



Comparison of 400-kyr paleoclimatic record from Lake Baikal with records from Atlantics and Antarctica using new unified timescales

M. Fedorin (1,2), E. Goldberg (1)

(1) Limnological Institute of the Siberian Branch of Russian Academy of Science; mikeph@mail.ru (2) Institute of Geophysics of the Siberian Branch of Russian Academy of Science

New orbital-tuned timescales are constructed for geochemical record from Lake Baikal (reflecting continental paleoclimatic changes) and for records of global paleoclimate (benthic $\delta^{18}\text{O}$ in oceanic sediments; ice δD and gas $\delta^{18}\text{O}$ and CH_4 in “Vostok” ice core). All the chronologies are built using the same procedure applied to primary records. The method is based on uniform (in time) binding of a paleorecord to adopting superposition of orbital variations’ series. Compared to traditional orbital correlation, the method employed uses not only precession or obliquity targets, but creates adopting E,T,P series to create full model of paleorecord’s approximation.

To find best approximation of a record the following parameters are varied: i) chronology $t(Z)$; ii) amplitudes and phases of E,T,P orbital components in the model. Quasi-Newton non-linear methods serve to achieve best fit. Ambiguity of the solution is eliminated by preliminary Monte Carlo search and by applying known absolute dates for record itself. The method was first checked on synthetic data and then applied to the real records.

Under the chronologies constructed, the spectra of the records changed. Of coarse, the orbital periods (19-, 23-, 41-, ~100 kyrs) got accentuated; in addition, the combination cycles (~30- and ~70 kyrs) are changed in some records. This allows to estimate the relation between non-linearities of climatic response and those caused by chronological non-linear distortions for each paleoclimatic record.

The detailed depth-age model allowed to estimate sediment accumulation rates dZ/dt

both within interglacials and glacial intervals in Baikal. We discuss competitive contribution of clastic (terrigenous) and autigenic (biogenic, etc.) sedimentation into the observed values of mean sediment accumulation rate on top of underwater Academicheskyy Ridge in Lake Baikal during last 450 kyrs.

Within models created we analyze the estimated phases in response to changing precession, obliquity and eccentricity, for all the records. The earliest reaction to all three orbital parameters is determined for continental paleoclimate recorded in Baikal bottom sediments. Obvious enough in this analysis is 100-kyr cycle of orbital eccentricity which leads in Baikal's paleorecord. The probable reasons for fast response are 1) relatively low inertness of compact climatic system of the continent itself, as well as 2) its ability to operate as (relatively) self-consistent climatic machine, able to reproduce planetary climatic patterns (orbitally-forced) within the continent.

Current investigation was supported by RFBR grants 03-05-65352 and 04-05-64395 and by the Siberian Branch of Russian Academy of Science, grant 121.