

Predicting Tidal Marsh Survival or Submergence to Future Sea-level Rise Using Paleo Sea-level Data

Speaker: Professor Benjamin P. Horton
Asian School of the Environment, NTU

Chair: Dr Chris Gouramanis
Department of Geography, NUS

Date/Time: Friday 7 September, 3.30pm

Place: Earth Lab (AS2 #02-03), Department of Geography, NUS

Abstract

Tidal marshes are vulnerable to relative sea-level rise (RSLR), because they occupy a narrow elevation range, where marshes retreat and convert to tidal flat, tidal lagoon or open water if inundated excessively. But regional and global models differ in their simulations of the future ability of marshes to maintain their elevation with respect to the tidal frame. Some landscape models predict up to an 80% decrease in global tidal marsh area by 2100, with substantial marsh loss even when RSLR rates are less than 8 mm/yr. By contrast, other simulation studies suggest that, through biophysical feedbacks and inland marsh migration, marsh resilience to retreat is possible at RSLR rates in excess of 10 mm/yr. The compilation of empirical data for tidal marsh vulnerability is essential to addressing disparities across these simulation studies.

Here we assess the limits to marsh vulnerability by analyzing >780 Holocene reconstructions of tidal marsh evolution in Great Britain, which includes both transgressive (tidal marsh retreat) and regressive (tidal marsh expansion) contacts. The probability of a marsh retreat was conditional upon Holocene rates of RSLR, which varied between -7.7 and 15.2 mm/yr. Holocene records indicate marshes are nine times more likely to retreat than expand when RSLR rates are ≥ 7.1 mm/yr. Coupling probabilities of marsh retreat with projections of future RSLR suggests a major risk of tidal marsh loss in the 21st century. All of Great Britain has a >80% probability of a marsh retreat under Representative Concentration Pathway (RCP) 8.5 by 2100, with areas of southern and eastern England achieving this probability by 2040.

About the Speaker

Benjamin Horton is the Chair of the Asian School of the Environment, Nanyang Technological University, Singapore. He was previously a Professor at Rutgers University and an Associate Professor at the University of Pennsylvania. Professor Horton obtained his BA from the University of Liverpool, UK, and PhD from the University of Durham, UK.

Professor Horton has won a number of awards in his career. For excellence in research, he has received awards from European Geosciences Union (Plinius Medal), American Geophysical Union (Voyager Award) the Geological Society of America (W. Storrs Cole Award) and Commanding General of the North Atlantic Division of the United States Army Corps of Engineers (Medal for Research Excellence). He was made a Fellow of the Geological Society of America in 2013 and a Fellow of the American Geophysical Union in 2018. Professor Horton was inducted into the World Class Professor Program by the Directorate of Higher Education of Indonesia. Professor Horton was an author of the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report and is an Editor for the new 6th Assessment Report. He was a project leader of International Geoscience Programme (IGCP) 588. He is currently a committee member of PALSEA (PALEO-constraints on SEA-level rise) and Councilor for Marine Geoprocesses for the American Quaternary Association. For excellence in teaching and outreach, Professor Horton has received the Linnean Society award for contributions to biological diversity and evolution, The Higher Education Funding Council for England Excellence in Teaching Award and the Menzies Australian Bicentennial Award for promoting scholarship, intellectual links, and mutual awareness and understanding between the United Kingdom and Australia. Professor Horton's research was cited by President Obama in his 2015 State of the Union Address at the United States Capitol on January 20th 2015.

Professor Horton has published over 200 articles in peer-reviewed journals, including 25 articles in Science, Nature, Proceedings of the National Academy of Sciences, and Geology. Professor Horton is supervising or has supervised 22 students to the degree of PhD and 16 postdoctoral scientists, of which 14 now occupy academic positions. Professor Horton's research concerns sea-level change. He aims to understand and integrate the external and internal mechanisms that have determined sea-level changes in the past, and which will shape such changes in the future. Professor Horton's research impacts upon important ethical, social, economic and political problems specifically facing such coastal regions.

ADMISSION IS FREE - ALL ARE WELCOME