



## **Is there a connection between Earth's core and climate at multidecadal time scales?**

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The length-of-day (LOD) undergoes multidecadal variations of several milliseconds (ms) attributed to changes in the fluid outer core angular momentum. These variations resemble a quasi-periodic oscillation of duration 60 to 70 years, although the periodicity (and its accurate length) are disputable because of the relatively short observational time span and the lower quality of the observations before the 20th century. Interestingly, similar variations show up in various measured or reconstructed climate indices including the sea surface (SST) and surface air (SAT) temperatures. It has been shown in several studies that LOD variations lead SST and SAT variations by a few years.

No clear scenarios have been raised so far to explain the link between external, astronomical forcing (e.g., Solar wind), Earth's rotation (core-driven torsional) oscillations, and Earth's surface processes (climate variations) at these time scales. Accumulating evidence, however, suggests the centrifugal tides generated by multidecadal LOD variations as a 'valve' to control the transfer of thermal energy from the lithosphere to the surface via geothermal fluxes. This hypothesis is supported by recent studies reporting significant correlations between tidal and rotational excitation and seafloor and surface volcanism.

In this study, we extend recent works from us and other independent authors by re-assessing the correlations between multidecadal LOD, climate indices, Solar and magnetic activities, as well as gridded data including SST, SAT, and cloud cover. We pay a special attention to the time lags: when a significant correlation is found, the value of the lag may help to discriminate between various possible scenarios. We locate some 'hot spots', particularly in the Atlantic ocean and along the trajectory of the upper branch of the Atlantic meridional overturning circulation (AMOC), where the 70-yr oscillation is strongly marked. In addition, we discuss the possibility for centrifugal tides generated by multidecadal LOD variations to activate geothermal activity on the seafloor or to affect the global conveyor belt circulation.