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Urban Climate Observatory (UCO) Berlin, Germany

Fred Meier, Achim Holtmann, Marco Otto, and Dieter Scherer

Chair of Climatology, Institute of Ecology, Technische Universität Berlin, Berlin, Germany

The Urban Climate Observatory (UCO) Berlin is an open and long-term infrastructure for integrative research on urban weather, climate, and air quality. Quality-controlled observations are carried out in order to study the interaction between atmospheric processes and urban structures, as well as climate variability and climate change in urban environments. It enables multi-scale, three-dimensional atmospheric studies integrating observational and numerical modelling methods. The UCO Berlin includes the following components:

The Urban Climate Observation Network (UCON) Berlin provides long-term observations of atmospheric variables (air temperature, relative humidity, air pressure, global radiation, wind, precipitation) in the Urban Canopy Layer (UCL) at various locations since the 1990s. Since 2015 freely available data from Netatmo weather stations in Berlin and surrounding have been systematically collected (Crowdsourcing).

The meteorological towers are located in the garden of the Institute of Ecology at Rothenburgstraße (ROTH) in Berlin-Steglitz since 2018 and on the roof of the main building of the TU Berlin at Campus Charlottenburg (TUCC) since 2014. Turbulent fluxes of sensible and latent heat as well as carbon dioxide are derived from eddy covariance (EC) systems, which combines an open-path gas analyzer and a three dimensional sonic anemometer-thermometer (IRGASON, Campbell Scientific). The EC-systems at ROTH are installed at 40 m, 30 m, 20 m, 10 m and 2 m above ground and at TUCC at 10 m above roof (56 m above ground). The down- and upwelling radiation is measured separately for short-wave and long-wave radiation (CNR4, Kipp & Zonen) at the same heights as the EC-systems. The seasonal development of vegetation is observed at both tower locations using phenocams part of the international PhenoCam (phenocam.nau.edu) network. The ROTH tower is an associate site of the European research infrastructure Integrated Carbon Observation System (ICOS) and part of the national ICOS-D network (ID: DE-Ber).

Ground-based remote sensing is used to study the urban boundary layer since 2017. The UCO Berlin operates two Doppler LiDAR systems (Streamline XR, Halo Photonics) and provide profiles of the horizontal wind speed and wind direction as well as information on atmospheric turbulence. Cloud height, cloud cover and aerosol layers are recorded with ceilometers (CHM 15k, Lufft) at sites Grunewald and TUCC, which is part of the E-Profile Network of the European meteorological services EUMETNET. The ceilometer range is 15 km, the vertical resolution is 15 m and the temporal resolution is 15 s. A microwave radiometer (HATPRO-G5, RPG Radiometer Physics GmbH) provides vertical profiles of air temperature and absolute humidity up to an altitude of 10 km.

Integrated liquid water path (LWP) and the integrated water vapor (I WV) are derived from measurements of the brightness temperature in 14 channels. An X-band Doppler weather radar with dual polarization (GMWR-25-DP, GAMIC) for precipitation research is in operation since autumn 2022 and has a range of 100 km.

The website of the UCO Berlin provides a data portal for search of meta data and download of open climate data in Berlin and surrounding: <https://uco.berlin>