A Comprehensive Training Data Set for the Development of Satellite-Based Volcanic Ash Detection Algorithms

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We present a comprehensive training data set covering a large range of atmospheric conditions, including disperse volcanic ash and desert dust layers. These data sets contain all information required for the development of volcanic ash detection algorithms based on artificial neural networks, urgently needed since volcanic ash in the airspace is a major concern of aviation safety authorities. Selected parts of the data are used to train the volcanic ash detection algorithm VADUGS. They contain atmospheric and surface-related quantities as well as the corresponding simulated satellite data for the channels in the infrared spectral range of the SEVIRI instrument on board MSG-2. To get realistic results, ECMWF, IASI-based, and GEOS-Chem data are used to calculate all parameters describing the environment, whereas the software package libRadtran is used to perform radiative transfer simulations returning the brightness temperatures for each atmospheric state. As optical properties are a prerequisite for radiative simulations accounting for aerosol layers, the development also included the computation of optical properties for a set of different aerosol types from different sources. A description of the developed software and the used methods is given, besides an overview of the resulting data sets.