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Micrometeorological fog experiments in Budapest and in Sió Valley near Lake Balaton (2018-2021)

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Characteristic phenomena in the Pannonian basin during the winter half year are the mist (500-1000 hours/year), the fog (150-300 hours/year) and the cold air pool with high air pollution concentrations. Formation, development and dissipation of fog events are complex processes that are impacted by short- and longwave radiation, condensation and evaporation, turbulent exchange, furthermore fog chemistry. The research presented here aims at exploring the interaction of these processes using field observations. To this end, complex field campaigns were conducted in Budapest (WMO code: 12843) and in the Sió Valley, 6 km away from Siófok (12935) during 1 to 3-month periods in the last three winter half years.

Besides air chemistry and standard meteorological variables, the leaf wetness, surface and soil temperature, soil moisture, soil heat flux (Huskeflux), radiation budget components (CNR1) and turbulent fluxes based on eddy covariance (CSAT3, EC150) and gradient methods were measured above the grassland. Time resolutions of measurements for slow sensors were 10 sec or rather 1 minute and for eddy covariance system 10 Hz. The mist and fog periods were detected using a cloud camera (in Sió Valley) and by synoptic observations in Budapest and Siófok.

Additional measurements in Budapest were i) the wind speed (*U*), air temperature (*T*) and relative humidity (*RH*) profiles together with Gill sonic anemometer at the top of a 30 m high tower, ii) LUFT CHM 15k ceilometer. SODAR and aviation meteorological measurements were also available from the Budapest Ferenc Liszt International Airport *(*LHBP*)* at 8 km distance. Other field experiments were done in the wet leeward Sió Valley in 2018-19 and 2019-20. Vaisala WXT530 sensor, LUFT CHM 15k ceilometer, tethered balloon measurements with GRAW radiosondes and METEK SODAR measurements were also provided as additional information behind the energy budget measurements.

Our results confirmed that according to the expectations, we have recorded more foggy situations in the Sió Valley than in Budapest (12843) and Siófok (12935). Radiation and advection type fog events were formed in most cases. The measured *RH* was above 95 and gradually increased during the onset period of fog. RH was around 100%, fluctuations could be measured less accurately. Dissipation of the fog is usually characterized by wind intensification and rise in the incoming solar radiation. The data of two field campaigns will be analyzed i) a cold pool situation in Sió Valley in January 2020 and ii) the foggy season 2020-21 in Budapest. The developed complex (micrometeorological, furthermore air and liquid chemistry) database gives opportunity to validate numerical model results (WRF, CHIMERE and detailed box model) and to improve parameterizations of the numerical models.