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the use of infrasound observations from volcanoes for improving the weather forecasts

Infrasound waves are emitted by various geophysical sources such as volcanoes, northern lights and ocean swell. In many situations, the middle-atmosphere can behave as a waveguide and infrasound can propagate up to thousands of kilometers. In such cases, infrasound signals can be recorded by stations of the International Monitoring System (IMS). Reliable simulation-based predictions of acoustical arrivals, however, need a so-called atmospheric specification, which describes the atmospheric state in terms of temperature, wind fields, and other meteorological-related variables. Such data can be obtained from products that are currently provided by the operational meteorological centers. The goal of this study is to use ray tracing simulations and observations made at the IMS stations, in terms of trace velocity and back azimuth, to select the atmospheric states that explain best the acoustical observations. Here these states are given via ensembles of short-range forecasts and analyses, using the global Numerical Weather Prediction (NWP) model ARPEGE of Météo-France, and a Bayesian approach is adopted for selecting the most likely members of the ensembles. The method is assessed using infrasound signals associated with a sequence of eruptions of Mount Etna in May 2016, and detected at the Tunisian infrasound station IS48.

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