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Surface solar radiation variability over Eastern Mediterranean: A high spatial resolution view from satellite and ground-based observations

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Surface Solar Radiation (SSR) has been measured for decades from ground-based observations for several spots around the planet. On the other hand, during the last decades, satellite observations made possible the assessment of the spatial variability of the SSR at a global as well as regional scale. In this study, a detailed view of the SSR spatiotemporal variability is presented at a high spatial resolution, focusing on the region of Eastern Mediterranean. This is a region of particular interest since it is affected by aerosols of various origins (continental, sea, dust and biomass burning particles) and encloses countries with significant socioeconomical changes during the last decades. The SSR satellite data used in this study have been obtained from the Satellite Application Facility on Climate Monitoring (CM SAF) (www.cmsaf.eu). The CM SAF SSR dataset is based on reflections in the visible channel of Meteosat First Generation, has a spatial resolution of 0.03^ox0.03^o and spans from 1983 to 2005. The satellite observations are validated against ground-based measurements for the city of Thessaloniki, a coastal city of $\sim$1 million inhabitants in northern Greece, situated in the heart of Eastern Mediterranean. Measurements from two pyranometers, an Eppley Precision pyranometer (1983-1992) and a Kipp & Zonen CM-11 pyranometer (1993-2005), both located at the center of the city, were homogenized and a uniform time series for the 23 year period was constructed. SSR was also calculated with the use of MODIS level-2 aerosol and cloud satellite data for the region of Thessaloniki and the Santa Barbara DISORT Atmospheric Radiative Transfer (SBDART) model. These new satellite-based results are compared to both CM SAF and ground-based observations in order to examine whether SBDART and MODIS could be further used for the investigation of the spatial patterns of SSR in the area.