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Passive monitoring of atmospheric dynamics using volcanic infrasound recordings

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Comprehensive observationally based atmospheric specifications in the mesosphere and lower thermosphere are presently limited to empirical models that only capture the average climatology. Many observational papers and first principles modeling work have shown that the variability of the upper atmospheric state, such as related to the atmospheric tides or planetary waves, over a specific region can be very significant. This conclusion is also supported by recent infrasound studies.

Within Atmospheric dynamics Research InfraStructure in Europe (ARISE) framework, a multi-disciplinary network of atmospheric probes has recently been established. The network includes airglow, Light Detection And Ranging (LIDAR) and infrasound measurements. Such a network will allow for future cross-comparison and validation studies. Airglow measurements allow predominantly for mesopause region temperature determinations; the LIDAR facility provides temperature measurements within the stratosphere from the upper troposphere to the lower mesosphere.

We present two case studies in which the influence of the solar tides on infrasound propagation is studied. We make use of two distinct volcanic infrasound data sets that have been recorded at infrasound arrays in the vicinity of Mount Etna, Italy (37 N) and Yasur Volcano, New Caledonia (20 S). The infrasound observables are compared to theoretical estimates obtained from propagation modeling using existing European Centre for Medium-Range Weather Forecasts (ECMWF) and Ground-2-Space (G2S) atmospheric databases.