

Cross-Calibration of optics data for Project SWARM

The three gliders from Project SWARM carried Wet-labs optics pucks during the experiment. UAF-507 carried FLBBCD-3948, factory calibrated in November 2014. UD-476 carried FLBB-5499, factory calibrated in February 2019. RU-32 carried FLBBCDSL-4653, factory calibrated October 2018. The optics puck on UD-476 measured chlorophyll (ug/l) and backscattering at 700nm (1/(m*sr)), while the pucks on UAF-507 and RU-32 measured color dissolved organic matter (cdom (ppb.)) in addition to chlorophyll and backscatter. Since UD-476 did not measure cdom, cdom observations were not compared between any of the gliders.

Since FLBB-5499 on UD-476 had the most recent calibration date, it was used as the cross-calibration standard for the other two gliders. However, UD-476 was not the stationary glider, like UD-134 was in Project CONVERGE, which made comparisons with the other transiting glider (UAF-507) challenging. No profiles between UD-476 and UAF-507 were within less than 1900m of each other. Therefore, UD-476 was compared to RU-32, and the corrected RU-32 data were used in the correction of UAF-507. In addition, RU-32 and UAF-507 were deep (1000m) gliders, which resulted in greater distances and times between profiles. For all comparisons, glider up-casts were compared when two profiles were within 300m of each other. The profiles compared in this analysis ranged from 77 to 265m apart. Also, profiles were between 3 and 60 minutes of each other. The compared profiles occurred throughout the experiment. Data were binned in either 1 or 5 m bins and the median of each depth bin was used in the model regressions.

UD-476:RU-32 comparison: Seven profiles were compared. Temperature and conductivity showed strong similarity. RU-32 consistently observed slightly lower temperature and conductivity in the surface (above ~100m) and slightly higher temperatures and conductivity at depth. There were significant differences between surface chlorophyll and scattering profiles. Model II regressions (Major axis regression) with data in 1m bins showed that temperature and conductivity were very close to the 1:1 line. Chlorophyll and backscatter all appeared to be overestimated by RU-32. Profiles corrected with the regression coefficients were in line with UD-476 profiles.

$$RU_{cor. chl} = (RU_{cal. chl} + 0.049)/1.26$$

$$RU_{bb700} = (RU_{cal. bb700} - 0)/1.207$$

RU-32:UAF-507 comparison: Five profiles were compared. Temperature and conductivity profiles showed strong similarity. UAF-507 observed slightly lower temperature and conductivity than RU-32, especially above 150m. UAF-507 also measured higher surface chlorophyll and overall higher backscatter than RU-32, after RU-32 was corrected using the above equations from the UD-476:RU-32 comparison. Model II regressions (Major axis regression) with data in 5m bins showed that temperature and conductivity were very similar to the 1:1 line. Chlorophyll was slightly overestimated and backscatter was very overestimated by UAF-507. Profiles corrected with the regression coefficients were in line with UD-476 profiles.

$$UAF_{cor. chl} = (UAF_{chl} - 0.006)/1.046$$

$$UAF_{cor. bb700} = (UAF_{bb700} + 0.)/0.988$$

Pierre Legendre (2013). lmodel2: Model II Regression. R package version 1.7-1. <http://CRAN.R-project.org/package=lmodel2>































































