2次元降下堆積モデルにおける堆積物GSDの層序変化に対する風の影響

The influence of the downwind on the stratigraphic GSD variation in the 2D fall and sedimentation model

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The stratigraphic variation of grain-size distribution (GSD) in pyroclastic fall deposit indicates the temporal variation of GSD of settling particles, and may reflect the temporal variation of the eruption. The temporal variation of eruption, especially the temporal variation of the source GSD, affect the temporal and spatial variations of GSD in the umbrella cloud. In order to relate the stratigraphic variation of GSD to the temporal variation of source GSD, it is necessary to take into account the fractionation process from the umbrella cloud and the transportation process of ejected particles.
We developed two-dimensional fall and sedimentation (2DFS) model in order to relate the temporal variations of GSDs between the source and the sediment. Our model deals with the influence of the fractionation from an umbrella cloud and the advective transportation caused by the downwind on the sediment GSD. In this study, we assess the influence of the downwind velocity on the sediment GSD and thickness as functions of stratigraphic height and distance from the source vent by numerically calculating the analytical representation.
As a result, in the same particle size at the same distance from the source vent, the number of particles of sediment in the 2DFS model with downwind is larger than that one without downwind due to the effective shortening of fractionation times. This difference in the particle number affects the thickness of sediment. Similarly, travel time of particles, which settle at a certain distance from the source vent, with downwind is shorter than that one without downwind.
Without downwind, the order of settling particles is from the largest particles to the finer particles resulting in the normal grading structure. However, with downwind, it is possible to settle from the finer particles than the largest particles due to the dominancy of advective lateral transportation by downwind rather than by sedimentation with size sorting. This suggests that the reverse grading structure of the pyroclastic fall deposit may result from the downwind effect.

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