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Ray optics method for tracking of hydrogel particles and its applications in erosion experiments¹ STELLA WANG, North Carolina School of Science and Mathematics, YUCHEN ZHAO, ROBERT BEHRINGER, Department of Physics, Duke University — The ray optics method is a technique that creates two-dimensional projections for three-dimensional transparent objects. When a transparent sphere is placed in a fluid with a slightly lower refractive index, the ray optics method implies that the sphere will project a circle with a dark outer ring. We investigate the potential application of the ray optics method in the study of three-dimensional granular systems and erosion. The experimental setup consists of a point source, a Plexiglas box filled with hydrogels and deionized water. We subject the hydrogels to a shear stress that is induced by stirring the top of the water. We verify that the ray optics method accurately displays the position of the hydrogels even when they are entrained in fluid flow. Our experiments demonstrate that ray optics can be used as an inexpensive method to find bed height and track particle positions and velocities over time.

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