Studying how flocculation affects acoustic reflection

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In inland estuaries and shallow coastal waters, small particles of organic matter, such as organic waste and debris or bacteria, clump together to form an aggregate known as floc. Flocculated particles can span a range of sizes, from a few micrometers to a few millimeters, and the properties and concentration of floc have a strong influence on water quality. To infer the properties of floc particles, researchers have proposed using acoustic backscatter measurements, a common technique for estimating sediment concentrations. To do so, however, requires an understanding of how the properties of floc particles affect acoustic wave reflection.

To find out, MacDonald et al. conducted a series of controlled laboratory experiments studying how high-frequency acoustic waves reflect off floc particles of differing composition, density, and size. They find that floc particles reflect acoustic signals differently from particles of the component organic material alone. The reflected signal depends on the base material, but also on the degree of flocculation and the size of the particle. Previous research found that as floc particles grow larger, they become less dense, so that very large floc has nearly the same density as the surrounding liquid. The authors suggest that the flocculation process itself alters the particle's reflection profile.

The authors' study explores how acoustic waves scatter off floc particles and details how sound can be used to study floc. They find that theoretical models using conventional scattering assumptions were capable of only partially describing the observed scattering properties. They suggest that future models should better align with the observed

scattering characteristics, therefore allowing acoustic observations to be used to routinely measure sediment properties in flocculating marine environments.

More information: Acoustic scattering from a suspension of flocculated sediments *Journal of Geophysical Research-Oceans*, doi:10.1002/jgrc.20197, 2013 onlinelibrary.wiley.com/doi/10 … /jgrc.20197/abstract

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