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The spatial and temporal variability of shortwave and longwave surface radiation in Europe as derived from satellite and ground based data.

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The aim of this work is to compare the results of a detailed trend analysis applied on surface down-welling shortwave (SW: 0.2-5.0 microns) and up-welling longwave (LW: 5.0-200.0 microns) radiation data from the International Satellite Cloud Climatology Project (ISCCP FD SRF) and measurements from selected ground-based stations in Europe. The ground-based observations were acquired from the WRDC (World Radiation Data Center) database and include up-welling and down-welling longwave and shortwave radiation measurements. The relative changes of the two datasets are examined and the ability of ISCCP to capture the spatial and temporal radiation fluctuations over Europe is assessed. In order to study the long-term variations of the ISCCP SW and LW radiation, monthly mean values for the 1984-2007 time period were calculated. The same was also applied for the WRDC observations; however the period varied for different stations according to data availability. To fit the time series, a model with a linear trend and a seasonal component for the annual cycle of radiation has been used. The seasonal component is estimated by a harmonic analysis. The significance of the longwave and shortwave radiation trend is also determined. It is revealed that the observed trends and their significance are rather variable for different areas in Europe.