



THE INTERNATIONAL CONFERENCE ON THE 120TH ANNIVERSARY OF THE BULNAY EARTHQUAKE: ADVANCES IN ASTRONOMY AND GEOPHYSICS



LONG-PERIOD FLUCTUATIONS IN THE EARTH ROTATION AND SOLAR ACTIVITY: SINCE AD1600

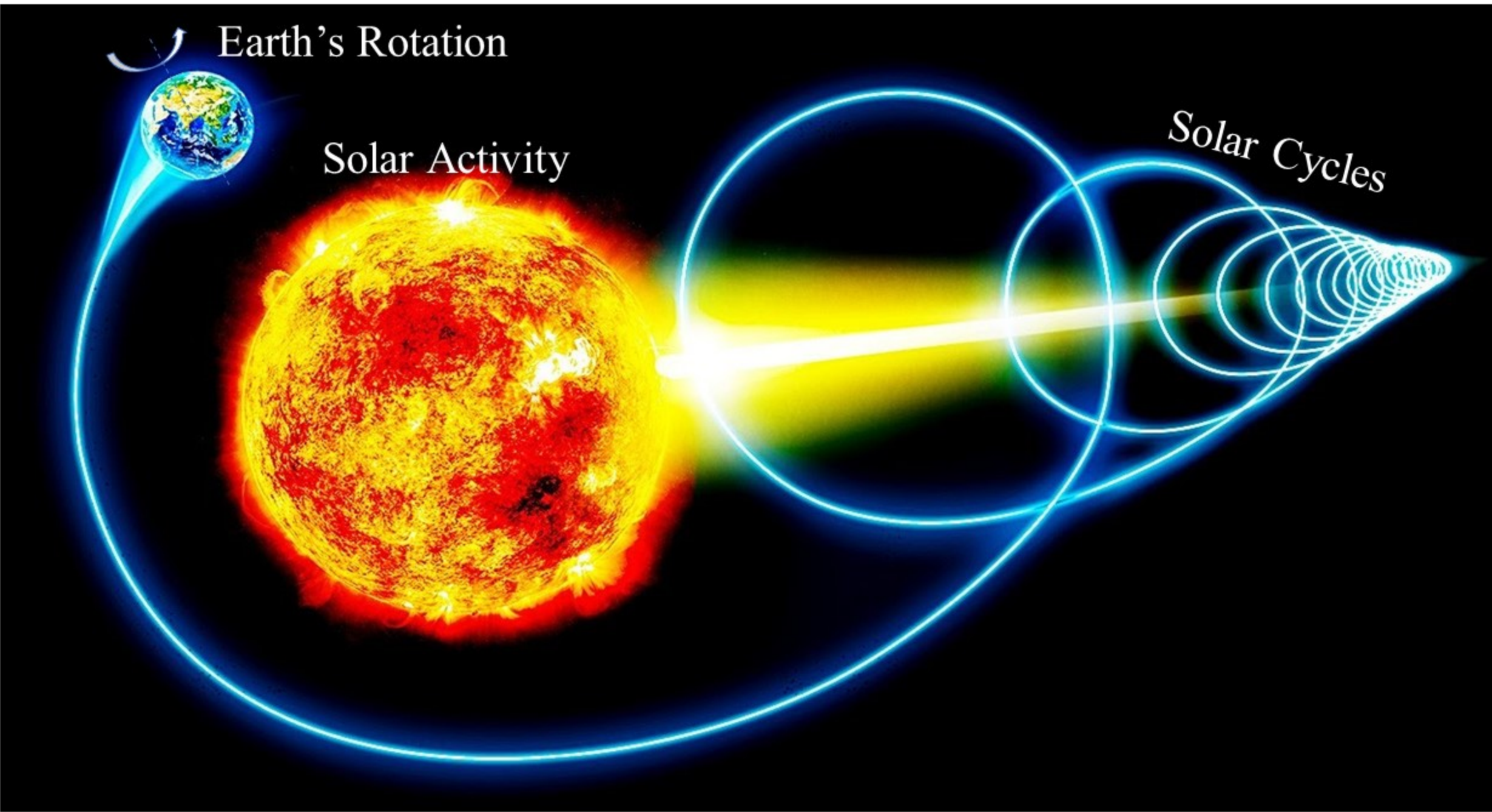
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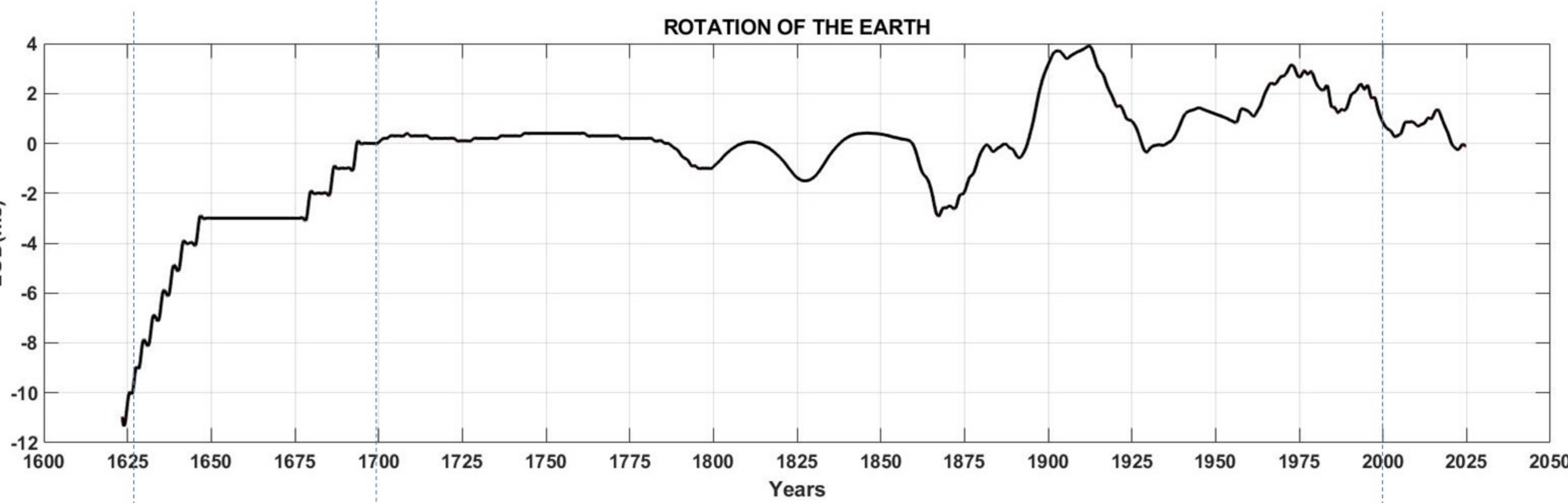
ABSTRACT: In this poster, we tried to study the relationship between the rotation of the Sun and the Earth. An attempt was also made to find a correlation between the solar activity phase and the Earth's rotation rate. The Sun and its planets are connected by gravity, but some physical relationships remain unclear. For example, this gravity and any effect of the sun are compared to the processes by which it causes the uneven movement of the Earth's rotation, and what active phenomena of the Sun coincide with the changes in the Earth's rotation. In the study, we cover long-term periods of solar activity and changes in Earth's rotation after 1600. Among them, during the lowest periods of solar rotation, such as 1790-1820 or the 5th, 6th, and 7th solar cycles, 1880-1930 or 12-16th solar cycles, and the 24th and 25th cycles after 2000, irregular long-term variations of the Earth's rotation in the previous period was fluctuations observed. It can be seen from the research chart.

