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How to build a new composite of the total solar irradiance out of disparate observations ?

Thierry Dudok de Wit (1) and Claus Fröhlich (2)

(1) University of Orléans, LPC2E, Orléans, France (ddwit@cnrs-orleans.fr, +33 238631234), (2) PMOD/WRC, Davos, Switzerland

Several attempts have been made to merge all total solar irradiance (TSI) observations into a single composite, which is crucial for assessing the presence of long-term trends in the solar radiative output. There exist presently three composites, which are based on different assumptions on the data, and also exhibit differing trends.

This problem of merging different and disparate observations of the same quantity occurs in various contexts, for example in the making of a composite MgII index. The Bayesian framework is ideally suited for this because it precisely allows to build a TSI composite that is consistent with all the observations, given their uncertainties. This approach has been successfully used for climate records, but apparently never for solar or for geomagnetic proxies.

We show how to build a new composite of the TSI, by using a multiscale method that reconstructs the TSI separately for different time scales. We then compare this new composite to existing ones and to results from spectral irradiance models.