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Phase lags between 11-yr cycles of Sunspot Number, Cosmic Ray Flux and Length of Day time series.

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We analyzed phase lags between the 11-year cycles of solar activity (sunspot numbers, SSN), cosmic ray flux (CRF) and 0.5-year oscillations of the length of day (LOD). The analysis is performed for the solar cycles number 20-23 (1965-2010). Phase lags are calculated by using different methods: time lag between maxima of corresponding cycles, according to maximal coefficient of cross-correlation, maximal amplitude of wavelet cross coherence, and as time lag between equivalent momentary phases calculated following the method of 2D-diagrams in phase space. For SSN and CRF time series, these methods allow to document a clear phase difference between odd and even cycles as shown by previous authors (e.g. Nymmik & Suslov 1995 Adv. Space Res. 9, 217; Usoskin et al. 2001 Adv. Space Res. 27, 571). By contrast, the phase lags between SSN and LOD do not show such a clear-cut systematic pattern. We will tentatively discuss the implications of these results for the plausibility of physical mechanisms proposed to link SSN, CRF and LOD.

Auteurs principaux: Dr BARD, E. (CEREGE UMR-6635, CNRS, Université Aix-Marseille, IRD, Collège de France); Dr BARLYAEVA, T. (CEREGE Aix-en-Provence)

Orateur: Dr BARD, Edouard (CEREGE Aix-en-Provence)

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