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Modelling total solar irradiance using a flux transport model

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Reconstructions of solar irradiance into the past are of considerable interest for studies of solar influence on climate. Models based on the assumption that irradiance changes are caused by the evolution of the photospheric magnetic field have been the most successful in reproducing the measured irradiance variations. Our SATIRE-S model is one of these. It uses solar full-disc magnetograms as an input, and these are available for less than four decades. Thus, to reconstruct the irradiance back to times when no observed magnetograms are available, we combine the SATIRE-S model with synthetic magnetograms, produced using a surface flux transport model. The model is fed with daily, observed or modelled statistically, records of sunspot positions, areas, and tilt angles. To describe the secular change in the irradiance, we used the concept of overlapping ephemeral region cycles. With this technique TSI can be reconstructed back to 1700.