

Strong regional climatic fluctuations in the tropics

December 2 2009

Climatic fluctuations close to the equator show a different pattern to climate change in the Arctic and Antarctic. In the tropics distinct 11500 year fluctuations between wet and dry periods can be clearly identified which do not occur in temperature reconstructions of polar ice cores.

The investigations of the climate of the last 25000 years in tropical Africa show that dry phases prevailed during lower solar radiation in March and September, which caused the following rain period to be less intensive. This emphasises the significance of hydrological variations in regional [climate change](#), as was formulated by a European consortium of earth scientists under the direction of Professor Dirk Verschuren (University of Gent, Belgium) in the latest issue of the science magazine "*Nature*" (Vol. 462, 7273).

Seasonally recurring rain periods are the decisive feature of the tropical climate, and are of existential importance for the life of the people there. In order to determine the reasons for the fluctuations in the intensities of the rain periods, the European research team examined the climate of equatorial East Africa on long-time scales. "To date there has been hardly any data on climate change in the tropics. Variations in the temperature do not play a major role in comparison to hydrological changes", explains Achim Brauer from the GFZ German Research Centre for Geosciences: His working group, together with his European colleagues, analyses the deposits in the Challa-Lake, a crater lake at the eastern foot of the Kilimandscharo. The GFZ scientists retrieved, for the first time in this region, annually laminated [sediment cores](#) from the lake

bottom, down to depths of 21 meters. "With this, the sediment core covers the last 25000 years" explains Achim Brauer. "Detailed microscopic and geochemical investigations of the individual sediment layers deliver climatic information on a very exact time scale". This world-wide first long profile of such lake deposits in the tropics is further supplemented with modern high-resolution geophysical data.

The results show that the changes from wet to dry phases vary on the same temporal scale as fluctuations in the solar radiation, which are caused by cyclic changes in the Earth's orbit around the sun. In particular the rotating of the Earth's axis at a rhythm of 23000 years becomes obvious, which consequently leads to an alternating maximum solar radiation every 11500 years in the southern tropics and in northern tropics. These radiation maxima in turn steer the position and the intensity of the inner-tropical convergence zone(ITCZ), the rain-rich cloud belt close to the equator. The ITCZ is strongest there, where the radiation is intense and evaporation is high.

It can, thus, be proven that Earth's orbit around the sun and associated regional fluctuations of [solar radiation](#), even if these are relatively weak, have a large influence on the climate at the equator. The question as to whether these tropical climatic fluctuations have influenced the global climatic history still remains open.

Source: Helmholtz Association of German Research Centres ([news](#) : [web](#))

Citation: Strong regional climatic fluctuations in the tropics (2009, December 2) retrieved 19 April 2024 from <https://phys.org/news/2009-12-strong-regional-climatic-fluctuations-tropics.html>

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