Intensity of Prolonged Solar Luminosity Cycles and Their Influence Over Past Climates and Geomagnetic Field

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Calcite speleothems luminescence depends exponentially upon soil temperatures that are determined primarily by solar visible and infrared radiation. So microzonality of luminescence of speleothems was used as an indirect Solar Insolation (SI) proxy index. For Cold Water cave, Iowa, US we obtained high correlation coefficient of 0.9 between a luminescence record and the experimentally observed Solar Luminosity Sunspot index.

We measured a luminescent speleothem record from Jewel Cave, South Dakota, US. It is still the first available experimental solar insolation proxy record with sufficiently long duration to reproduce the orbital variations. This record covers 89300- 138600 yrs B.P. with high resolution. It reveals determination of millennial and century cycles in the record.

This solar insolation proxy record contains not only orbital variations, but also solar luminosity self variations, producing many cycles with duration from several centuries to 11500 years. The most powerful non- orbital cycle is 11500 years cycle (as powerful as the 23000 a. orbital cycle in our record). It was found previously to be the most intensive cycle in the delta C-14 calibration record and was interpreted to be of geomagnetic origin. Our recent studies suggest, that this is a solar cycle modulating the geomagnetic field. We found also cycles with duration of 6000, 4400, 3300, 2500, 2300, 1900 and 1460, years (in order of decreasing intensity) with amplitude ranging respectively from 3 to 0.7 % of the Solar Constant.

Latest results suggest that these millennial solar luminosity cycles can produce climatic variations with intensity comparable to that of the orbital variations. Known decadal and even century solar cycles have negligible intensity (100 times less intensive) relatively to this cycles. Solar luminosity (SL) and orbital variations both cause variations of solar insolation affecting the climate by the same mechanism. In spite their influence over the geomagnetic field involve fundamentally different mechanisms, determined by the properties of the solar wind.