

APPLICATION NOTE

Sediment Calibration of Optical Backscatter (OBS[®]) Sensors



CAMPBELL SCIENTIFIC, INC.[®]
WHEN MEASUREMENTS MATTER

Copyright (C) April 2008 Campbell Scientific, Inc.

Sediment Calibration of Optical Backscatter (OBS[®]) Sensors

This application note discusses the preparation of sediment for the calibration of optical backscatter (OBS[®]) sensors. Wet and dry sediment samples are mentioned.

Wet Samples

The best way to calibrate an OBS sensor for measuring suspended solids concentration (SSC) is to take water samples immediately adjacent to the sensor and develop a numerical relationship between the signals and the SSC values of the samples. Many OBS users do this and examples are shown in Figure 1. In some situations, however, these calibrations are impractical because of limited access, remote operations, or lack of personnel. An alternative approach is to calibrate an OBS sensor in a sediment suspender using dry, disaggregated material.

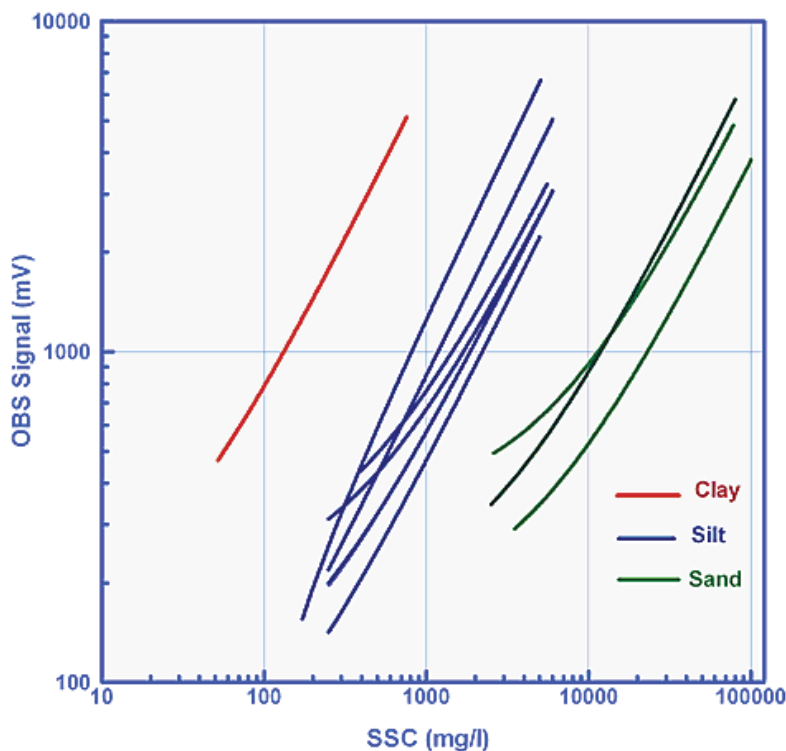


Figure 1. Graph shows the calibrations for sand, silt, and clay. The best way to calibrate the sensor is to take water samples immediately adjacent to the sensor.

Dry Samples

Sediment preparation does have a large effect on OBS calibrations when the OBS sensor is calibrated in a sediment suspender using dry, disaggregated material. Use of dry sediment works very well for non-cohesive sediment like beach sand and glacial sediments because the particles do not stick to one another and water can be accurately weighed. The dry sediment is also easy to handle.

For cohesive sediment, the material must be disaggregated by severe methods such as ultrasonic treatments, grinding, and sieving to reduce brick-like material to powder. Disaggregation (i.e., breaking up sediment clumps) makes small particles out of bigger ones, and in the process, causes the sediment to become finer grained than it was in the environment. Consequently, the treatment can give an invalid representation of how the OBS sensor will respond in the environment. So when using disaggregated sediment, be aware that the indicated OBS sensitivity can be higher than it would be if the sensor was calibrated by the preferred in situ method. Figure 2 shows how the disaggregation methods influence the turbidity indicated for the sample.

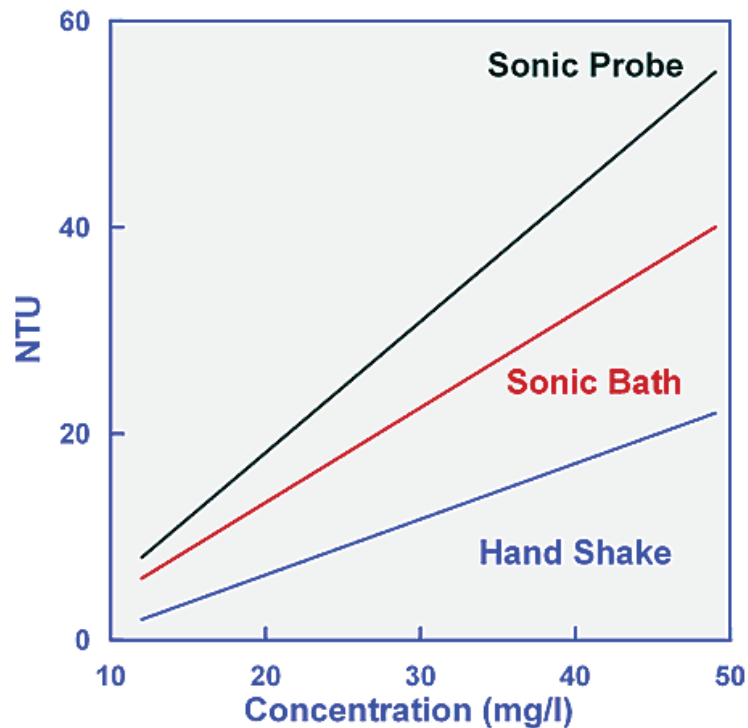


Figure 2. As this graph shows, the method of disaggregation can influence the turbidity measurements.

Sediments susceptible to disaggregation effects include:

1. organic-rich estuarine mud
2. cohesive and flocculated suspended matter
3. clay-rich sediment

References

- Gippel, C.J and J. Dawson. 1989. The Use of Turbidimeters in Suspended Sediment Research. *Hydrobiologia*. 176/177, pp. 465-480.
- Sternberg, R.W. & R. Johnson. 1986. An Instrument System for Monitoring & Sampling Suspended Sediment in the Benthic Boundary Layer. *Marine Geology*. Vol. 71, pp. 187-199.