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Validation of satellite-based surface solar irradiance calculations in Alpine areas

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Solar radiation drives atmospheric circulation and hence weather and climate. Accurate determination of the surface solar irradiance (SSI) is important for a variety of solar-energy-related uses. As the ground-based measurement network has a low spatial resolution, satellite data in combination with accurate radiative transfer modelling can fill the gap to obtain comprehensive SSI information even in complex terrain. On that account, high-quality data measured at four stations in the European Alps representing different topographic settings are analysed and compared to simulations using a 1D, pseudospherical, twostream radiative transfer equation solver provided in the software package libRadtran. The input parameters for the model include total water column and a modified Aerosol Ångström coefficient, derived from MACC (Monitoring Atmospheric Composition and Climate) data. Cloud and albedo information arises from Meteosat second generation data preprocessed with the HelioMont-method by Stöckli (2013) which allows 15 min temporal resolution. The Meteosat dataset comes with modelled SSI which is also used for comparison purposes. With the use of MACC data (3-hourly values) and mainly because of precise local horizon information for each measurement site, there should be an improvement in validating specific sites compared to the HelioMont-method. First calculations reveal an rmse-advance of $2 W m^{-2}$ ($50 W m^{-2}$) for monthly means in Innsbruck (St. Leonhard) in 2012 in comparison to the HelioMont-method. This difference is mainly attributed to the influence of the shading from the horizon, which is more important in St. Leonhard and mirrors in the results of both calculations.