

SATURN-07 Turbidity Data QA/QC

4/13/21 - 3/1/22

OFFSET CORRECTIONS:

Prior to deployment at SATURN-07, the turbidity sensor (TB218-0653) was co-deployed at SATURN-03 along with the regular SATURN-03 sensors, allowing for comparison with the SATURN-03 turbidity sensor output. In addition, in-situ DI water was run at the station several times during this co-deployment allowing for an estimate of calibration offset. After approximately 10 months at SATURN-07, the sensor was recovered and deployed again at SATURN-03 as recovered (with fouling) and following sensor cleaning.

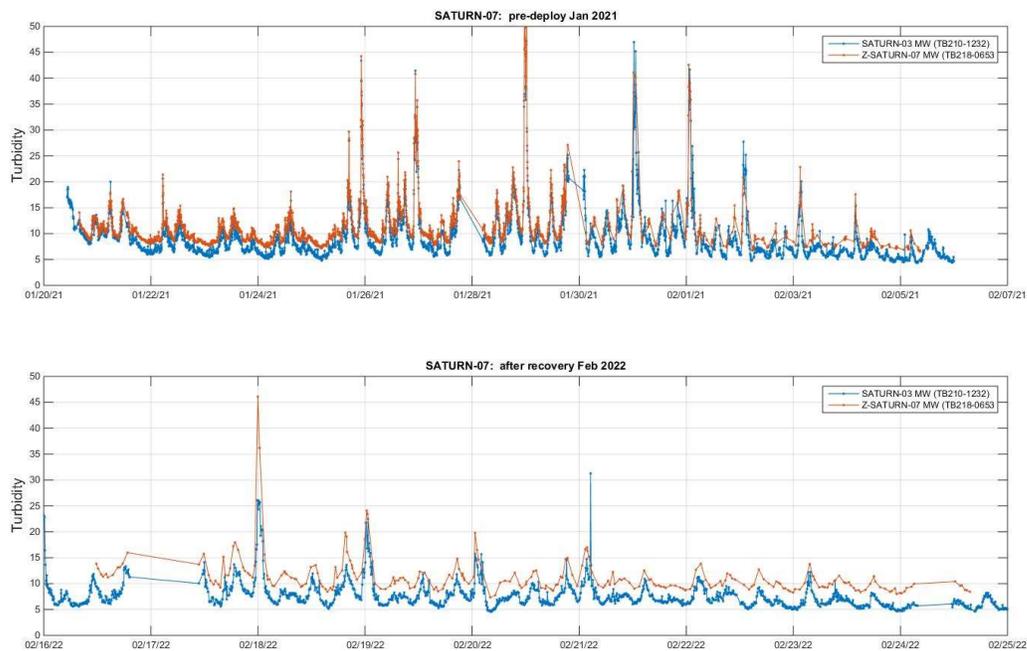


Figure 1: Co-deployment of SATURN-07 turbidity sensor at SATURN-03. Top panel: before the buoy was deployed to SATURN-07; bottom panel: following recovery after approximately 10 months of deployment on the SATURN-07 buoy.

These pre- and post-deployment evaluations show that the sensor calibration (slope of sensor response) remained stable and is compatible with that of the SATURN-03 sensor, only differing in offset. Sensor offset was determined for both the SATURN-03 and SATURN-07 sensors, based on DI-water readings. Once offset corrections were applied, the output from the two sensors were in agreement (Figure 2; Table 1).

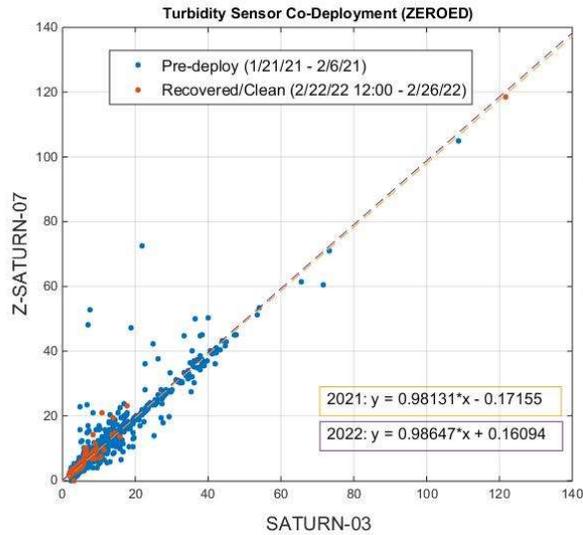


Figure 2. Turbidity data from the co-deployment of the SATURN-07 turbidity sensor at SATURN-03. These data have been corrected for an offset & drift determined by in-situ DI-water readings and detailed in Table 1.

