Geophysical Research Abstracts
Vol. 18, EGU2016-4722, 2016
EGU General Assembly 2016

Regulation of CO_2 Air Sea Fluxes by Sediments in the North Sea

William Burt (1), Helmuth Thomas (1), Mathilde Hagens (2), Heiko Brenner (3), Johannes Pätsch (4), Nicola Clargo (5), and Lesley Salt (6)

(1) Dalhousie University, Department of Oceanography, Halifax, NS, Canada (helmuth.thomas@dal.ca), (2) Department of Earth Sciences - Geochemistry, Utrecht University, Utrecht, The Netherlands, (3) Royal Netherlands Institute for Sea Research, Yerseke, The Netherlands, (4) Institute for Marine Sciences, ZMAW, University of Hamburg, Hamburg, Germany, (5) Royal Netherlands Institute for Sea Research, Texel, The Netherlands, (6) Station Biologique de Roscoff, Roscoff, France

A multi-tracer approach is applied to assess the impact of boundary fluxes (e.g. benthic input from sediments or lateral inputs from the coastline) on the acid-base buffering capacity, and overall biogeochemistry, of the North Sea. Analyses of both basin-wide observations in the North Sea and transects through tidal basins at the North-Frisian coastline, reveal that surface distributions of the δ13C signature of dissolved inorganic carbon (DIC) are predominantly controlled by a balance between biological production and respiration. In particular, variability in metabolic DIC throughout stations in the well-mixed southern North Sea indicates the presence of an external carbon source, which is traced to the European continental coastline using naturally-occurring radium isotopes (224Ra and 228Ra). 228Ra is also shown to be a highly effective tracer of North Sea total alkalinity (AT) compared to the more conventional use of salinity. Coastal inputs of metabolic DIC and AT are calculated on a basin-wide scale, and ratios of these inputs suggest denitrification as a primary metabolic pathway for their formation. The AT input paralleling the metabolic DIC release prevents a significant decline in pH as compared to aerobic (i.e. unbuffered) release of metabolic DIC. Finally, long-term pH trends mimic those of riverine nitrate loading, highlighting the importance of coastal AT production via denitrification in regulating pH in the southern North Sea.