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Getting radical – hydroxyl radicals in marine sediments.

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Burial of organic matter (OM) in sediments on geological time scales play an important role in controlling atmospheric oxygen concentrations. Multiple mechanisms controlling OM burial in sediments have been proposed and the scientific discussion is controversial. One proposed mechanism is that formation of small, highly-reactive, oxygen-containing species, such as hydrogen peroxide and hydroxyl radicals, may be important in degradation of sorbed OM under oxic conditions. No studies have shown the presence of reactive oxygen species in sediments. We have carried out calculations showing that abiotic formation of hydroxyl radicals from hydrogen peroxide and Fe^{2+} through the Fenton reaction may be substantial in coastal sediments. In addition, we have carried out preliminary experiments showing that we have a method for detection of hydroxyl radicals in sediment pore waters. We propose that hydroxyl radicals and hydrogen peroxide are formed in abiotic reactions affected by sediment redox conditions. Further, we propose that hydroxyl radicals and hydrogen peroxide have substantial formation rates in coastal sediments and that the formation rates and steady-state concentrations vary with season.