

Modelling of Subsurface Calcite Dissolution Regarding Respiration and Re-oxidation Processes in the Equatorial Upwelling off Gabon

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The organic matter mineralisation and the resulting calcite dissolution was simulated for surface sediments on the upper continental slope off Gabon using in-situ measurements of O₂, pCO₂, pH and Ca with microsensors, porewater concentrations of NO₃⁻, Fe²⁺, Mn²⁺, SO₄²⁻ and sulphate reduction rates from incubation experiments. For modelling organic matter decay with several oxidants, redox-reactions and precipitation the transport and reaction model CoTReM was used. The best fit for the pH profile which is the most sensitive parameter was performed by adapting three different rate constants for the

calcite dissolution rate in the kinetic rate law. The rate constants vary between 5 and 0.12 mol . kgw⁻¹ . a⁻¹. The variation in the dissolution kinetic possibly depends on calcite ageing and/or alteration in the calcite-poor sediment. The degree of freedom for the fit of the pH value is limited by the succession of the reaction rates in the model as well as by the interactions between dissolution and precipitation of the single parameters. It is possible to point out the significance of the different processes of organic matter decay and to make a C-balance for input, decay and burial.