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Stratospheric processes as measured by collocated Lidar and infrasound measurements

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To better initialize weather forecasting systems, a key challenge is to understand stratosphere-resolving climate models. The ARISE project aims to design a novel infrastructure integrating different atmospheric observation networks to accurately recover the vertical structure of the wind and temperature from the ground to the mesosphere. This network includes Lidar and mesospheric airglow observations, complemented by continuous ground-based infrasound measurements. It will help to better describe the interaction between atmospheric layers from the ground to the mesosphere and the influence of large scale waves on the atmospheric dynamics. Systematic multi-year comparisons between Lidar soundings at several stations part of the international Network for the Detection of Atmospheric Composition Changes (NDACC) and ECMWF models are performed. Below 50 km altitude, they highlight differences as large as $\sim$20°K, more specifically during stratospheric warming events. At some sites, comparisons with collocated infrasound measurements provide additional useful integrated information about the structure of the stratospheric waveguide. We investigate possible correlation between unexpected infrasound propagation paths and unresolved atmospheric perturbations in the stratosphere. Such collocated observations from different complementary sounding techniques offer a unique opportunity to provide detailed information on upper atmospheric processes from seasonal to daily scales and study their interaction with the mean circulation.