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EFESTO- Evaluating Flight safety during volcanic Eruptions: a System to support air Traffic Operations

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The EFESTO (Evaluating Flight safety during volcanic Eruptions: a System to support air Traffic Operations) project, starting from the end-user needs and the analysis of the state-of-the-art capabilities, will investigate the potential offered by Unmanned Aircraft System (UAS1) to aid airspace management in the event of explosive volcanic eruptions. These events inject clouds of ash and corrosive gases into the atmosphere that can jeopardize the regular flow of air traffic. As a consequence, in recent decades there have been a number of efforts to provide the air traffic community with an ever improving capability to detect, assess, forecast and monitor these events.
When equipped with appropriate scientific instrumentation, UASs can be used to gather essential data that will both complement and enhance the exploitation of the information provided by existing instrumentation, such as space-based assets (e.g., SEVIRI/METEOSAT, IASI/METOP or MODIS/AQUA/TERRA/CALIPSO) and land based observation systems (e.g., EARLINET), as well as to improve the inputs that can be provided to modelling tools (e.g., UM, GFS, WRF, ECMWF ISF or COSMO-EU).
UASs enable the execution of rapid-response, remotely-controlled, on-site measurements, and are able to operate without endangering air crew or expensive aircraft in flights in potentially hazardous environments. The data that they can collect would therefore significantly enhance the current observational capabilities for characterizing this type of natural phenomena. Further, as the sampling and probing of the content of the volcanic cloud can be performed to an extent that is not achievable with current methods, the UAS employment will also enhance the amount and quality of information that can be retrieved with current space- and land-based assets.
The potential applications of UAS-based solutions are manifold, and include: monitoring and probing activities of airspace that are particularly critical for air traffic management; performing specific sampling campaigns (e.g., in order to validate model output as well as determine the level of risk in an area); and conducting sampling near to the source of the event to provide fundamental data for input to numerical forecast models.

The EFESTO project will study how such a UAS-based solution could best be used in order to validate and refine model forecasts and thus optimise and therefore minimise flight restrictions that are imposed on airports when volcanic clouds are present. EFESTO will also refine the UAS concept and provide an integrated UAS solution equipped with a wide range of scientific instruments for evaluation purposes. which will, in turn, be used to demonstrate a representative UAS deployment.
All of the above have the ultimate aim of producing a technology roadmap for an integrated monitoring capability (space, airborne and land-based) which can overcome a range of limitations in current observational methodologies.

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