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Particle simulations with Stokeslet and Stresslet kernels

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Smoothed particle methods in applied mechanics and in hydrodynamics (SPAM and SPH) are commonly employed in fluid and solid mechanics. In this work I explore how a similar formulation but with a different particles kernel enables solving problems such as RT-instability and convection in non-homogenous media. The innovation of this work is based on the observation that BEM is in fact a particle approach, in which the particle kernels are described by the anisotropic field due to the integral of a Green function on a panel. The new kernels are based on Stokeslets and Stresslets, and their integrals on panels (common name for Boundary Integral Elements in BIEM simulations). Classically SPAM and SPH cannot be applied to problems that treat sharp surfaces or interfaces and to materials under tension. I introduce Stokeslets and Stresslets as efficient kernels for pure "particle" or "particle in panels" simulations to show how they can simulate such sharp interfaces. This approach presents fundamental advantages compared to SPAM and SPH, because of the combination of different kernels in one simulation, which allows solving non-homogenous Stokes flow. I show how this approach allows advances in modelling sharp surfaces and interfaces, and suggest how it can be applied to fundamental problems in geophysical fluid-dynamics.