VO-TCS Report on Quality and Assurance

V1.0

For the "Daily volcanic ash/gas forecasting maps for selected Icelandic volcanoes" service

Quality assurance (data content)

Since November 2018 a public web site has been created to allow the general public to access the daily forecast of tephra and volcanic SO2 dispersal originating from Icelandic volcanoes. The simulations are performed daily even when eruptions are not on-going. In this case the simulations are labelled as hypothetical and they do not imply that an eruption is occurring somewhere. When an eruption starts a new simulation is initialized by using the observations available, like for example the plume height assessed by the radar network; the exact eruption location assessed by direct observations, seismicity and infrasound; the amount of SO2 released assessed by the DOAS network. Currently, the system uses to different software for the forecasting of tephra (NAME) and for the forecasting of volcanic gas (CALPUFF). The results are available at the following link: dispersion.vedur.is

Quality check:

Both numerical models used by the Icelandic Meteorological Office to simulate the atmospheric dispersal of tephra and gas have been validated and tested against several real events.

- The NAME model is used as default for the simulation of tephra dispersal and deposition in the IMO's daily forecasting system. It has been developed by the UK meteorological Office and it is the current numerical model adopted by London VAAC for the forecasting of volcanic ash cloud transport in atmosphere (https://www.metoffice.gov.uk/services/transport/aviation/regulated/vaac/index). A wide literature exists for NAME as this model is constantly improved, verified and developed. A community worldwide uses it as a reference model for atmospheric transport.
    - BECKETT, Frances M., et al. Atmospheric dispersion modelling at the London VAAC: A review of developments since the 2010 Eyjafjallajökull volcano ash cloud. Atmosphere, 2020, 11.4: 352.
- The CALPUFF model is a software developed for air-quality purposes in the late 1980's. It is currently provided by a private company at the link src.com and is open-source. It uses a 3D meteorological field to transport the material released in the atmosphere and tracks the pollutant as a series of puffs.
    - BARSOTTI, Sara. Probabilistic hazard maps for operational use: the case of SO2 air pollution during the Holuhraun eruption (Bárðarbunga, Iceland) in 2014–2015. Bulletin of Volcanology, 2020, 82.7: 1-15.

It is worth mentioning that the quality and accuracy of the forecasts strongly depend on the input data used to characterize the eruption of interest. In this sense, hypothetical scenarios are built on historical data and eruptions monitored in the past, whereas in real case the monitoring network, operated by the

IMO, should provide data to initialize the numerical model. Accuracy of the forecasts will therefore depend on availability of data and frequency of acquisition.

A user's guide is accessible at: https://cdn.vedur.is/dispersion/User_Guide_for_dispersion_system.pdf

It provides an overview on the forecasting system, the graphical user interface and the data used to initialize the model for the hypothetical scenarios.