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Role of volcano observatories in a pan-European early-warning system

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International aviation is one of the most important components of modern society and yet is incredibly vulnerable to airborne hazards such as particles emitted by volcanic eruptions, dust storms, wild fires, and nuclear or industrial accidents. Whilst there are many national and international organisations who are responsible for air traffic control and ensuring safe flight paths, the aftermath of events such as the 2010 Eyjafjallajökull eruption in Iceland revealed a gap in real-time airspace monitoring and the efficient communication of that information to the relevant stakeholders such as air traffic controllers and pilots. As a result of this, the primary goal of the H2020 European Natural Airborne Disaster Information and Coordination System for Aviation (EUNADICS-AV) is “Closing the significant gap in European-wide data and information availability during airborne hazards”. The EUNADICS-AV network consists of many different partners including national meteorological offices, universities, and volcano observatories.

Two of these partners, the Iceland Meteorological Office and the Italian National Institute of Geophysics and Volcanology, maintain volcano observatories in their respective regions of Europe. In this contribution we present the role of these observatories in a pan-European early warning network. Monitoring is carried out using multispectral (from visible to infrared) images of meteorological satellites and ground-based video-surveillance cameras; optical particle counters; signals of seismic and infrasound stations that are processed in real-time; scanning lidars and ceilometers; and finally Doppler radar which is able to detect important features of the eruption column dynamics in all weather conditions. Forecasting is performed using automatic procedures that download weather forecast data from meteorological mesoscale models, run tephra dispersal models, plot hazard maps and publish them on a dedicated website. 24/7 OE-Control Room operators were able to timely inform Aviation operators through VONA messages for an effective aviation safety management. These instruments are partly operative, and partly still in development. They enhance the observation of ash plumes by providing, in quasi real-time, key parameters such as mass discharge rate (MDR) and particle size-distribution (PSD). These parameters are necessary for ash dispersal models which are able to simulate the temporal and spatial trend of the volcanic cloud and what effect it may have on air traffic.

Eruptions observed in Iceland and Italy over the past decade show a relatively large range of physical characteristics, from weak to strong plumes, with respect to the comparable size of the eruptions. This data is being used to enhance current dispersal models that will improve the management of air traffic and airport operations during future events. All this information is being made available to the H2020 EUNADICS-AV partners with the aim of closing the gap in data and information availability, enabling all stakeholders in the aviation system to obtain fast, coherent, and consistent information, minimizing the economic damage while enhancing the safety of millions of passengers.