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Clim. Past, 2, 131-136, 2006
www.clim-past.net/2/131/2006/

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Equatorial insolation: from precession harmonics to eccentricity frequencies

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Abstract. Since the paper by Hays et al. (1976), spectral analyses of climate proxy records provide substantial evidence that a fraction of the climatic variance is driven by insolation changes in the frequency ranges of obliquity and precession variations. However, it is the variance components centered near 100 kyr which dominate most Upper Pleistocene climatic records, although the amount of insolation perturbation at the eccentricity driven periods close to 100-kyr (mainly the 95 kyr- and 123 kyr-periods) is much too small to cause directly a climate change of ice-age amplitude. Many attempts to find an explanation to this 100-kyr cycle in climatic records have been made over the last decades. Here we show that the double maximum which characterizes the daily irradiation received in tropical latitudes over the course of the year is at the origin in equatorial insolation of not only strong 95 kyr and 123 kyr periods related to eccentricity, but also of a 11-kyr and a 5.5-kyr periods related to precession.

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Citation: Berger, A., Loutre, M. F., and Mélice, J. L.: Equatorial insolation: from precession harmonics to eccentricity frequencies, *Clim. Past*, 2, 131-136, 2006. [Bibtex](#) [EndNote](#) [Reference Manager](#)



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