Prototype for operational source term (volcanic ash, SO$_2$ and nuclear accidents) inversion modelling for aviation

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The EUNADICS-AV (European Natural Airborne Disaster Information and Coordination System for Aviation) project takes upon the ambition and important task to design a prototype demonstration system to provide consistent and coherent information to aviation authorities for a wide range of environmental disasters. Within this project, under the WP4 (Data integration and assimilation) umbrella, at the Austrian Weather and Geodynamical Service (ZAMG) an operational framework is being developed to provide timely and frequent source term updates for both nuclear accidents and volcanic emissions (ash and SO$_2$). The procedure includes running the Lagrangian particle dispersion model FLEXPART with an initial a priori source term, and combining the output together with observations (from satellite, ground-based, etc. sources) to obtain an a posteriori source term. The system builds upon previous work developed in the VAST (vast.nilu.no) project and aims at ensuring that at certain time intervals when new observational and meteorological data is available during an event, an updated source term is provided to the analysis and forecasting groups, it is therefore a dynamical inversion framework. In order to be suitable for use in an operational environment, the computational costs should be as low as possible without significantly compromising the required accuracy. Reaching such balance has required extensive sensitivity studies and nevertheless some flexibility has to be allowed to adapt to the very different nature of the events and, variations within the same type of hazard (for example: volcanic eruptions that are very explosive and have a very large injection height versus those less explosive). The system is tested with the Grimsvoetn event for volcanoes and Fukushima for the nuclear accidents. Additional tests with other cases, to cover a wider range of events, are undergoing.