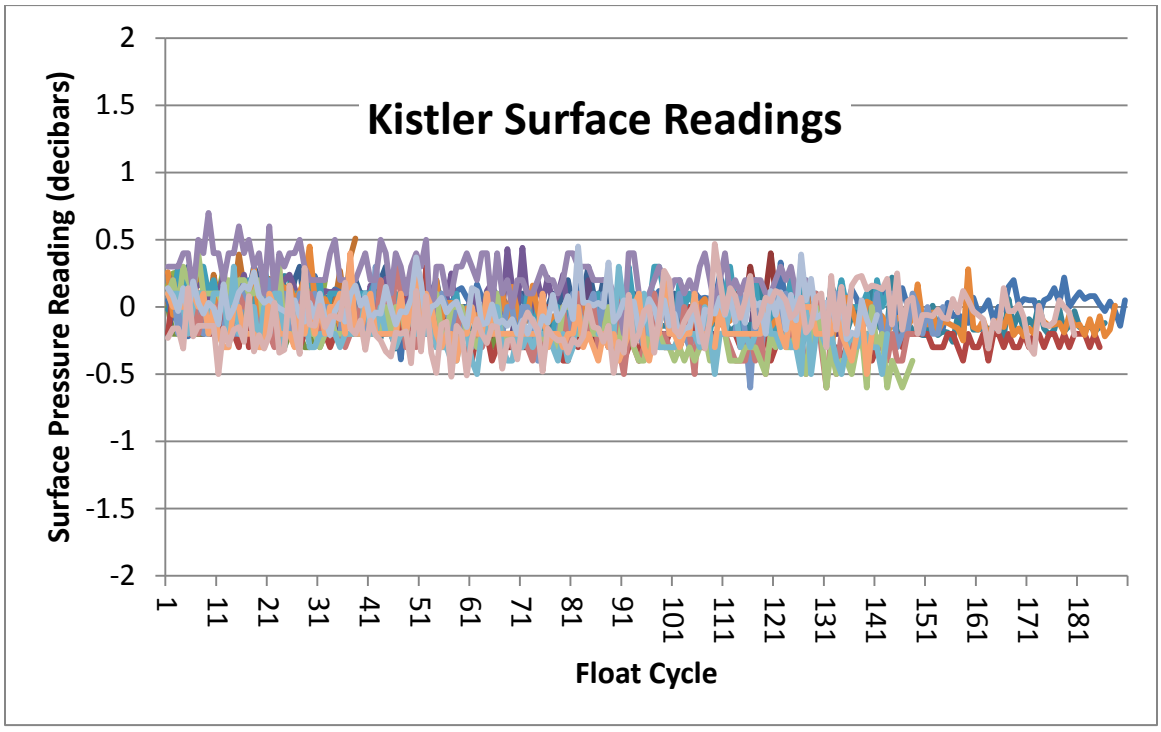

Figure 2. Surface pressure readings from Kistler-equipped floats

Figures 3 and 4 show drift assessments of each sensor type conducted at Sea-Bird as a screening process prior to building Argo CTDs. Figure 3 shows typical drift for Druck sensors; the red line is a plot of data from a rejected sensor that exhibits drift greater than +/- 0.25 decibar. Figure 4 shows Kistler sensor data collected under the same conditions. Note that the sensor data is "zeroed" after the first reading to allow subsequent data to reflect drift that is easier to interpret. Both sensor types fall within the +/-0.25 decibar acceptance criteria, the Drucks showing less spread in their long-term drift.

