

NOAA Pacific Marine Environmental Laboratory
Ocean Climate Stations Project

TECHNICAL NOTE 2

Data Drift in Load Cells from Load Cell Central

NOTICE

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Data Drift in Load Cells from Load Cell Central

Introduction

OCS moorings have been deployed with load cells from two manufacturers; 3PS and Load Cell Central. Each type has been problematic, with regular failures. Units from Load Cell Central have been found to be inaccurate due to unexplained drift in the readings.

Failures in the Field

A load cell drift issue was first noted in Load Cell Central unit S/N 52451, deployed at the Papa 2010 (PA005) mooring, in the North Pacific. The data below show the tensions recorded since deployment in mid-June 2010 up to mid-February 2011. The load cell tension readings increased gradually for several months after deployment. Once the readings reached a plateau, the values became more erratic, with higher standard deviations. The sea surface temperature data were checked for possible effects on the tension readings, and none were apparent.

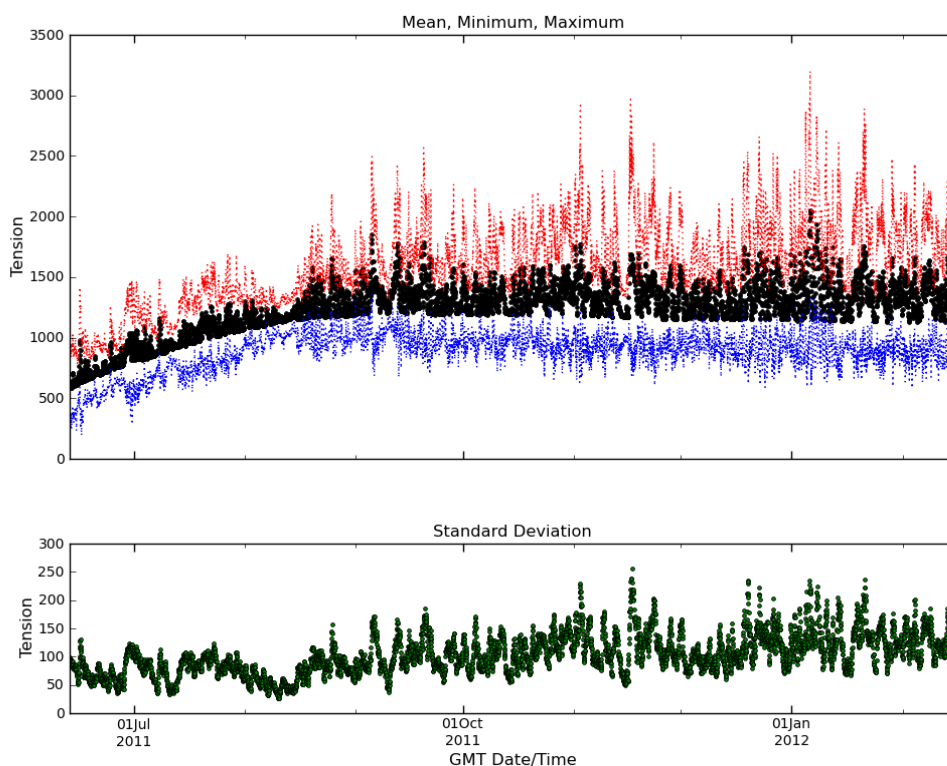


Figure 1: Output of LCC S/N 52451 deployed at Ocean Station Papa. Measurement drift occurs during first months of deployment.

The Load Cell Central unit S/N 52453 was deployed at the KEO mooring in November 2011, also in the North Pacific. It failed completely just two months into the deployment. On recovery, the cable to the load cell was found to be damaged, which was suspected as the cause of failure. However, when it was returned to the lab, the load cell was connected to a data acquisition system and tested on September 4, 2012. The output tensions remained constant, even under weight, indicating that the load cell was no longer functioning.

