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The Effect of Droplet Inertia on Combined Gravitational and Thermocapillary Interactions of Contaminated Spherical Drops MICHAEL ROTHER, University of Minnesota Duluth — The motion of two spherical drops under the influence of gravity and a vertical temperature gradient in the presence of bulk insoluble, nonionic surfactant is considered in the limit of an incompressible surfactant film. In this limit the surfactant coverage is nearly uniform. Thermal convection is negligible, and flow conditions are such that droplet inertia is important, while inertia due to the surrounding matrix fluid can be neglected. In terms of dimensionless parameters, these conditions imply that the Stokes number may be order unity or larger, while the Reynolds number remains small. Physically, such conditions generally mean that the density of the surrounding fluid is much less than the drop density and that the drop radii are typically in the range of 5 to 50 micrometers. In the case where both the Stokes and Reynolds numbers are small, closed and retrograde trajectories are observed. The effect of droplet inertia is to destroy symmetry in the trajectories and reduce the collision-forbidden region of the parameter space. Van der Waals forces are also taken into account. A practical application of this research is in the study of raindrop growth, where the collision efficiencies fall between those for clean drops and solid spheres.

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