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Atmospheric dynamics Research InfraStructure in Europe: The ARISE project

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ARISE proposes to design a new infrastructure that integrates different station networks in order to provide a new "3D" image of the atmospheric dynamics from the ground up to the mesosphere with unprecedented spatio-temporal resolution. The implied networks are:
-the International infrasound network developed for the verification of the Comprehensive nuclear Test Ban Treaty (CTBT). This system is unique by its quality for infrasound and atmospheric wave observations,
-the Network for the Detection of Atmospheric Composition Changes (NDACC) which uses Lidar to measure stratospheric dynamics,
-the Network for the Detection of Mesopause Changes (NDMC), dedicated to airglow layer measurements in the mesosphere, and additional complementary stations and satellite data.

The infrastructure extends across Europe and outlying regions, including polar and equatorial regions. Atmospheric waves play a key role in atmospheric mixing and global circulation in the stratosphere and mesosphere. Planetary waves can lead to sudden stratospheric warming while gravity waves generate predictable tropical oscillations of mean wind, which can lead to enhanced predictability of climate. Parameterization of gravity waves is needed for accurate simulation of mean climate and variability, but parameters are uncertain due to lack of long-term high-resolution observations.

ARISE expected benefits would be a better description of the atmosphere, leading to an improved accuracy in short and medium range weather forecasts. The measurements will be used to improve the parameterization of gravity waves in the stratosphere to better resolve climate models. Such description is crucial to estimate the impact of stratospheric climate forcing on the troposphere. In the long term, data will be used for monitoring changes in the occurrence of extreme events and trends in the middle atmosphere climate. The benefits also include civil applications related to monitoring of natural hazards as volcanoes.