Geophysical Research Abstracts
Vol. 21, EGU2019-4012, 2019
EGU General Assembly 2019

Cold wave of February 2018 above Europe observed by rotational Raman lidar

Alexandre Baron, Patrick Chazette, and Julien Totems

Laboratoire des Sciences du Climat et de l'Environnement, Institut Pierre Simon Laplace, CEA-CNRS-UVSQ, Université Paris-Saclay, Gif-sur-Yvette, France (alexandre.baron@lsce.ipsl.fr)

The forecast of an incoming cold wave by meteorological services in February 2018 has been the opportunity to test the new atmospheric profiling capabilities offered by the lightweight 355 nm Weather and Aerosols LIdar (WALI), over the CEA centre of Saclay, 20 km South of Paris. This lidar system, newly equipped with a rotational Raman channel, measures the thermodynamic temperature to 1°C within both the planetary boundary layer and the lower/middle free troposphere (∼5 km) with a vertical resolution of 0.1 km and a temporal resolution of 30 minutes. Such a continuous sampling allows a better apprehension of temperature variations within the troposphere linked to transient, wave or frontal phenomena. In this case study, a quasi-biennial deformation of the polar vortex perturbed the jet stream and induced in February 2018 a cold wave coming from Siberia descending to about 48°N of latitude above Europe. ECMWF ERA5 reanalyses corroborate lidar observations and help in their interpretation. The lidar system was calibrated using radiosondes from the Trappes weather station for temperature excursions between -50 and 5°C. The measurements, calibrated against local radiosondes, are associated with standard deviations in the order of 1°C or lower up to 7 km altitude (with long averages limiting measurement noise). The temperature variations related to the intrusion of cold Siberian air are significantly higher (∼10°C) than the error level of the lidar measurement. It is therefore easy to highlight this type of phenomenon via the lidar temperature profile and monitor its evolution at a high temporal resolution comparatively to radiosondes. The description of the event will be presented in parallel with the lidar measurements and a comparison to state-of-the-art of mesoscale modelling.