

Oxygen isotopes of diatom silica and their utility for palaeothermometry

ROBERT MOSCHEN¹, ANDREAS LÜCKE¹,
JÖRN PARPLIES^{1,2} AND GERHARD H. SCHLESER¹

¹Institute of Chemistry and Dynamics of the Geosphere V:
Sedimentary Systems, Research Centre Juelich, D-52425
Juelich, Germany (r.moschen@fz-juelich.de,
a.luecke@fz-juelich.de,
j.parplies@fz-juelich.de,
g.schleser@fz-juelich.de)

²Department of Geography, Universität zu Köln (University of
Cologne), D-50923 Cologne, Germany

The use of the oxygen isotope composition of diatom silica ($\delta^{18}\text{O}_{\text{diatom}}$) as a palaeothermometer has found increasing attention. Two main reasons have hindered an even broader application: Firstly, substantial analytical problems with the preparation of diatom frustules, particularly from fresh diatom silica and, secondly, considerable uncertainty with respect to the temperature dependence of the oxygen isotope fractionation during silica formation. We have developed a novel technique for the determination of $\delta^{18}\text{O}_{\text{diatom}}$ which is based on inductive heating and high temperature carbon reduction (iHTR) of the silica. With the new iHTR method quantitative silica disintegration with low sample amount and high accuracy and precision is achieved in one continuous routine in a high-vacuum device. Calibration studies with marine and freshwater diatoms had provided contradictory results with published temperature coefficients varying from zero to $-0.5\text{‰}/^{\circ}\text{C}$. Therefore, we have accomplished a calibration study using fresh diatoms grown during an annual cycle in Lake Holzmaar, a small freshwater lake (Germany). Based on identical results for three different diatom size fractions we propose a value of $-0.2\text{‰}/^{\circ}\text{C}$ as the most realistic temperature coefficient of oxygen isotope fractionation between diatom silica and lake water. However, at the sediment surface and within the surface sediment, an effect of silicon dissolution / biogenic silica maturation takes place that causes an ^{18}O enrichment of the diatom silica and introduces a possible bias with respect to palaeothermometry.

References

- Lücke A. *et al.* (2005), *Geochim. Cosmochim. Acta* **69**. 1423-1433.
Moschen R. *et al.* (2005), *Geophys. Res. Lett.* **32**. L07708.
Moschen R. *et al.* (2006), *Geochim. Cosmochim. Acta* **70**. 4367-4379.

Investigating empirical equations of determining concentration time of flood in Karaj river basin

B. MOTAMEDVAZIRI¹ AND, M. AGHAI²

¹Islamic Azad University, Science & Research Branch,
Faculty of Agriculture & Natural Resources, Tehran, Iran,
(bmvaziri@yahoo.com)

²Curative Services Office, Sanandaj, Iran, (Email:
(pegi_mv@yahoo.com))

Time parameters are used mostly in hydrologic and hydrolic models. The most often used time parameter in hydrology is concentration time.

Concentration Time is the time required for a particle of water to travel from the hydrologically most distant point in the watershed to outlet or designing point. Concentration time is used for designing spillway, estimating flood volume, preparing flood hydrograph and many other hydrologic analysis.

Many methods (empirical equations) are available for estimating concentration time. the aim of this research is selecting the best method(s) for estimating concentration time in the studied basin. To achieve the said aim, a field method based on measurement of travel time by salt solution is used. In order to select the best method(s) for estimating concentration time in the basin, the defference between values obtained by using these methods and the field method are determined.

Results of this research show that In steep area, SCS Lag method is the best for estimating concentration time. In this area Ventura, Gianduti, Passini, and Carter methods provide a fairly good estimate of concentration time.

In flat area, Chow, Kirpich, Basoo, and California methods provide a fairly good estimate.