

# Solar Irradiance and Its Relation with Earths Temperature

## Abstract

Sun is the source of life on Earth and its irradiance have the strong but complex relation and the variation in solar activity has the strong effect on the climate of earth in which different layers of atmosphere and clouds play the major role which have been verified with different space mission and other observational parameters . The Total Solar Irradiance (TSI) have the strong impact on the upper and lower atmosphere.

**Keywords :** Solar Irradiance.

## Introduction

Sun is the major driving force for the Earth. The temperature of Earth and the Solar Irradiance, the power per unit area received at the top of the Earth atmosphere have the strong relation. At the period of higher solar activity the Earth is subjected to the higher solar irradiance which varies in time. The composition of atmosphere and the temperature at any point in the atmosphere is the net effect of solar heating and infrared cooling <sup>(1)</sup>. The variation in solar output and atmospheric temperature have the complex and nonlinear relation <sup>(2)</sup>.

Space based measurement of the wavelength dependent i.e. the integrated Total Solar Irradiance (TSI) began in 1978. The spectral irradiance variation below 400 nm contribute nearly 80% to TSI variability. The surface photospheric magnetic flux <sup>(3)</sup> is the important tool to measure the variation in TSI. The equilibrium of Earth temperature is mainly dependent upon solar irradiance absorption and reflective properties of Earth <sup>(4)</sup>.

The cloud play <sup>(5)</sup> the major role in the transportation of latent heat from oceans to the atmosphere and reflect the solar radiation back to space and trap the infrared radiation <sup>(6)</sup>. The climate record show that the climate is changing over the past century (IPCC 2007) of which important indicators are retreating mountain glaciers, rising sea level and increased precipitation on events (IPCC 2001) <sup>(7)</sup>.

The study of correlation between solar activity and climate was also carried out by Marsh and Svensmark <sup>(8)</sup> showed that between 1983 and 1994 the low latitude low cloud cover varied in phase with galactic cosmic rays intensity and Kristjansen and Kristiansen <sup>(9)</sup> suggested that the strong correlation exists between cloud cover and solar UV radiation.

There is no single instrument that has observed TSI continuously and there are three important instruments that has observed the solar cycle spectral irradiance of changes (Fig.1)

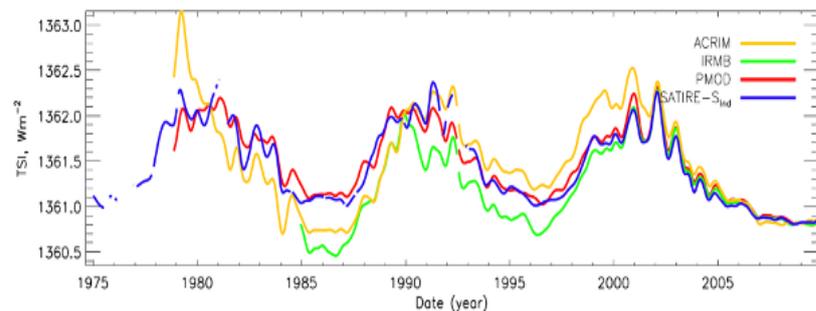


Figure 1. Three TSI composites (red, yellow and green) and the SATIRE-S reconstruction (blue) between 1974 and 2010. All datasets have been smoothed and are normalised to the SORCE/TIM TSI instrument (not shown) at December 2008

The time dependent error estimates was also used to provide the relative data <sup>(10)</sup>.

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The spectral analysis method have been the simplest of all the approaches that have been adopted to identify the impact of solar signal on the climate of Earth. In this method the cycles of 11 (or 22 or 99 etc.) years are assume to be associated with the sun.<sup>(11)</sup> The solar radiation and climate experiment (SORCE) satellite in 2003 was the first mission to observe SSI variation in visible and IR wavelength. According to the latest IPCC report the radiative forcing from 1750 to the present time is .01 to .1 Wm<sup>-2</sup> which is very vast rainge.<sup>(12)</sup>

In the end we can say that TSI has been traced without interruption since 1978 through different space missions<sup>(13)</sup> and it has been prove that understanding and modeling the solar irradiance variation is very difficult process because (i) the models of solar irradiance are sensitive to assumption of solar and atmospheric structure and relation between local and global effect (ii) The degrading of instrument used in observation due to radiation (iii) Most of the model used for observation of Solar irradiance variation have spectrum dependent degradation and that is not easy to account for.

So we can say that the changes in total solar irradiance undoubtedly impact the earth energy balance but the influences are complex and wavelength dependent so the further research is needed to explore the relation of solar irradiance with the upper and lower atmosphere and its impact on the climate of Earth.

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