The Total Solar Irradiance (TSI) is measured from space since 32 years, covering completely the ‘11 year’ solar cycles 22 and 23. After a longer than usual minimum at the end of cycle 23, cycle 24 started end of 2009, and the TSI is now clearly increasing. At this point we make a review of the status of our knowledge of the TSI variations and of the absolute level of the TSI.

Over the past minimum we estimate the TSI variation as the mean variation measured by the independent DIARAD and PMO6 VIRGO radiometers and by the TIM radiometer. We compare with a regression model that was fitted to the measurements over cycle 23. We obtain an unprecedented agreement between the three independent measurements and with the regression model with an uncertainty of the order of +/- 0.1 W/m². The regression model uses Mount Willson magnetic indices, supporting the conclusion that present day TSI variations are determined by solar surface magnetic features.

Our best characterized instrument for the measurement of the absolute level of the TSI is the DIARAD/SOVIM instrument that made measurements from the ISS in 2008. DIARAD/SOVIM has two independent channels, yielding a TSI estimate of 1364.75 W/m² with the right channel, and 1364.5 W/m² with the left channel. The unprecedented low difference between the channels of 0.25 W/m² is probably obtained thanks to the progress in the accuracy of the aperture area measurement. The independent TIM/SORCE absolute radiometer measures a value about 3.8 W/m² lower than DIARAD/SOVIM. To make further progress in the reconciliation of the absolute levels of the TIM/SORCE and DIARAD/SOVIM a detailed analysis of the different factors that contribute to the absolute accuracy of both radiometers is needed.