Submitted Abstract

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Abstract

The Atmospheric Boundary Layer (ABL) affects the transport and storage of passive tracers, like greenhouse gases (GHGs), through advection, turbulence, and vertical mixing and therefore impacts the vertical distribution of these trace gases especially on a regional scale. ICON hindcast simulations (model grid spacing of 1 km) using a standard TKE-based turbulence closure are performed (hereafter ICON-NWP), followed by a detailed evaluation against surface stations, profile observations, and tall tower measurements over two sites on the Swiss Plateau namely Payerne and Beromüsnter. The target cases include a strong diurnal cycle of the GHGs under different weather regimes, initially in particular clear-sky fair-weather situations. For the stable boundary layer (SBL), ICON-NWP tends to produce a cooler and more humid surface layer compared to observations. During daytime, ICON-NWP exhibits a shallower and warmer convective boundary layer compared to observations. These differences indicate that the current boundary layer scheme needs further tuning. Different tuning parameters like surface exchange coefficient, etc. are tested. Furthermore, the newly developed two-energies turbulence scheme (D#ura#n et al. 2018) is tested and evaluated. Apart from different turbulence closures, an evaluation at finer model grid spacings will be discussed.