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Regional climate simulation of boundary layer energetics over Europe for present-day and future climate conditions

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We present a description of the planetary boundary layer (PBL) for current (1960-1990) and future (2070-2100) climate periods as obtained from a regional climate model (RCM) centered on the Mediterranean basin. Vertically integrated turbulent kinetic energy (TKEZ) and boundary layer height (z_i) are used to describe PBL energetics. Present climate shows a TKEZ annual cycle with a clear summer maximum for southern regions, while northern regions of Europe exhibit a smoother or even a lack of cycle. Future climate conditions exhibit a similar behaviour, with an increase in the summer maximum peaks. A detailed analysis of summer surface climate change energetics over land shows an increased Bowen ratio and decreases in the evaporative fraction. The enhanced sensible heat flux responsible for these results causes an energy surplus inside the PBL, resulting in increased convective activity and corresponding TKEZ. These results are consistent with temperature increases obtained by several other model simulations, and also indicate that changes in the turbulent transport from the PBL to the free troposphere can affect atmospheric circulations.