Internal variability of surface solar radiation and associated PV production

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Results on the statistical properties of internal variability of annual mean surface solar radiation (SSR) and associated decadal scale trends are presented, following in part Folini et al. 2017 (doi:10.1002/2016JD025869). Estimates are based on 43 pre-industrial control (piControl) experiments of the Coupled Model Intercomparison Project Phase 5 (CMIP5). Trends are shown to depend strongly on geographical region and on whether they are quantified in absolute units or relative to the long term mean SSR. Providing one map for absolute and one map for relative trends is sufficient, as approximate analytical relations are shown to hold between trends of different length and likelihood and the standard deviation of the underlying SSR time series. Comparison with present-day observations and inter-model spread suggest an average uncertainty of these estimates of about 30%. Intermodel spread suggests that regional uncertainties can be up to about three times larger or smaller. Using the model by Crook et al. 2011 (doi:10.1039/C1EE01495A) to translate SSR into PV production, associated internal variability of photo voltaic (PV) energy production is inferred. Results suggest that it is plausible for PV production to change by several per cent over a decade just because of internal variability.