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Solar Forcing of Climate: A Review

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Abstract

Attempts to determine variations in solar forcing have been made since the advent of satellite observations of Total Solar Irradiance (TSR). These have been influenced by variations in apparent proxies such as sunspot numbers and understanding of solar magnetodynamics. Perhaps a second order proxy is the so-called Maunder and Sporer Minima during which there were few sunspots for decades, a time accompanied by cool global temperatures—the so-called Little Ice Ages. Two major determinations (Hoyt and Schatten, 1993, and Lean 1995) showed a relatively large forcing variation. More recent studies, which showed that basic assumptions from these early determinations were incorrect, (Wang et al, 2005) suggested that forcing variations were much smaller--of the order of what has been observed in a decadal sunspot cycle. Still more recently another study (Schmidt et al, 2011) reverses this and indicates a larger variation. In addition regression studies of observed temperatures disagree on the amount of forcing--linear regressions (Lean and Rind 2008 & Camp and Tung 2007) finding approximately twice the TSI forcing (suggesting an indirect component), while non-linear ones indicate essentially TSI forcing only. The recent stillstand in global temperatures during the abnormally low activity portion of the solar cycle makes determination of solar forcing more important than previously thought. This talk will review these papers and discuss possible implications from computer simulations.