EGU22-6803
https://doi.org/10.5194/egusphere-egu22-6803
EGU General Assembly 2022

Constraining middle and upper atmospheric variables by assimilating measurements from infrasound propagation

Javier Amezcua[1], Sven Peter Näsholm[2,3], and Ismael Vera-Rodriguez[3]
[1]University of Reading, National Centre for Earth Observation, Department of Meteorology, Reading, United Kingdom of Great Britain – England, Scotland, Wales (j.amezcuaespinosa@reading.ac.uk)
[2]University of Oslo. Oslo, Norway
[3]Norwegian Seismic Array. Kjeller, Norway

When an infrasound wave travels through the atmosphere, it is affected by the atmospheric variables it encounters (e.g. temperature and winds) in its path. When the wave is detected, the integrated effect of these variables along the trajectory of the wave affects measured quantities such as apparent velocity, backazimuth angle and travel time.

Data assimilation combines background atmospheric information with observations to get a better estimate (analysis) of atmospheric variables. In this work, we use the ensemble Kalman filter --with the 10-member ERA-5 reanalysis as background-- to assimilate integrated infrasound observations from the Hukkakero explosions detected by the ARCES array. This process helps get better estimates of atmospheric variables, specially in the stratosphere and lower mesosphere. For each explosion, this process has three steps: (i) the mapping of each of the 10 atmospheric profiles into observation space using the Infra-GA wave propagation model, (ii) the application of the filer equations in observation space, and (c) the mapping back to the space of model variables. The results of these experiments are compared to the Copernicus Artic Regional Reanalysis Service.