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High trace gas concentrations during lowered boundary layer heights at a Swiss tall tower site

Andreas Plach^{1,2}, Andreas Stohl¹, and Markus Leuenberger^{2,3}

¹University of Vienna, Department of Meteorology and Geophysics, Wien, Austria (andreas.plach@univie.ac.at)

²Physics Institute, Climate and Environmental Physics, University of Bern, Bern, Switzerland

³Oeschger Centre for Climate Change Research, Bern, Switzerland

Measurements of trace gas concentrations and their fluxes are essential to investigate source regions of greenhouse gases (GHGs) and other pollutants. Most flux towers provide observations at heights of several meters to tens of meters and therefore provide information about possible flux sources on a local spatial scale. Here we present an analysis of trace gas concentration and flux measurements from one of the few European tall towers located close to Beromünster, Switzerland. The tower was initially set up as a CarboCount CH site — a dense GHG observation network run for four years (2012 - 2015) — and is continued since by the University of Bern. The presented measurements are taken at an altitude of 212m above ground. This relatively high observation height results in a flux footprint of the tower of many kilometers and therefore the tower observations are predestined for a source analysis on a much larger scale than typical for flux towers. We analyze subsets of the available time series selected by season, time of day, wind direction, and other criteria. In a first step, the field of view of the tower for these subsets is estimated with a flux footprint parameterization. This is followed by a correlation analysis between various observations. Results indicate particularly high trace gas concentrations during periods of lowered planetary boundary layer heights and wind coming from the Zurich metropolitan area. In a next step we intend to perform a field of view analysis with a Lagrangian atmospheric transport model (Flexpart).