Geophysical Research Abstracts,
Vol. 11, EGU2009-5750, 2009
EGU General Assembly 2009

Enhanced ocean carbon storage from anaerobic alkalinity generation in coastal sediments

H. Thomas (1,2), L.-S. Schiettecatte (3), K. Suykens (3), Y. J. M. Koné (3), E. H. Shadwick (1), A. E. F. Prowe (1,4), Y. Bozec (5), H. J. W. de Baar (2), and A. V. Borges (3)

(1) Dalhousie University, Department of Oceanography, Halifax, NS, Canada (helmuth.thomas@dal.ca, +1 902 494-3877), (2) Royal Netherlands Insitute for Sea Research, Texel, The Netherlands, (3) University of Liège, Chemical Oceanography Unit, Liège, Belgium, (4) Leibniz-Institut für Meereswissenschaften, IFM-GEOMAR, D-24105 Kiel, Germany, (5) SCRIPPS Institution of Oceanography, La Jolla, CA, USA

The coastal ocean is a crucial link between land, the open ocean and the atmosphere. The shallowness of the water column permits close interactions between the sedimentary, aquatic and atmospheric compartments, which otherwise are decoupled at long time scales (>1000 yr) in the open oceans. Despite the prominent role of the coastal oceans in absorbing atmospheric CO2 and transferring it into the deep oceans via the continental shelf pump, the underlying mechanisms remain only partly understood. Evaluating observations from the North Sea, a NW European shelf sea, we provide evidence that anaerobic degradation of organic matter, fuelled from land and ocean, generates total alkalinity (AT) and increases the CO2 buffer capacity of seawater. At both the basin wide and annual scales anaerobic AT generation in the North Sea's tidal mud flat area irreversibly facilitates 7-10%, or taking into consideration benthic denitrification in the North Sea, 20-25% of the North Sea's overall CO2 uptake. At the global scale, anaerobic AT generation could be accountable for as much as 60% of the uptake of CO2 in shelf and marginal seas, making this process, the anaerobic pump, a key player in the biological carbon pump. Under future high CO2 conditions oceanic CO2 storage via the anaerobic pump may even gain further relevance because of stimulated ocean productivity.