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# Spatial representativeness of ground-based solar radiation measurements – Extension to the full Meteosat disk

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The spatial representativeness of a point measurement of surface solar radiation (SSR) of its larger-scale surrounding, e.g. collocated grid cell, is a potential source of uncertainty in the validation of climate models and satellite products. Here, we expand our previous study over Europe to the entire Meteosat disk, covering additional climate zones in Africa, the Middle east, and South America between -70° to 70° East and -70° to 70° North. Using a high-resolution (0.03°) satellite-based SSR dataset (2001–2005), we quantify the spatial subgrid variability in grids of 1° and 3° resolution and the spatial representativeness of 887 surface sites with respect to site-centered surroundings of variable size. In the multi-annual mean the subgrid variability is the largest in some mountainous and coastal regions, but varies seasonally due to changes in the ITCZ location. The absolute mean representation errors at the surface sites with respect to surroundings of 1° and 3° are on average 1-2% (3 $Wm^{-2}$) and 2-3% (4 $Wm^{-2}$), respectively. The majority of sites are found to be representative within the in-situ measurement accuracy. We show that their site-specific representativeness can be reliably approximated by the subgrid variability in a fixed grid (1°). The subgrid variability in turn is only moderately reduced when computed from coarser grid data, typically the only data available in areas not covered by the 0.03° resolved Meteosat disk. Together, this paves the way to a fully global assessment of site-specific spatial representativeness.

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