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# Solar Impact on the Earth Rotation

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The causes of the Earth's rotation are usually explained by tidal forces, and by the consequences of dislocations of large masses of air, water and minerals. At the same time, certain phenomena cannot be explained in the framework of dominant paradigm of the Earth's rotation, which has to be thoroughly reconsidered.

The objective of this study was to analyze the character of the Earth's rotation in the light of possible influence of solar activity. The author used database of International Earth Rotation Service, to determine length of day and Polar displacement. Temporal resolution was one year for the period 1755-2006, one month for the period 1956-2006, and one day for the period 1973-2006.

The author found out that the oscillations of length of day coincide with periods of Carrington rotation, and very precisely match with the synodic period of solar rotation (27.3 days). During each synodic period, the Earth accelerates its rotation twice, and decelerates its rotation twice. The minimums of length of day are observed when the Sun radiates active longitudes. The maximums coincide with passive solar longitudes. The last patterns are relatively stable and have been observed during the same moments throughout 20 consecutive solar rotations, i.e. during 1.5 years. Incessant drift of active solar longitudes leads to variations of periods between maximums. The amplitude of such variations is between 10 and 17 days. The comparison of lengths of day during new moon and full moon during 430 revolutions of the Earth's satellite showed that these lengths were nearly equal. But moon manifests its influence at perige and apogee meetings.

The data of SOHO CELIAS Proton Monitor (1996-2006) were used to discover physical nature of influence of solar wind on length of day. These data spanned 142 Carrington cycles. The author founded that intense solar wind, when protons move with the speeds over 700 km/h, is associated with reduction of length of day by 0.237 ms

(or by 41% of the mean variation). In 31.6% of such cases, acceleration of the Earth's rotation was observed (versus the current norm of 15.3%). Over 65% of events, accompanied by strong solar wind, were observed during the days with minimal length of day or during the days of diminishing length of day. Thus, solar wing is the source of energy for the Earth's rotation.

Annual pattern of changes of length of day has two maximums (during spring equinox and fall equinox) and two minimums (during winter solstice and summer solstice). The difference between annual maximums and minimums is equal to 2 ms. This difference is caused by the Earth's movement either towards or away from solar corona, with the speed of 1142 km/h. It is important to study critical parameters of solar wind, which are associated with the change of sign of increment of length of day. To accelerate the Earth's rotation in winter, the density of protons should be at least 15-20 particles per cubic meter, or their velocity should be more than 700 km/h. In summer, these thresholds are much lower.

The author discovered long-term changes of length of day and changes of orientation of the Earth's axis during the periods of transition from one Schwabe-Wolf cycle to another. The even and odd cycles are characterized by opposite trends. The Earth experienced the strongest solar influence in 1832 and 1923, during the transition from one 90-year cycle to another.

On the basis of established dependencies, one may expect the next dramatic change of the Earth's rotation in 2007-2008.