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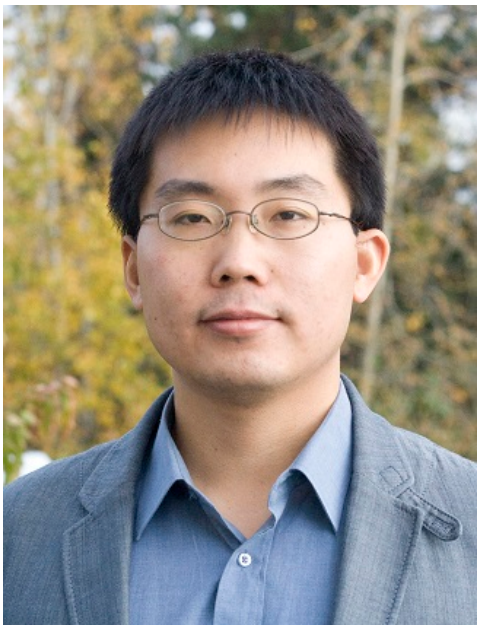

UAA Professional Development Seminar Series

A Comprehensive, Process-based Model for Arctic Coastal Erosion

Presented by Dr. Jifeng Peng,
Professor of Mechanical Engineering,
UAA

In Arctic Alaska, coastal erosion rates are accelerating due to climate warming. The erosion is causing large-scale land loss, and is a potential hazard for infrastructure in many coastal communities, military installations, oil and gas fields, etc. Therefore, it is imperative to understand the physical mechanisms of Arctic coastal erosion and to establish models to quantitatively assess the process. However, the Arctic coastal erosion process is unique compared with erosion in warm-climate regions. It is more complex as it includes many physical processes and their interactions, such as storm surges, wave impacts, permafrost thaw, block collapses, etc. Therefore, it makes process-based models for arctic coastal erosion more challenging. In this study, a comprehensive, process-based model for Arctic coastal erosion is established. In the model, storms and waves are described by hydrodynamics, permafrost thaw is governed by heat transfer, erosion is represented by fluid-structure interactions, and block collapses are dictated by soil mechanics. In model implementation, these components of the model are coupled at run-time through a finite-element-based numerical scheme. As a case study, the model is applied to the erosion on a coastal bluff. The study can demonstrate permafrost thaw due to the higher sea water level and temperature; bluff base erosion due to impact of imping waves on thawed soil; and block collapses due to bluff base erosion. The model is demonstrated as a useful tool to understand and to assess Arctic coastal erosion.

Dr. Jifeng Peng is a Professor of Mechanical Engineering at the University of Alaska Anchorage. His research interests include: Computational fluid dynamics (CFD), propulsion, wind and hydro energy, micro-grid, environmental transports, pipeline flows, multiphase flow in porous media, vortex dynamics, marine structures, fluid-structure interactions, oil spills.

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Online Via YouTube Live