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Interface between climate and energy communities: assessing long term variability of the surface solar irradiance for solar energy projects

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Assessing the future surface solar irradiance (SSI) is important for both energy and climate community : it is a way to understand the solar resource characteristics and SSI is an essential climate variable. In a way to develop concrete mitigation projects taking into account a changing climate, communication between the two communities can bring out promising approaches mixing both statistical and physical methodologies, especially in SSI assessment. In solar energy conversion projects, the method used by developers to take into account the interannual variability of SSI during the lifetime of the projects is essentially applied on 10+ years of historical SSI datasets. This work proposes a review of the different statistical methods accessing the on-site solar resource and its inter-annual variability. Among others, we show that most of statistical methods suppose the data are independent and identically distributed. This hypothesis is questionable because of the climate long term variability. In climate community, assessing the future SSI is essentially based on physical approaches with related climate scenarios. Finding a common way to assess the climate variability could allow learning from past estimations in order to have a more accurate approach to predict resource variations in the future.