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# Early diagenesis of manganese and the sediment accumulation rate

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Manganese is a major red-ox reactive element of benthic metabolism. We have built a data base of benthic geochemistry of Mn in the Bay of Biscay in order to obtain a comprehensive picture of the behaviour of Mn in a variety of environments during early diagenesis. The data base contains vertical profiles of particulate and dissolved Mn species of 59 cores collected during 17 cruises between 1997 ad 2006 at nine stations positioned between 150 and 4800 m depth. All the stations show that the oxic layer contains Mn(III, IV) particles, the major part of which is of diagenetic origin, and results from the oxidation of pore water Mn(II) that diffuses from the anoxic sediment. At depth, dissolved Mn(II) concentrations are constant , which reflects probably an equilibrium with a solid Mn(II)-carbonate phase. Mn associated with carbonate is the ultimate phase into which Mn is fossilized. Bioturbation can convey Mn(III, IV) species in the anoxic sediment, where they are reduced. Then, a peak of dissolved Mn(II) appears in the anoxic sediment. In that case, the distribution of Mn species is not at steady state, but because dissolved Mn(II) is re-oxidized when it diffuses toward the oxic layer, the stock of diagenetic Mn(III, IV) phase stays at steady state, independently of bioturbation. For stations where (or periods when) bioturbation does not affect the dissolved Mn(II) profile, it is possible to calculate the time necessary to build the stock of diagenetic Mn(III, IV) particles, using the upward directed flux of pore water Mn(II). By applying this time to the accumulation of the sediment enclosed in the oxic layer, we obtain the overall sediment accumulation rate. The values calculated for the sediment of the Bay of Biscay fit well with accumulation rates obtained from radionuclides. The method is also validated with data collected on other marine sediment environments. This is a contribution of the FORCLIM project.