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The Effect of Maxwell Slip on Gravitational Collisions of Viscous Drops MICHAEL ROTHER, University of Minnesota Duluth — When the gap between two spherical particles or liquid drops is comparable to the mean free path of surrounding fluid molecules, Stokes theory for the motion of the matrix fluid is no longer adequate. Use of the Maxwell slip approximation in this region shows that the resistance between two approaching surfaces decreases and that collision is possible, even for two solid particles. An important application of slip flow theory is to raindrop growth, where the mean free path of the air molecules is approximately 0.1 μm. Previous study of water drops in the atmosphere has treated small drops as solid spheres. In the current work, relative trajectories are calculated for two spherical liquid drops with exact methods for determining the hydrodynamic forces at finite Stokes number and low Reynolds number in gravitational flow. These constraints are met for drops between 10 and 30 μm in radius. In close approach, lubrication and attractive molecular forces are considered. In addition, Maxwell slip effects are determined exactly for motion along the drops' line of centers by bispherical coordinate techniques. Collision efficiencies for liquid drops, including Maxwell slip with allowance for internal circulation in the drops, are compared to those for solid spheres.

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