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# Log-normal Approximation of Floc Size Distribution for Advection in Size-resolved Sediment Transport Modeling

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The transport of cohesive sediments in estuaries and coastal oceans can be simulated by coupling flocculation models with circulation models. Since size-resolved flocculation models allow the dynamic evolution of floc size distribution, these types of models can well characterize the transport and fate of cohesive sediments in water columns. However, due to the addition of tens of floc variables, the computational cost of these types of models is extremely high and has limited their application in real environments.

To improve the calculation efficiency, we proposed an efficient and accurate method for the representation of floc size distributions (FSD) in sediment transport models. A log-normal approximation of the floc size distribution is obtained by fitting the FSD with three parameters: the total mass concentration , the medium floc size  and the standard deviation parameter . The approximation is used for advection in circulation models. Instead of advection of floc concentration in each size bin, the  and the  are advected. After the advection is done, the FSD on each grid is obtained from the new and  as well as the constant .

Applications of the method in simulations of cohesive sediment transport in an idealized estuary for aggregation, breakup, gravitational settling and tidal mixing are described. The results are compared to results from the same simulation but without the log-normal approximation. According to these comparisons, the new method can improve the calculation efficiency by about 50%, and the differences are less than 10%. So the method has a great potential to be applied in size-resolved cohesive sediment transport modeling.