Effects of complex plume morphology on tephra dispersion modeling in ATHAM 3D

Shannon EK Nawotniak[1], Marcus I Bursik[2]

[1]Idaho State University, USA, [2]University at Buffalo, USA

E-mail: kobsshan@isu.edu

Ambient wind conditions play a critical role in plume morphology and, therefore, tephra dispersion. Models for tephra dispersion and deposit inversion have historically been required to simplify wind-plume interactions in order to accommodate computational expense; the Active Tracer High-resolution Atmospheric Model (ATHAM) takes advantage of cluster computing to calculate 3D wind-plume interaction using the Navier-Stokes equations with a Lagrangian Eddy Simulation turbulence closure. With the inclusion of a large pyroclast dispersion module, it is possible to use ATHAM to model tephra deposition from complex plume morphologies, including bent plumes resulting from strong ambient winds. Strong low-elevation windshear or interaction with the jetstream produce markedly different plume morphologies and mass loading in the atmosphere. The resulting deposition patterns reflect the increased plume complexity and influence of lateral sorting of equal-mass pyroclasts, a consequence of differing drag effects from horizontal flow exacerbated by the wind-plume interaction.