



On the relationship between diurnal temperature range and surface solar radiation in Europe

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The surface solar radiation (SSR) is an important factor influencing the local and global energy budget. However, information on the spatial and temporal variation of SSR is limited. A more commonly available measure, which may provide such information, is the diurnal temperature range (DTR). In this study we analyze the relationship between DTR and SSR in Europe between 1970 and 2005 on seasonal and decadal scale. When comparing 31 pairs of sites with long-term SSR and DTR measurements we found a correlation coefficient of 0.87 in the annual mean and between 0.61 and 0.92 in the seasonal mean anomalies. When investigating the pairs of SSR and DTR individually we found that local correlations are mostly lower than the European mean and that they decrease rapidly in seasons and latitudes with low incident angles and at high alpine altitude. The highest correlation on local and seasonal scales seems to be connected with the variability of the large scale circulation in Europe. A comparison between the station-based European mean DTR and gridded datasets shows good agreement. The output of 11 simulations of current generation regional climate models over Europe shows a strong relationship between SSR and DTR. The seasonal dependence of the relationship is well reproduced but the absolute values are mostly too low. The pattern of decrease (dimming) and increase (brightening) in SSR and DTR was not reproduced in the modeled time series. There is still strong evidence from both models and observations that DTR is a reliable representative of SSR.