Scattering by two spheres: Theory and experiment

Extensive studies of scattering of acoustical signals by targets of different regular shapes have formed a useful background for attempts to develop procedures for remote monitoring of suspended materials in marine environments as, for instance, measurements of characteristic parameters of suspended sediments. The scattering properties of single regular-shaped particles have been studied in depth by several authors in the past. However, single particle scattering cannot explain all features of scattering by suspended sediment. When the concentration of particles exceeds a certain limit, multiple particle scattering becomes important. As a first step in the investigation of mutual interactions between several particles, the acoustical scattering by two spheres has been studied theoretically and experimentally and the results are reported in this paper. The study has mainly been focused on three issues: (1) to develop a simplified theory for scattering by two elasitical spheres; (2) to measure the scattering by two spheres in a water tank, and (3) to compare the theoretical/numerical results with the measured data. A number of factors influencing multiple scattering, including the geometrical distribution of particles, their shape, size, and material properties are taken into consideration in the studies to be reported. Broadband signals were used for the experimental studies.