

MASTER THESIS IN COMPUTATIONAL BIOLOGY & SEDIMENTOLOGY

The reactivity continuum of carbon decomposition in marine and freshwater sediments

A part of the organic carbon that passes through inland waters or is transported into coastal areas settles down to the sediments. A fraction of this sedimented organic carbon becomes microbially mineralized to carbon dioxide, and is emitted to the atmosphere. Another proportion becomes buried for geological timescales. The fractions of mineralized vs. buried organic carbon depends for example on the quality of the organic matter (e.g. terrestrial derived or internally produced), the sediment oxygen penetration depth or temperature.

The 'reactivity continuum model' is a statistical model that was developed in sedimentology to describe sediment organic carbon decomposition. In contrast to the commonly applied exponential or multi-exponential decay models, the reactivity continuum model accounts for the fact that the decay coefficients decrease over time because the easier decomposable compounds are lost first. Yet, this model has, after its development, not yet been applied on a larger dataset of sediment organic carbon decomposition.

The objectives of the proposed master thesis study are to 1) conduct a literature survey collecting organic carbon depth profiles from many different marine and freshwater sediments, 2) apply the reactivity continuum model on the suitable datasets (i.e. those where organic carbon loss over depth can largely be attributed to decomposition based on system background information), 3) investigate the environmental factors regulating the reactivity continuum model parameters and 4) compare the reactivity continuum model parameters from sediments to those from decomposition of other organic pools available from earlier studies (e.g. dissolved organic carbon and leaf litter decomposition). Methodologically, the thesis contains mostly literature research, and statistical modeling as well as data analysis using the programming language R.

The master student will be part of the highly motivated and active research group 'Biogeochemistry and Climate Impact' at the Department of Limnology Evolutionary Biology Centre, Uppsala University. The supervision will be conducted by Birgit Koehler. The starting date will be as agreed upon.

Interested candidates please contact Birgit Koehler (birgit.koehler@ebc.uu.se) for further information.

