



An Overview of Total Solar Irradiance Composites Used for Climate Studies

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The total solar irradiance (TSI) provides the net incoming energy powering the Earth's climate system. Measurements of this time-dependent quantity have been uninterrupted since 1978 via an overlapping series of spacecraft instruments, which enables the creation of a multi-instrument TSI composite as needed for climate studies including natural influences such as solar radiative forcing. The dozen TSI instruments contributing to the long-term measurement record have each been corrected for absolute accuracy and long-term trends to the best of the responsible instrument team's abilities. At the levels of accuracy and stability needed for climate studies, however, there remain artifacts in the individual data records from at least some of these instruments. These data-record differences, even between co-temporal instruments, lead to different TSI-composite constructions, and several such have been published. Climate modelers and other users of these radiative-forcing records are left to select which available composite to use, often being unaware of the likely artifacts included in or magnitudes of uncertainties associated with each.

I will give an overview of the most prominent TSI composites, describing the methods used to create them, their differences on both short- and long-term timescales, the advantages and suspected artifacts in each, the need for time-dependent uncertainties associated with them, and plans for future improvements to this important spacecraft-era solar-forcing record for the climate-research community.