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An evaluation of potentiometric pH sensors in coastal monitoring applications

Karen McLaughlin [1*], Nikolay P. Nezlin[1], Stephen B. Weisberg[1] Andrew G. Dickson[2], J. Ashley Booth[3], Curtis L. Cash[3], Adriano Feit[4], Joseph R. Gully[5], Scott Johnson[6,7], Ami Latker[4], Michael J. Mengel[8], George L. Robertson[8], Alex Steele[5], Laura Terriquez[8]

[1]*Southern California Coastal Water Research Project Authority, Costa Mesa, California*

[2]*Scripps Institution of Oceanography, La Jolla, California*

[3]*City of Los Angles Sanitation, Playa del Rey, California*

[4]*City of San Diego Public Utilities Department, San Diego, California*

[5]*Sanitation Districts of Los Angeles County, Carson, California*

[6]*Aquatic Bioassay and Consulting Laboratories, Inc, Ventura, California*

[7]*City of Oxnard, Oxnard, California*

[8]*Orange County Sanitation District, Fountain Valley, California*

**Corresponding author, Karen McLaughlin,* karenm@sccwrp.org

ABSTRACT

A wealth of historical coastal water pH data has been collected using potentiometric glass electrodes, but the accuracy and stability of these sensors is poorly understood. Here we compared pH measurements from five potentiometric sensors incorporated into profiling Sea-Bird instrument packages and compared them to spectrophotometric measurements on discrete bottle samples collected at two to three depths associated with each cast. Differences ranged from 20.509 to 10.479 with a mean difference of 20.055 pH units. Ninety-two percent of the measurements were within60.2 pH units, but 1% of the measurements had differences greater than 0.322. Sensor performance was affected by depth, but most of the difference was associated with calibration shortcomings. Sensor drift within a day was negligible; moreover, differences between bottle samples and electrode measurements within a sampling day were smaller than differences across days. Bootstrap analysis indicated that conducting a daily in situ calibration would reduce the mean difference to 0.002 pH units and increase the number of samples within a 0.2 pH unit error to 98%.

Full Text