

## **Compound-specific radiocarbon dating of soil and sedimentary leaf waxes in an arid high-altitude environment**

BERNHARD AICHNER<sup>1,2</sup>, JANET RETHEMEYER<sup>3</sup>, MERLE GIERGA<sup>3</sup>, ALEXANDER STOLZ<sup>4</sup>, MONIKA MĘTRAK<sup>5</sup>, MATEUSZ WILK<sup>5</sup>, DIRK SACHSE<sup>6</sup>, ILHOMJON RAJABOV<sup>7</sup>, STEFFEN MISCHKE<sup>8</sup>

<sup>1</sup>IGB Berlin, Germany. bernhard.aichner@igb-berlin.de

<sup>2</sup>Inst. of Geosciences, Univ. Potsdam, Germany

<sup>3</sup>Inst. of Geology and Mineralogy, Univ. Cologne, Germany

<sup>4</sup>Inst. of Nuclear Physics, Univ. Cologne, Germany

<sup>5</sup>Fac. of Biology, Univ. Warsaw, Poland

<sup>6</sup>OSG Lab, GFZ Potsdam, Germany

<sup>7</sup>Tajik Hydromet, Dushanbe, Tajikistan

<sup>8</sup>Fac. of Earth Sciences, Univ. of Iceland, Reykjavik, Iceland

Compound-specific radiocarbon analysis (CSRA) of leaf waxes has revealed significant lag times before compounds are deposited in marine and lacustrine sediments. To elucidate transport dynamics of terrestrial leaf waxes in a cold and arid environment (MAT: -4°C, MAP <100mm), we determined CSRA-ages of selected long-chain *n*-alkanes in four surface soil samples (0-5 cm), collected from alpine meadows in the catchment of Lake Karakul (Pamirs, Tajikistan), and in two sections of a well dated sediment core from the same lake.

C<sub>29</sub> and C<sub>31</sub>-alkanes in the soil samples exhibited variable ages, ranging from 236±148 to 2261±105 yrs BP, which were on average older than those of compounds in comparable studies conducted in warm and humid environments. In the two sediment core samples, three of the four obtained ages for C<sub>29</sub>- and C<sub>31</sub>-alkanes are statistically indistinguishable from the the 2σ-uncertainty range of the modelled age (established by means of AMS <sup>14</sup>C<sub>TOC</sub> and OSL dating).

We conclude that pre-aging of terrestrial leaf waxes, i.e. accumulation over several hundred years in the surface soils, is a relevant factor in the catchment of Lake Karakul. On the other hand, the results confirm the applicability of the conventional age-model with respect to terrestrial biomarkers. The large span of CSRA-ages of soils give evidence for heterogenous decomposition and transport conditions in the catchment and we hypothesize that compounds with longer pre-aging contributed in lower proportions to the accumulated lake sediments.