

Solar Irradiance Variability and the Earth' Climate

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The question of how much solar irradiance variability contributes to climate change has become an important issue in all discussions about the origin of recent global changes. There are two aspects of this question: How variable can the Sun be and how do such changes influence the Earth' climate. Both questions cannot be answered in a simple way, mainly because the basic understanding of the mechanisms leading to a variable Sun and governing the Earth' reaction to such changes is still inadequate, although progressing. Reconstructions of the global climate cover now more than 1000 years into the past and time series of a mean surface temperature of the northern hemisphere are generally accepted as reliable representations of global climate, although their rather small amplitudes on centennial time scales are still somewhat controversial. Direct measurements of total solar irradiance are only available since late 1978. Manifestations of solar activity - such as the occurrence of sunspots - can also be reconstructed back to the Middle Ages. Comparison of these two records shows some similarity which led to speculations about a physical relationship, which are thought as solar-activity related changes of irradiance.

The key question is how reliable is such an inference of solar irradiance. In order to quantify this the total solar irradiance observations from the last 25 years, covering now almost three solar cycles, will be critically reviewed and its reliability discussed. These results will be used to deduce possible mechanisms responsible for such changes which in turn lead to reconstructions of TSI back to the Middle Ages. These will be reviewed and some answers to the question "How much changes can be expected from our Sun" will be given.