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Volcanic ash modeling with the online NMMB/BSC-ASH-v1.0: A novel multiscale meteorological model for operational forecast

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Volcanic ash forecast became a research priority and a social concern as a consequence of the severe air-traffic disruptions caused by the eruptions of Eyjafjallajökull (Iceland, 2010) and Cordón Caulle (Chile, 2011) volcanoes. Significant progress has taken place in the aftermath of these dramatic events to improve the accuracy of Volcanic Ash Transport and Dispersal (VATD) models and lessen its associated uncertainties. Various levels of uncertainties affect both the quantification of the source term and the driving meteorological inputs. Substantial research is being performed to reduce and quantify epistemic and aleatoric uncertainties affecting the source term. However, uncertainties arising from the driving NWPMs and its coupling offline with the VATDMs have received little attention, even if the experience from other communities (e.g. air quality) highlights the importance of coupling online dispersal and meteorological modeling. Consequently, the need for integrated predictions to represent these two-way feedback effects of the volcanic pollutants on local-scale meteorology is timely.
The aim of this talk is to present the NMMB/BSC-ASH, a new on-line multi-scale meteorological model to simulate the emission, transport and deposition of tephra particles released from volcanic eruptions. The model builds on the NMMB/BSC Chemical Transport Model (NMMB/BSC-CTM), which we have modified to account for the specifics of volcanic particles. The final objective in developing the NMMB/BSC-ASH model is two-fold. On one hand, at a research level, we aim at studying the differences between the online/offline approaches and quantify the two-way feedback effect of dense volcanic ash clouds on the radiative budget and regional meteorology. On the other hand, at an operational level, the low computational cost of the NMMB dynamic core suggests that NMMB/BSC-ASH could be applied in a future for more accurate online operational forecasting of volcanic ash clouds.