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**Rolling and sliding motion of spheres propagating down inclined planes in still water**[1] YI HUI TEE, ELLEN LONGMIRE, Aerospace Engineering and Mechanics Department, University of Minnesota — In modelling the motion of spheres submerged in liquid, gravity, drag, lift, and added mass forces have to be taken into account. For spheres contacting bounding surfaces, friction coefficients due to rolling and sliding increase the complexity of the model. In this study, experiments are conducted to investigate the effects of particle density and diameter on the rolling and sliding motion of spheres. Spherical particles with marked surfaces are released from rest on an inclined glass plate in still water at various inclination angles and allowed to accelerate. A 45° mirror mounted beneath the plate allows simultaneous capture of both longitudinal and spanwise motions of the sphere. Based on sequences obtained by high speed imaging, the translational and rotational velocities are determined. Particle Reynolds numbers at terminal velocity range from 400 to 2500 corresponding with Galileo numbers of 800 to 2800. By comparing the translational and rotational velocities, the occurrence of sliding motion can be identified. The onset of sliding motion is then determined as a function of inclination angle and Galileo number for multiple particle materials. The experimental results are also compared against the existing models from the literature.

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Ellen Longmire
Aerospace Engineering and Mechanics Department, University of Minnesota

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