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Terrestrial temperature, sea level and ENSO index variations linked with solar and volcanic activity

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In this paper we investigated the Oceanic Niño Index (ONI), for simplicity called in this paper an El Nino Southern Oscillation (ENSO) index in 1950-2023 by applying the wavelet spectral transform and the IBM SPSS correlations analysis. ONI follows the three months current measurements of an average temperature of the sea surface in the East-Central tropical part of the Pacific ocean nearby the international line of the date change over the average sea surface temperature over the past 30 years. The ENSO index is found to have a strong ($> 87\%$) correlation with the Global Land-Ocean Temperature (GLOT). The scatter plots of the ENSO-GLOT correlation with the linear and cubic fits have shown that the ENSO index is better fit by the cubic polynomial increasing proportionally to a cubic power of the GLOT variations. The wavelet analysis allowed us to detect the two key periods in the ENSO (ONI) index: 4-5 year and 12 years. The smaller period of 4.5 years can be linked to the motion of tectonic plates while the larger period of 12 years is shown to have a noticeable correlation of 25% with frequencies of the under-water (submarine) volcanic eruptions in the areas with ENSO occurrences. Not withholding any local terrestrial factors considered to contribute to the ENSO occurrences, we investigated the possibility of the volcanic eruptions causing ENSO to be also induced by the tidal forces of Jupiter and Sun showing the correlation of the under-water volcanic eruption frequency with the Jupiter-Earth distances to be 12% and with the Sun-Earth distances, induced by the solar inertial motion, in January, when the Earth is turned to the Sun with the southern hemisphere where the ENSO occurs, to become 15% . Hence, the underwater volcanic eruptions induced by tidal forces of Jupiter and Sun can be the essential additional factors imposing this 12 year period of the ENSO (ONI) index variations.

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Presenting author

Valentina Zharkova

Author list and affiliations

Primary author: ZHARKOVA, Valentina (Northumbriaa University, Newcastle, UK)

Co-author: VASILIEVA, Irina (Main Astronomical Observatory, Kyiv Ukraine)

Presenter: ZHARKOVA, Valentina (Northumbriaa University, Newcastle, UK)

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