The Solar Cycle Influence: How TSI and Insolation Warm and Cool the Ocean

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LASP SORCE TSI and the CDR Historical TSI data were analyzed to determine that the increasing trend in solar irradiance over 400 years from the long low period of the Maunder Minimum to the equally long Modern Maximum, was the primary source of energy responsible for the increase in ocean temperature since the LIA.

Earth's ocean is determined to warm under rising solar activity or insolation over any duration- a week, month, year, solar cycle, or many consecutive cycles.

Equatorial ocean heat content and temperatures are observed as sensitive to and linear-lagged with daily TSI-insolation variation, from upwelled heat accumulation of sub-surface solar penetration from prior clear sky high insolation and/or rising or high TSI, such as during a cycle onset El Nino.

Decadal scale ocean warming and post-solar maximum El Nino events are calculated to occur after solar activity rises above an average of 120 sfu F10.7cm, statistically equivalent to 94 v2 SSN and 1361.25 W/m^2 SORCE TSI.

HadSST3 is found to be linearly sensitive to SORCE TSI at a rate of 0.5°C/W/year.

An empirical 'F10.7-TSI-SST model' was created using an F10.7cm-SORCE TSI regression model and the HadSST3-TSI sensitivity factor, predicated on the SWPC Solar Cycle 24 panel 2016 F10.7cm flux forecast, was used in December of 2015 to uniquely and successfully predict the 2016 HadSST3 fall to within 3% error.

Solar minimum La Nina events result from insufficient TSI over time, driving less equatorial evaporation, less cloud cover and precipitation that causes US drought, which is now forecasted for 2018-2020 using this model.

The 'solar cycle influence' is the accumulated terrestrial temperature effect from all solar cycle activity, which varies with the evolution of the solar magnetic field, is herein found to be the primary energy source for net warming or cooling, tropical evaporation, and subsequent extreme events.