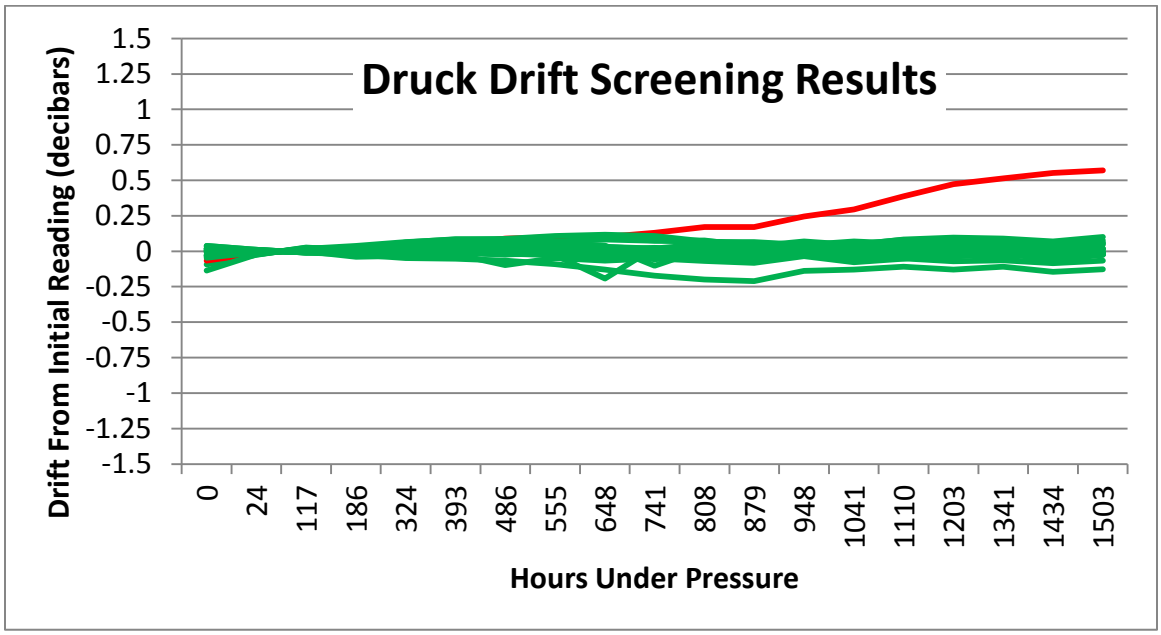

Figure 3. High-pressure screening of Druck sensors for drift

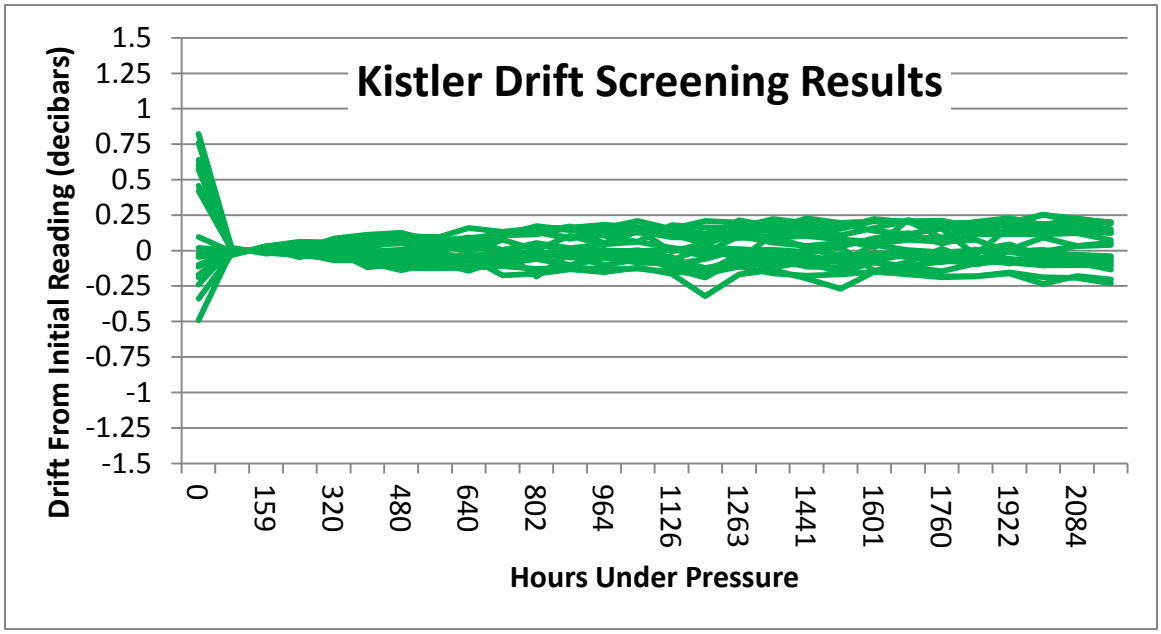

Figure 4. High-pressure screening of Kistler sensors for drift

Discussion and Conclusions

In the ocean, surface pressure measurements show that Druck and Kistler sensor are comparible in their long-term drift and short term noise performance, both showing small negative drifts in their surface pressure time series. In the laboratory, high-pressure drift accessment of both sensor types show similar long-term performance.

Overall, both sensor types are very stable in terms of drift and noise and both have performed well in field deployments. Other than 8 Druck sensors in the presented data set that exhibited unexplained surface pressure spikes, the long-term drifts are within +/- 1.5 decibars for Druck and are within +/- 0.5 decibar for Kistlers.

While Druck is committed to rebuilding their factory and continuing to manufacture the 2000 decibar sensor that is broadly used for SBE 41/41cp Argo float CTDs, there is no guarantee that they will meet their schedule for returning to production in May of 2015. Sea-Bird is confident, based on current data analysis, that Kistler sensors will perform to Argo program specifications, and recommends the acceptance of these when necessary to avoid compromising the Argo float deployment schedule.