Geophysical Research Abstracts
Vol. 16, EGU2014-7192, 2014
EGU General Assembly 2014

Organic matter turnover in reservoirs of the Harz Mountains (Germany): evidence from 13C/12C changes in dissolved inorganic carbon

Johannes A.C. Barth (1), Franziska Nenning (2), Robert van Geldern (1), Michael Mader (1), and Kurt Friese (3)

(1) GeoZentrum Nordbayern, Lehrstuhl für Angewandte Geologie, Erlangen, Germany (johannes.barth@fau.de), (2) Institut für Geologie und Paläontologie. Westfälische Wilhelms-Universität Münster. Corrensstrasse. 24. 48149 Münster. Germany, (3) UFZ – Helmholtz Centre for Environmental Research. Brückstr. 3a. 39114 Magdeburg. Germany

The Harz Mountains in Germany host several reservoirs for drinking water and electricity supply, the largest of which is the Rappbode System with its two pre-reservoirs. They are the Hassel and the Rappbode pre-reservoirs that have about the same size. These pre-reservoirs were investigated in a comparative study in order to quantify turnover of dissolved organic carbon (DOC) as a representative for organic matter. The objective was to find out how organic matter turnover in these reservoirs may affect dissolved inorganic carbon (DIC) and related CO_2 dynamics.

Depth profiles of dissolved organic and inorganic carbon (DOC and DIC) were established together with their carbon stable isotope distributions (expressed as δ13CDIC and δ13CDOC). Our results showed up to 104 % increase of DIC contents by organic matter turnover when calculated via isotope mass balances. This contrasted observations of DIC concentration differences between waters collected at the surface and at 12 m depth. These concentration comparisons showed much less DIC increases, and in some cases even decreases, between surface and bottom waters. Such discrepancies could be explained by formation of CO_2 at depths below the photic zone that reached calculated values above 7000 ppmV. Such high CO_2 concentrations may have reduced the DIC pool by upwards migration. Despite such a concentration decrease, turnover of organic matter has likely incorporated its isotope signal into the DIC pool.

While not all DOC present was transposed to DIC, other forms of organic matter from sediments may also have transferred their isotope ratio on the DIC pool. However, with its stable isotope ratio of -28.5 permille the measured DOC was representative of C3 plants and can be assumed as a proxy for other forms of sedimentary carbon including carbon from pore waters and particulate organic matter.

Other carbon turnover, including DOC leaching, increased import to the reservoirs after precipitation events and photosynthetic uptake of DIC could also be observed in surface waters. In addition, near-bottom waters in the reservoirs showed first signs of methane formation that were indicated by enrichment in 13C of the DIC.