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WRF4PALM v1.0: A Mesoscale Dynamic Driver for the Microscale PALM Model System 6.0

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A set of Python-based tools, WRF4PALM, has been developed for offline-nesting of the PALM model system 6.0 into the Weather Research and Forecasting (WRF) modelling system. Time-dependent boundary conditions of the atmosphere are critical for accurate representation of microscale meteorological dynamics in high resolution real-data simulations. WRF4PALM generates initial and boundary conditions from WRF outputs to provide time-varying meteorological forcing for PALM. The WRF model has been used across the atmospheric science community for a broad range of multidisciplinary applications. The PALM model system 6.0 is a turbulence-resolving large-eddy simulation model with an additional Reynolds averaged Navier–Stokes (RANS) mode for atmospheric and oceanic boundary layer studies at microscale (Maronga et al., 2020). Currently PALM has the capability to ingest output from the regional scale Consortium for Small-scale Modelling (COSMO) atmospheric prediction model. However, COSMO is not an open source model which requires a licence agreement for operational use or academic research (). This paper describes and validates the new free and open-source WRF4PALM tools (available on). Two case studies using WRF4PALM are presented for Christchurch, New Zealand, which demonstrate successful PALM simulations driven by meteorological forcing from WRF outputs. The WRF4PALM tools presented here can potentially be used for micro- and mesoscale studies worldwide, for example in boundary layer studies, air pollution dispersion modelling, wildfire emissions and spread, urban weather forecasting, and agricultural meteorology.