A source-to-sink study of terrestrial biomarkers along the modern Danube river system

C. V. FREYMOND[1]*, F. PETERSE[12], L. GIOSAN[3], F. FILIP[45] AND T. I. EGLINTON[1]

[1]Geological Institute, ETH Zürich, Switzerland (*Chantal.Freymond@erdw.ethz.ch, timothy.eglinton@erdw.ethz.ch)
[2]Geochemistry, Utrecht University, Netherlands (f.peterse@uu.nl)
[3]Geology & Geophysics, Woods Hole Oceanographic Inst., MA, USA (lgiosan@whoi.edu)
[4]Department of Geography, University of Bucharest, Romania
[5]Fabrica De Cercetare, Bucharest, Romania (felipe_fad@yahoo.com)

Organic carbon (OC) discharged by rivers and buried in continental margin sediments represents an important carbon sink and a valuable record of information on past environmental variations on the continents. In this context, it is crucial to understand the sources of carbon in river basins and the factors that influence biomarker signals during transport from the continental source to the oceans. In this study, we adopt a source-to-sink approach where concentration and compositional variations in branched glycerol dialkyl glycerol tetraethers (brGDGTs), plant wax fatty acids and lignin phenols in fine-grained (<63 μm) riverbank sediment deposits from the Danube River are investigated. In combination with compound-specific stable carbon and hydrogen isotope measurements and ultimately biomolecular ^{14}C dating, we seek to establish geochemical "fingerprints" of the largest tributaries and follow the evolution of these signatures along the course of the river, from headwater tributaries to its delta. Spatial trends in biomarker concentrations along the river transect are set in context with mineralogical characteristics of the fluvial sediments and assessed through normalization to mineral-specific surface area. Surface area-normalized total organic carbon, brGDGT and plant wax concentrations show a clear trend to decreasing values (ng compound m^{-2}) from the upper to the lower catchment. The distributions of brGDGTs, a group of soil bacterial membrane lipids that has been shown to record local environmental parameters, reflect the trend of increasing air temperature from the upper to the lower reaches of the Danube. This trend suggests an increasing contribution of soil organic carbon from tributaries joining the lower Danube basin to the OC that is finally delivered to the delta.