Geophysical Research Abstracts
Vol. 21, EGU2019-5353, 2019
EGU General Assembly 2019

Using WRF-Chem & PLUMERIA as forecasting tools for Aviation Planning during Volcanic Eruptions

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The impact of volcanic eruptions on the aviation sector constitutes a major problem that needs to be addressed. Thus, the improvement of ash detection in relevant flight levels using an operational tool based is being developed. The tool comprises of two models: WRF-Chem and PLUMERIA. WRF-Chem (Weather Research and Forecasting model with coupled Chemistry) simulates the emission, transport, transformation and sedimentations of aerosols, including those released by volcanic eruptions. PLUMERIA is a one-dimensional steady-state volcanic plume model which explicitly calculates the Emission Source Parameters (ESPs). The objective of this study is to incorporate PLUMERIA-derived ESPs into WRF-Chem; improving the current WRF-Chem system of tabulated ESPs. Further, the results of the coupled model will be validated using state-of-the-art remotely sensed satellite data. The coupling of PLUMERIA and WRF-Chem would result in a more detailed and realistic ash dispersion forecast; the need for such models was highlighted after the 2010 Eyjafjallajökull eruption, that shut down part of the European airspace, costing € billion to the economy. Thus, the demand to improve the management of volcanic eruptions in the context of civil aviation, increased. Since then, there have been advances in research in terms of calculating ESPs and remote sensing, but this study addresses the need for an operational advanced ash forecasting model that discriminates ash into different flight levels, providing, in a useful way, the visualization of safe and non-safe flight zones for pilots.