



THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics
and
Department of Ocean Science

JOINT SEMINAR NOTICE

**Controls on Surface Water Carbonate Chemistry in
North American Ocean Margins**

by

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Abstract

While spatial patterns of carbonate system properties and their variability have been a focus of studies in the global ocean, such large-scale syntheses are lacking for the coastal oceans. Our ability to plan for the impacts of ocean acidification especially in more dynamic coastal domains is still quite limited. Here, we show that in the Atlantic and Gulf coasts total dissolved inorganic carbon (DIC) and carbonate mineral saturation state (Ω) are largely controlled by partial gas equilibrium with the atmosphere resulting in low DIC to total alkalinity (TA) ratios and high Ω in warm southern waters and the opposite in cold northern waters, making the latter more vulnerable to acidification. However, pH and the partial pressure of carbon dioxide ($p\text{CO}_2$) have no simple spatial pattern. This is because that acid-base equilibrium is not sensitive to temperature changes for DIC and Ω , rendering the control of their meridional distributions to be regulated by the temperature sensitive CO_2 solubility. By contrast, the two temperature effects cancel each other out for pH and $p\text{CO}_2$, and lead to no simple pattern in their meridional distributions. Within the California Current System in the Pacific coast, however, upwelling brings subsurface waters with high DIC and low temperature, Ω , and pH, while biological CO_2 removal works to counteract these patterns. This results in waters with high pH but low Ω , confounding general carbonate system relationships found in open ocean waters and challenging our ability to readily anticipate biological responses to future acidification. Perturbation of the carbonate chemistry from equilibrium with the atmosphere by coastal ocean processes may strongly amplify ocean acidification signals.

Finally, I will also discuss changes in the CO_2 chemistry seasonal variability patterns in the US eastern ocean margins over the past few decades.

Date : 5 November, 2019 (Tuesday)
Time : 2:00pm – 4:00pm
Venue : Room 2408 (Lift no. 17/18)
HKUST, Clear Water Bay, Kowloon

(Host faculty: Prof. GAN Jianping)

All Are Welcome!