Making of Composites Out of Multiple Observations: The new Total Solar Irradiance and MgII index composites

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Reconstructing past solar activity critically depends on present direct observations of the total solar irradiance (TSI) and of proxies such as the MgII index. Recently, two teams have been working on making new composites out of existing observations: an ISSI TSI team, and the SOLID project for reconstructing solar spectral irradiance. Both aim at combining all available observations via rigorous, reproducible, and unbiased methods that include estimated time-dependent uncertainties.

Here we present preliminary results from both teams, and concentrate on the making of the TSI composite (1980-today) and the MgII index composite (1978-today). Our approach consists of first decomposing all observations into multiple time scales, and merging these before building the composite. Knowing the uncertainties of the individual instruments is critical, so we developed a methodology for estimating these from the observations only. Finally, we discuss the composites' uncertainties at various time scales, which are important for understanding the significance of long-term variations of the solar radiative output.