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Fine-resolution mapping of micro-meteorological features in regions with heterogeneous landscapes

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Human socioeconomic activity and wild life conservation tasks frequently require meteorological information at fine (about 100 m) spatial resolution. For instance, this information is needed for assessment of wind load, wind gustiness, air quality and urban comfort in high latitudes where the atmospheric convection is limited. Neither sparse observational network nor operational meteorological models are able to directly provide this information to end-users. Methods of geo-statistical weighted interpolation (kriging) have been already successfully applied to reconstruct fine-resolution maps in geophysics. In this study, we applied a kriging with external drive to micro-meteorological reconstructions. As kriging is a statistical interpolation method, its application requires information from a more or less uniformly distributed network of observational stations. This condition is rarely satisfied. We propose use of a turbulence-resolving large-eddy simulation model (LES) to: (i) obtain variograms for each station; (ii) correct extrapolation of the data outside the domain covered with observations. The proposed fine-resolution method with external drive from the LES is demonstrated for the surface air temperature distribution (resolution 50 m) in the central valley of Bergen.