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AN: **V41E-2328** ***Poster***
TI: Coupling gravity current and advection-diffusion models in tephra sedimentation analysis
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AB: Recent explosive eruptions (e.g. Chaiten in 2008 and more remarkably Eyjafjallajökull in 2010) have exposed the vulnerability of society, and particularly aircraft operations, to volcanic ash. These events emphasized the need for a better understanding through development of numerical models of tephra dispersal and sedimentation. Tephra deposits result from sedimentation from both the margins of the rising plume and from the base of the wind-advected umbrella cloud. These sedimentation processes are mainly governed by the terminal settling velocity volcanic particles and the wind field. There are at least two approaches to simulate these features of tephra dispersal and deposition: gravity current and advection-diffusion models. In this study we compare the results of these two models and attempt to develop a coupled model. We have applied a gravity current model to the BF2 layer from the 2450 BP Plinian eruption of Pululagua and compared this to the published results for the advection-diffusion model (i.e. Tephra2). We found that the gravity current model generates similar eruption parameters results (e.g. column height of ≈25\,km a.s.l.) to those from an inversion procedure coupled with the Tephra2 advection-diffusion model. Similarly, we applied the inversion technique coupled with Tephra2 to the 1991 tephra deposit from the Plinian eruption of Pinatubo, finding total masses for both the C1 and C2 layers that are comparable with published results (i.e. 1×10^{12}\,kg and 1.5×10^{12}\,kg, respectively). We also confirmed that the advection-diffusion model (based on total deposit thickness) is not very sensitive to the column height compared to the gravity current model, and that large diffusion coefficients are necessary to model proximal fallout data accurately. In order to better describe tephra deposits, we coupled the gravity current model and the advection-diffusion model described above. The gravity current model is used for proximal tephra locations, where the physics of the advection-diffusion model falls short, while an advection-diffusion approach is used for medial/distal areas, where the gravity current model in turn has deficiencies. The main uncertainty with this approach is fixing the position (i.e. distance from the vent) where the transition from one model to the other takes place.
DE: [8400] VOLCANOLOGY
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