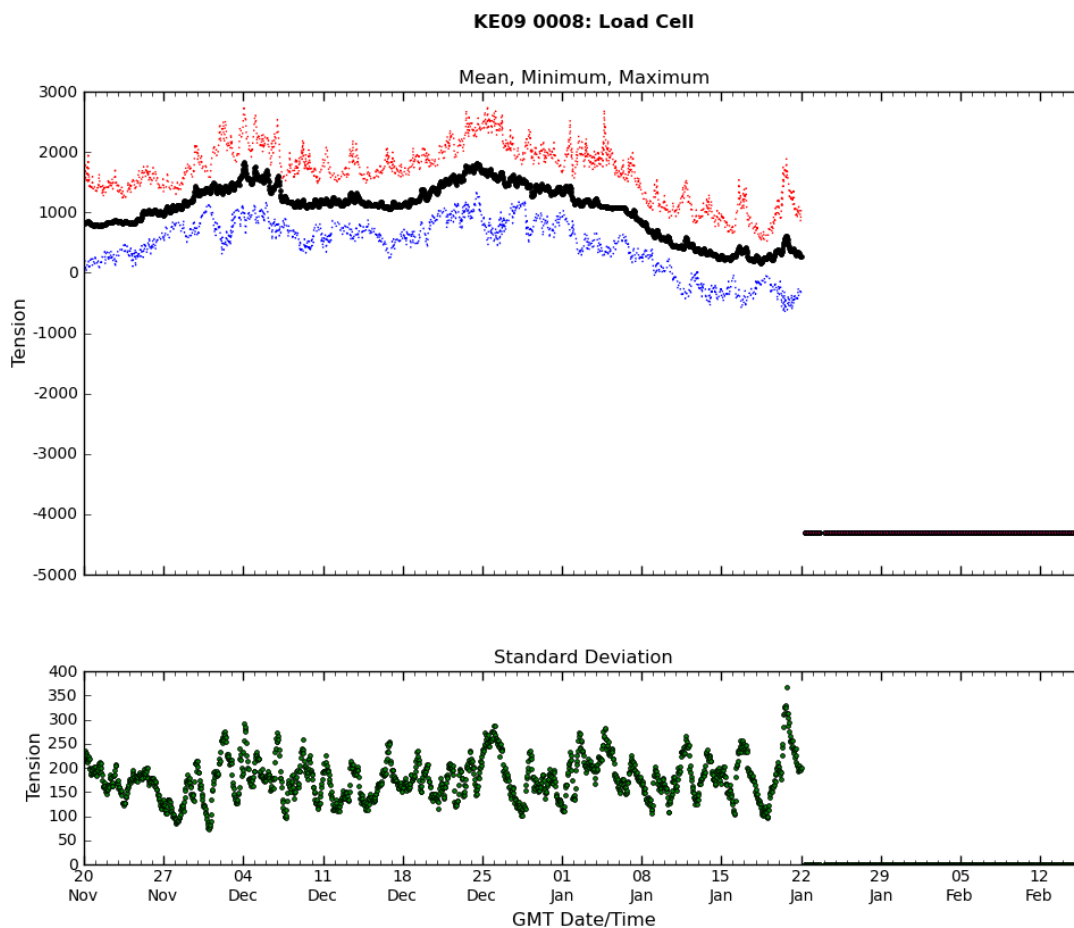


Figure 2: Failure of LCC S/N 52453 on KEO mooring.

Bench Testing

Before deploying the third LCC unit S/N 52452, it was calibrated and then suspended from a test fixture for long term testing to check for drift on January 24, 2012. The data below show the unit under a load of about 700lbs, over a period of three and a half weeks. This unit was outside, but not submerged in water. Effects of air temperature changes can be seen in the reported tensions. Air temperature data were also logged for reference.

