EGU21-4576
https://doi.org/10.5194/egusphere-egu21-4576
EGU General Assembly 2021

Particle-Resolved Direct Numerical Simulations of Clay Particles in the Absence of Gravity.

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Flocculation processes of clay particles are usually influenced by settling effects due to gravity. This inhibits the investigation of the effects of cohesive forces in isolation and limits our understanding of flocculation processes over long time scales that are more common in aquatic environments. To address this issue, particle-resolved Direct Numerical Simulations (pr-DNS) are conducted to simulate the flocculation processes of a preceding campaign of microgravity experiments that have been performed onboard the International Space Station (ISS). The experiments with clay suspensions of kaolin (8 ppt) in saline water (35 PSU) have been examined in the absence of gravity over a time period of more than 100 days by taking pictures of the suspension at regular time intervals. The results of the image analysis are used to validate the numerical computation of clay aggregate growth over time. The simulations are based on a numerical cohesion model which includes the fluid-particle interaction via the Immersed Boundary Method (IBM) by geometrically resolving the flow field around the suspended particles. To this end, monodisperse spherical primary particles *w*ere randomly placed in a triple-periodic box and exposed to an oscillatory flow. This oscillation is used to mimic the jitering motion of the ISS, which may be caused by onboard instruments as well as the drive-line technology. In this talk, we will present the results of these simulations and link them to the observations provided by the microgravity experimtents.