<i>start</i>	<i>end</i>	<i>starting correction</i>	<i>ending correction</i>
4/13/2021	5/31/2021 11:00	-4.82 ntu	-4.82 ntu
5/31/2021 11:00	2/9/2022	-14.527 ntu	-24.722 ntu

Table 1. Corrections applied to SATURN-07 turbidity data to correct for baseline offset and drift, as determined by in-situ DI-water readings. An average offset of 4.82 ntu was determined by several pre-deployment DI-water measurements. After recovery, the sensor was determined to have fouled, reading 8.24 ntu in DI-water prior to cleaning. A correction for the 4.82 ntu offset was applied to the data through 5/31/21. A correction for linear drift between an offset of 14.527ntu on 5/31/21 (the point at which the sensor gain changed) and an offset of 24.722ntu upon recovery on 2/9/22 was applied to the data. These corrections are 3 times greater than the measured offsets (4.82 ntu and 8.24 ntu, respectively) in order to correct for the gain switch during this period causing the output to be 3-fold greater than it should have been (see below).

CORRECTION FOR SHIFT IN SENSOR GAIN SETTING:

Approximately 6 weeks following deployment (at 5/31/21 11:00 PST), the Turner Designs Cyclops 7 turbidity at SATURN-07 had an issue with the gain shifting from 10x to 30x, most likely due to unintended grounding wires involved in setting the instrument gain. Experience with this sensor has shown that inadvertent grounding of these wires results in a gain of 30x (rather than the typical 10x or 100x). The observed shift in data was a 3-fold increase and because of previous experience with this mid-range gain shift due to grounding we feel confident that this is likely to be the cause of the change. The data have been corrected for this 3-fold shift from the initial deployment period by applying a 0.333 correction factor to the data. The adjusted data are in-line with the data

prior to the gain-shift and have a similar relationship to data at SATURN-03 as compared to the initial data from the deployment. Because of the sensor malfunction, these corrected data have been flagged as QL3.

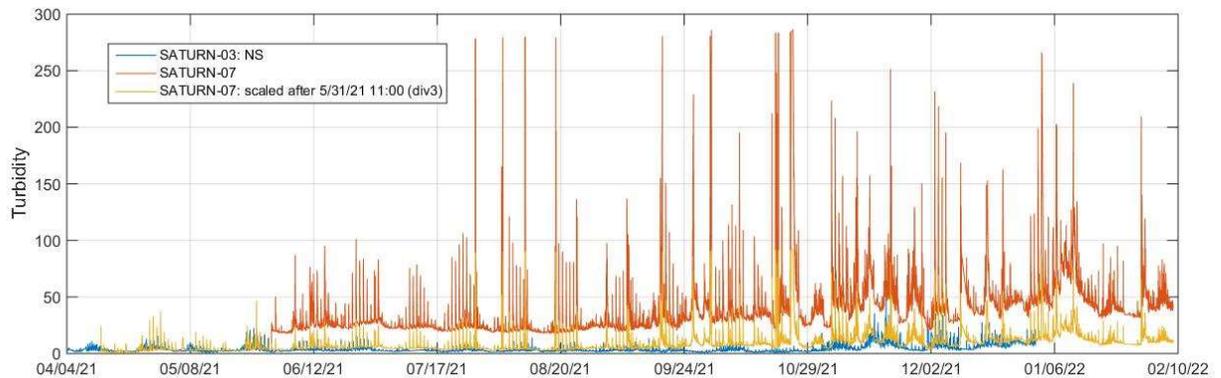


Figure 3. Raw SATURN-07 turbidity before (orange) and after (yellow) correction for sensor gain switch on 5/31/21, relative to near-surface turbidity at SATURN-03 (blue). Data were corrected for a switch from a gain of 10x to 30x by multiplying the output by a scale factor of 0.333.

CALIBRATION:

Units are relative fluorescence units (RFUs) only. No additional calibration is currently available for this sensor. However, data are directly comparable to the concurrent turbidity data at SATURN-03, as shown by co-deployment data from these sensors (see above).