A dramatic increase in the standard deviation began around February 4, 2012. On February 14, 2012, all pins of the load cell were grounded, in the chance that some sort of electrical charge build up was causing the measurement drift. This is marked by the vertical line in the plots.

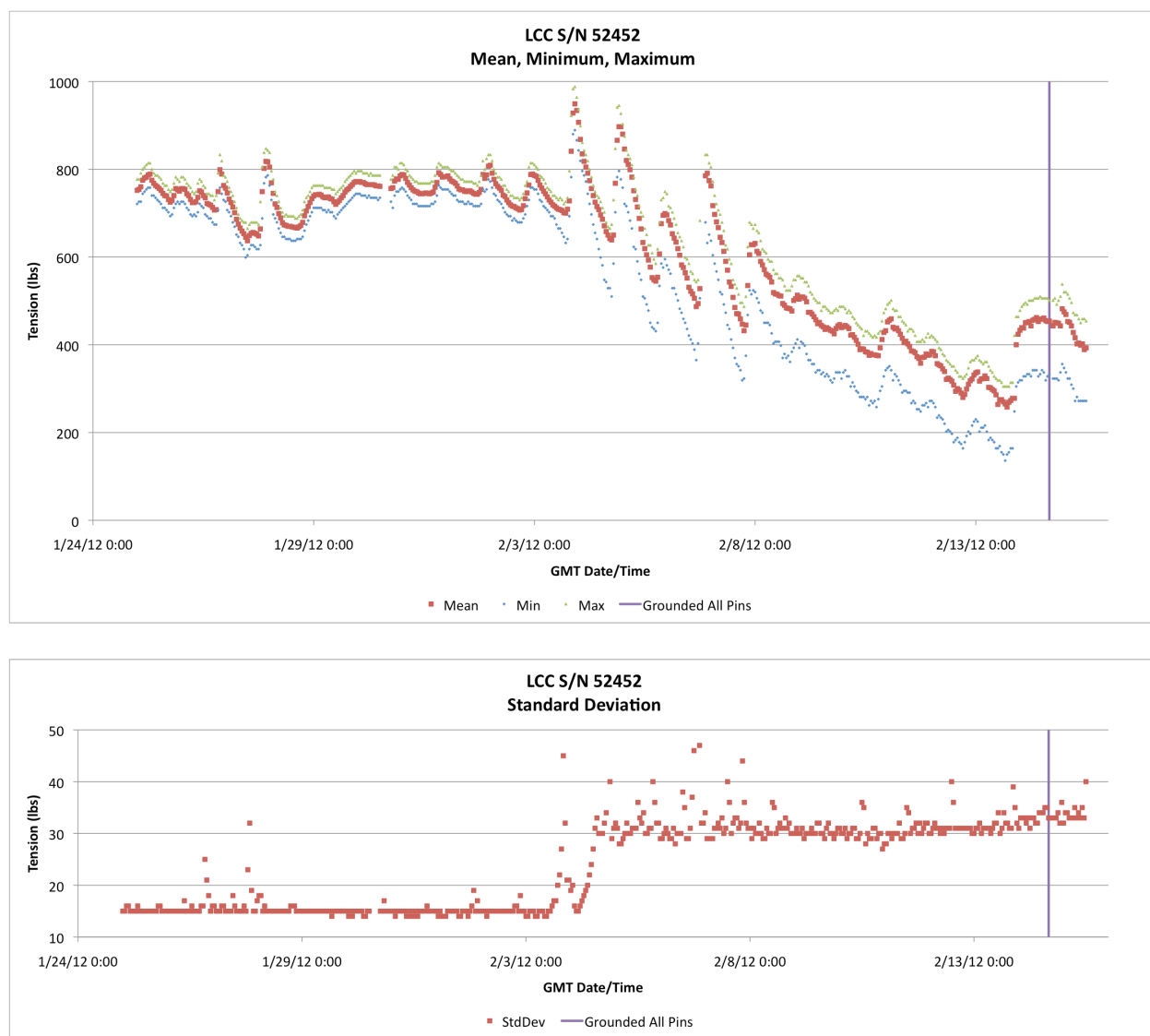


Figure 3: Reported tensions and standard deviation of LCC S/N 52452 under steady load on a test rig.

