## Toward faster and more accurate hydrodynamic dropletdroplet interactions

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Our Cloud Physics "Peta-Apps" project is a multifaceted, multidisciplinary attempt to advance our understanding of meso-scale clouds through peta-scale computation. Major advances will require progress on multiple fronts encompassing modeling, analysis, algorithms, software architecture and computational hardware. This presentation will focus on our modeling, analytical and algorithmic efforts. Fundamentally, cloud simulation requires the rapid evaluation of Stokeslet velocities in a turbulent background flow. Our efforts to accelerate the droplet velocity calculation has centered on the preconditioned GMRes algorithm. We will present theoretical bounds for the accuracy and stability of the method, and prospects for dealing with regimes when the Krylov space methods will not converge. Finally, we will discuss our most recent results in this direction and outline future algorithmic directions toward peta-scale computing of meso-scale clouds.

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