

Abstract Submitted  
for the DFD17 Meeting of  
The American Physical Society

**The fluid dynamics of deep-sea mining** THOMAS PEACOCK, ANDREW RZEZNIK, MIT — With vast mineral deposits on the ocean floor, deep-sea nodule mining operations are expected to commence in the next decade. Among several fundamental fluid dynamics problems, this could involve plans for dewatering plumes to be released into the water column by surface processing vessels. To study this scenario, we consider the effects of non-uniform, realistic stratifications on forced compressible plumes with finite initial size. The classical plume model is developed to take into account the influence of thermal conduction through the dewatering pipe and also compressibility effects, for which a dimensionless number is introduced to determine their importance compared to the background stratification. Among other things, our results show that small-scale features of a realistic stratification can have a large effect on plume dynamics compared to smoothed profiles and that for any given set of environmental parameters there is a discharge flow rate that minimizes the plume vertical extent. Our findings are put in the context of nodule mining plumes for which the rapid and efficient re-sedimentation of waste material has important environmental consequences.

Thomas Peacock  
MIT

Date submitted: 01 Aug 2017

Electronic form version 1.4