INTRODUCTION: The study of the Earth's rotation in space (encompassing Universal Time, length of day, polar motion, and the phenomena of precession and nutation) addresses the complex nature of Earth orientation changes, the mechanisms of excitation of these changes and their geophysical implications in a broad variety of areas. Also, the main factors affecting the rotation of the Earth are the Sun and the Moon. The length of day are among various main motions of the Earth's rotation that reflects its interior and exterior physical processes. Earth rotation provides a unique and truly global measure of natural and man-made changes in the atmosphere, oceans, and interior of the Earth. Therefore, study of Earth's rotation plays an important role for understanding dynamics of global change, coupling and relationship of different processes, to improve our knowledge on Earth system.



Variation of the Earth's rotation and Sun activity

In this study, we compared long-term Earth's rotation parameters data from the International Earth Rotation and Reference System Service (IERS) and long-term Solar activity data from the SOHO (Solar and Heliospheric Observatory), SIDC (Solar Influences Data Analysis Center). We performed the calculation using the MatLab program. The figures below show variations in Earth's rotation and Solar activity since 1600.



400 Years of Sunspot Observations

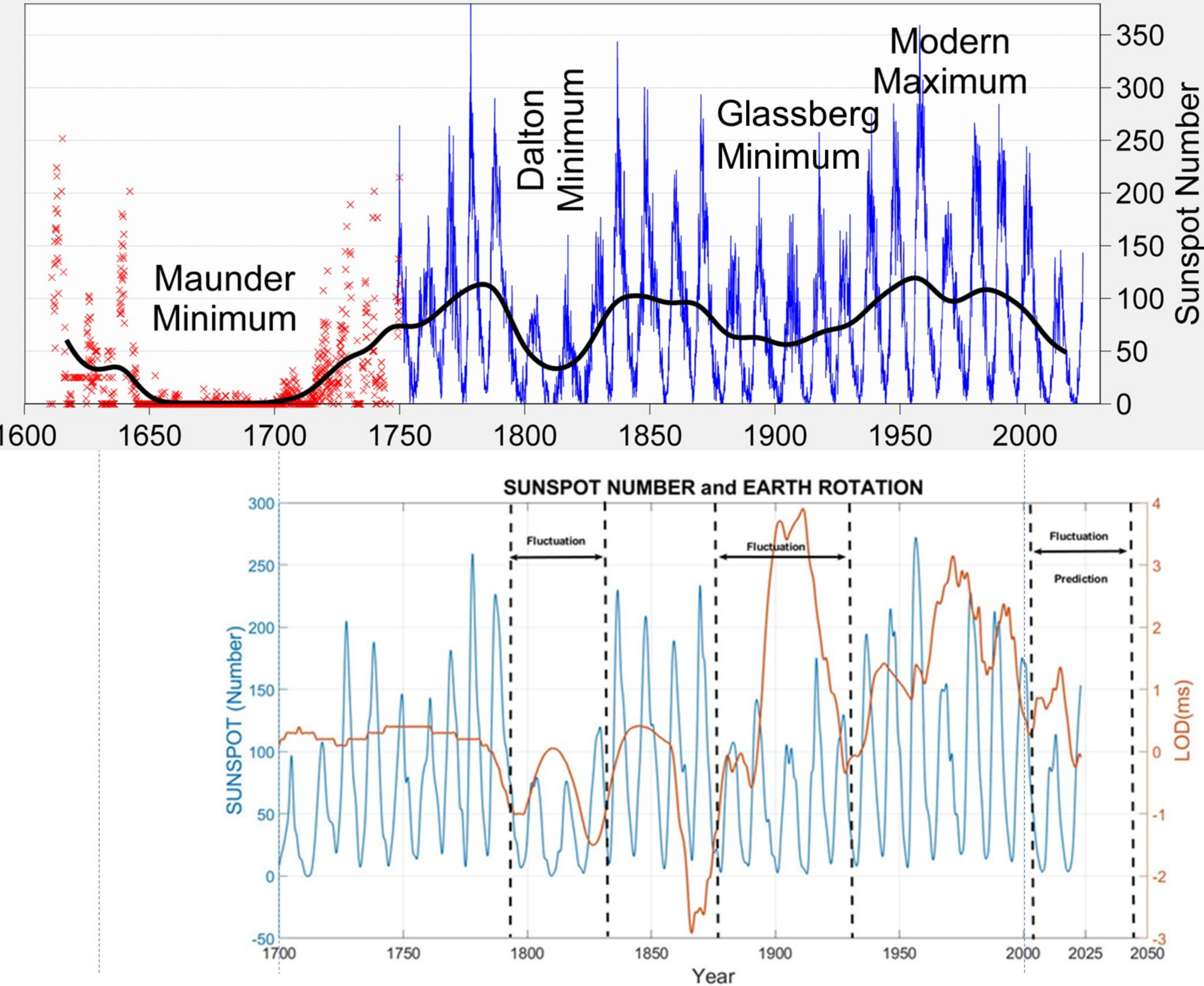
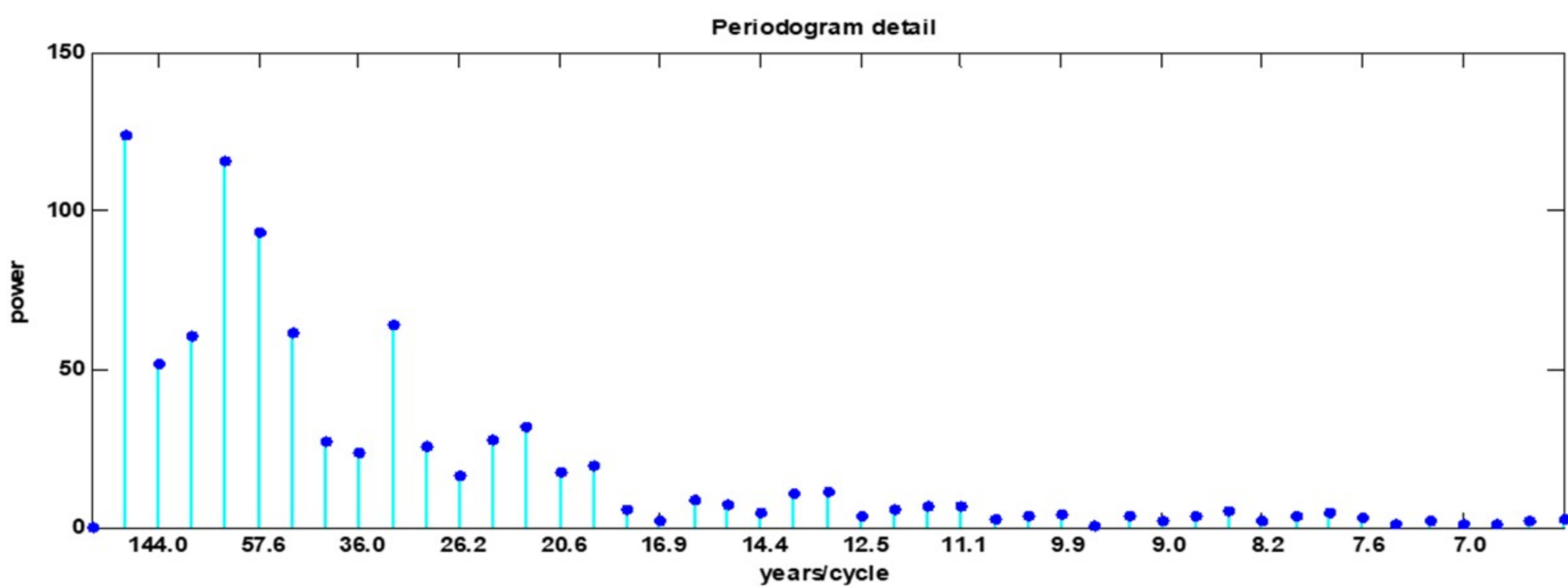
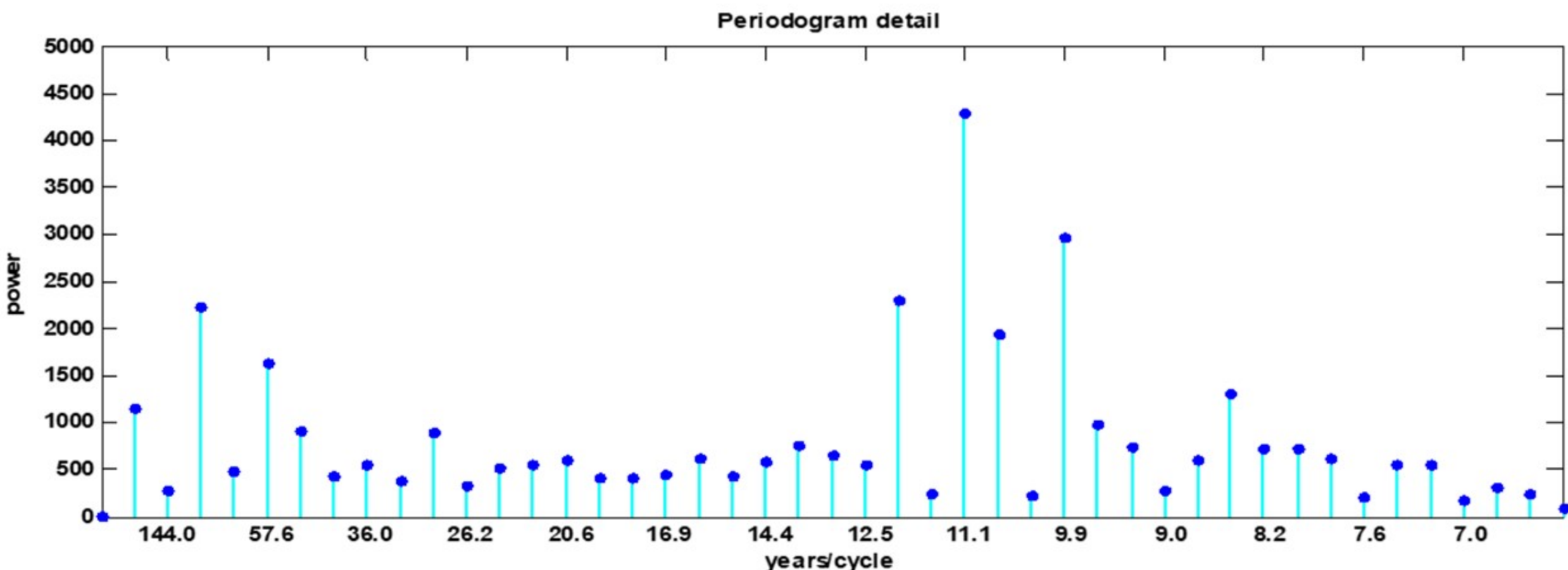


