Using reanalysis fields of 10m winds and 2m temperature to characterize the representativeness of German station observations

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The 10m wind and 2m temperature fields from a regional reanalysis (COSMO-REA6) and from two global re-analyses (ERA-Interim, ERA-20C) are compared with the station observations of Deutscher Wetterdienst (DWD). Significant differences in the frequency distributions indicate stations which are affected by processes not modelled in the reanalysis. This could be caused by either very local processes which are not modelled in the reanalysis, or deficiencies in the measurement procedures, or deficiencies in the data assimilation. We compare about 200 stations. Some stations, especially in more complex topography, show monthly statistics significantly different from the reanalysis, or show little correlation. On the other hand, comparable frequency distributions between station observations and reanalysis, together with a high correlation between both, point to a station representativeness comparable to the resolution of the reanalysis, i.e. an absence of notable local influences. For stations in the same region, which compare rather differently to reanalysis fields, we conclude station representativeness or station specific measurement procedures must be the cause. The latter can be excluded for the recent years with help of the stations auxiliary records or station's meta-data. Here we investigate two parameters (10m wind fields, 2m temperature) to conclude on the station's representativeness. The spatial representativeness is dependent on the chosen time scale. We extend our analysis of monthly means, to sub-daily means (where local effects can be expected to be larger) and extend to seasonal and annual means (where local effects can be expected to be smaller due to some averaging) to test the robustness of our study.