An early-Pleistocene environment of a Tibetan lake related to tectonic activity and climatic change

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1. Introduction

The significance of the Tibetan Plateau studies stems from the wide recognition that the knowledge of the uplift has played a major role in understanding Asian/global climatic change since late Cenozoic. Much effort has been invested during the last decades in studying sedimentation in the Bengal Fan and loess deposition in association with the uplift, however little evidences come from internal plateau till now. The determination of the time and duration of the uplift is essential for the tests and calibrations of global atmospheric circulations. Tectonic activities are likely to cause important variation in the supply of detrital sediment to the deltas and/or the plains, however sediments in rivers and the Bengal fan have proven very hard to correspond to tectonic events, perhaps due to long-term transportation.

Here we present an early-Pleistocene lacustrine record from the longest lake sediment core by far from a tectonically-driven basin in the central Tibetan Plateau. The palynological and geochemical records allow us to address the response of basin ecosystem to possible forcing factors, such as climatic change and/or tectonic erosion.

2. Sampling and methods

Sediments and dating: The core CE (31°31’18” N, 91°32’55” E, 4500 m above sea-level, 205.5 m overall length) was drilled from the Co Ngoin (Co = lake) basin in July 1999. The age model for the top 197 m of the core CE was developed by using palaeomagnetism profile correlating with the grain size and pollen variations.

Experiment and analyses:

We chose adult and A-1 valves of the ostracode Qinhacypersia Huang 1979, and Psychrodromus Danielopol & McKenzie 1977 in some intervals, for trace element (Mg and Sr) and stable isotope (C and O) measurements. Mg/Ca and Sr/Ca ratios were analysed on a Vista ICP-AES using an intensity ratio calibration. Stable isotopes analyses were carried out on a VG SIRA mass spectrometer at the Godden Laboratory, University of Cambridge.

3. Results

4. Implications

The Co Ngoin data show that the amplitude of environmental changes during early Pleistocene was in association with climatic change and/or tectonic activity. Regard less of effect of the tectonics, the climate in the central Tibetan Plateau during early Pleistocene was multistage in which moisture availability and temperature oscillated abruptly. It was interrupted by at least three drying episodes. The interstadial periods between drying episodes also show obvious climate instability, for example there are three relatively wetter oscillation episodes between 1.15 and 0.93 Myr. Pollen and ostracods (both Qinhacypersia Huang and Psychrodromus) records express a synchronous respond to these oscillations. The ostracod records have yielded the original information about variations in stable isotope composition of the early Pleistocene central Tibetan Plateau.

References