



THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics  
and  
Department of Ocean Science

***JOINT SEMINAR NOTICE***

**Sea-ice loss amplifies summer-time decadal CO<sub>2</sub>  
increase and ocean acidification rates in the  
western Arctic Ocean**

by

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**Abstract**

The Arctic Ocean is potentially a major sink for atmospheric CO<sub>2</sub> as is suggested by its low partial pressure of CO<sub>2</sub> ( $p\text{CO}_2$ ). While the Arctic Ocean has experienced rapid warming and sea-ice loss, their impacts on long-term  $p\text{CO}_2$  trends, rate of ocean acidification and their seasonal variations are unknown. Here we report decadal changes of summer-time sea surface  $p\text{CO}_2$  and ocean acidification from 1994-2017 in the western Arctic Ocean. We find widely variable changes in sea surface  $p\text{CO}_2$  with an increasing rate in the ice-free deep Canada Basin twice higher than that of the atmosphere CO<sub>2</sub>, which contrasts with no significant change in the shallow waters of the Chukchi Sea shelf. Acidification rates in the Canada Basin is also much faster than other ocean basins. Our analysis suggests that the reduced ice concentration in the Canada Basin facilitated an enhanced CO<sub>2</sub> uptake, a rapidly increasing sea surface  $p\text{CO}_2$ , and an amplified seasonal variation of  $p\text{CO}_2$  as well as rate ocean acidification. Thus, the summer-time CO<sub>2</sub> sink intensity has rapidly reduced during the low ice period of later summer in the Canada Basin and is expected to reach zero within the following decade. In contrast, strong biological uptake of CO<sub>2</sub> in the shelf waters has held  $p\text{CO}_2$  lower with less seasonal difference in the Chukchi Sea and thus air-sea CO<sub>2</sub> difference and CO<sub>2</sub> sink have increased and are expected to increase further in the future. Improved understanding of processes regulating seasonal variability of  $p\text{CO}_2$  and acidification in the Arctic Ocean is essential for reliable forecasting of multi-decadal response of the ocean carbon cycle to climate change.

**Date : 11 November, 2019 (Monday)**  
**Time : 2:00pm – 4:00pm**  
**Venue : Room 4621 (Lift no. 31/32)**  
**HKUST, Clear Water Bay, Kowloon**

**(Host faculty: Prof. GAN Jianping)**

*All Are Welcome!*