Figure1. Comparison of the fluctuations in irregular long-term variations Earth's rotation (length of day or LOD) and Solar activity (sunspot number or SN)

Spectrum of the Earth's rotation



Spectrum of the Solar activity



The Earth's rotation or length of the day and spectrum lines of the Sun's activation are compared. Spectral lines of the long-term Solar activity and Earth's rotation are observed in both the 96th or about 100 year periods.

The following fluctuations are served in the LOD time series with the Solar activity minimums:

Solar Maunder minimum: Earth's rotation vary slowed down, changing by 12ms.

Solar Dalton minimum or 5th, 6th, and 7th Solar cycles : The Earth's rotation has made a single oscillation with an amplitude of 1ms with a period of approximately 50 years.

Solar Glassberg minimum: Around 1900, during the period of 1880-1930, when the Sun's activity was minimal, i.e. during the 12th-16th Solar cycle, the Earth's rotation was the slowest, increasing by 0.004 seconds from the LOD average, and changes and fluctuations were observed.

Solar minimum or 20th Solar cycle: The Earth's rotation has slowed by 3.2 ms.

Solar minimum or 24th and 25th Solar cycle: The Earth's rotation, or the length of the day, is accelerating towards minus.

CONCLUTIONS

During the minimum periods of Solar activity, there is a significant fluctuations in the Earth's rotation. These two long-term variations show some correlation. Research shows that during these years of Earth's rotational changes, there was a high frequency of extreme geophysical phenomena and natural disasters. These two astronomical phenomena are observed to coincide with each other, with a frequency of approximately 100 years. Shows the Earth's rotation accelerating. Around 1900, 12th-16th Solar cycle, the Earth's rotation was the vary slowest, increasing by 4 milliseconds from the LOD average, and changes and fluctuations were observed. In the solar cycles 24 and 25, the length of the day is observed to be negative. It is expected that there may be changes in the future.

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