The testing was stopped, and a post calibration was performed on February 15, 2012. Drift was clearly present in the data and the calibrations. The figure below shows data from both the pre (red) and post (blue) calibrations.

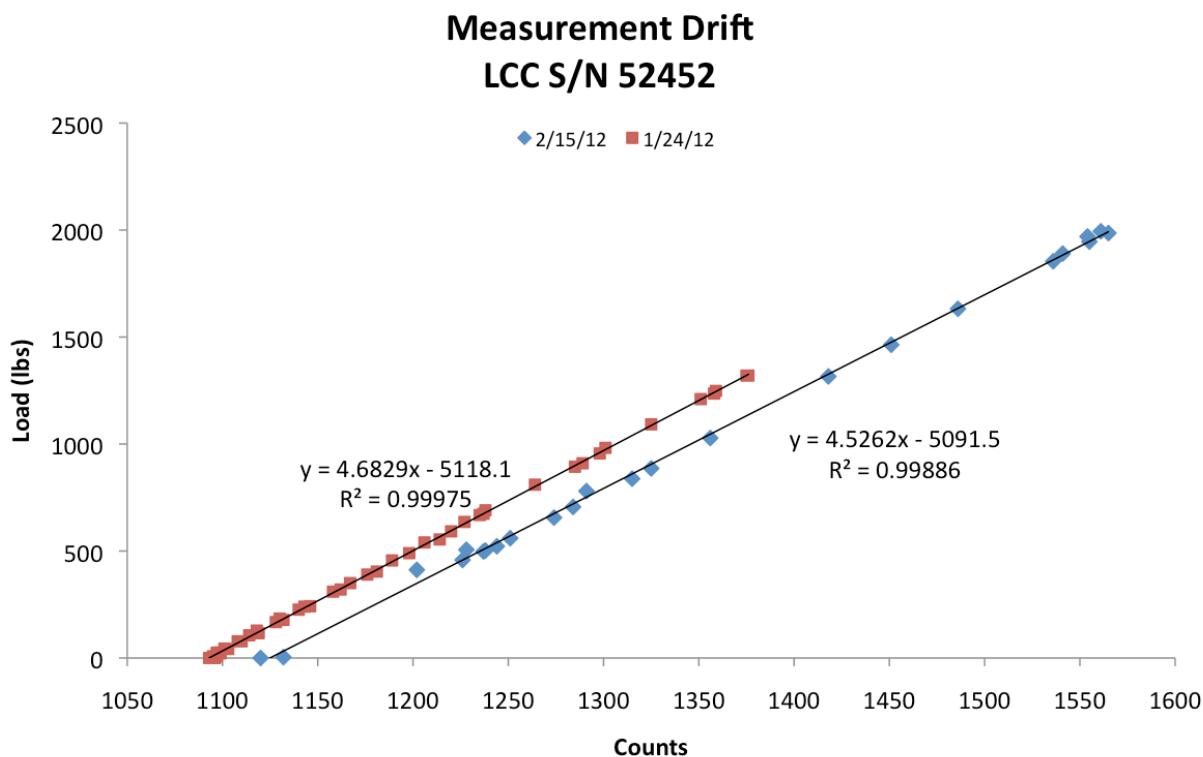


Figure 4: Pre (red) and post (blue) calibration data for LCC S/N 52452 used in bench testing.

Recommendations

Due to the unreliable tensions measurements, due to drift and early failure, it is recommended that load cells from Load Cell Central no longer be purchased or repaired for deployment on OCS moorings. If the manufacturer is able to find a solution to this problem, this decision will be reconsidered.

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