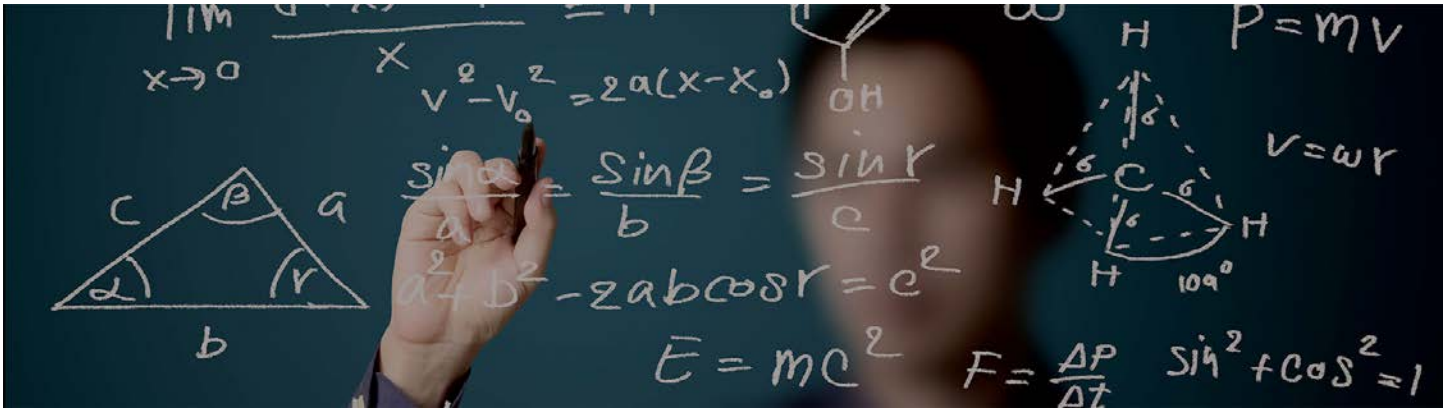

Spring 2019

RENSSELAER POLYTECHNIC INSTITUTE

DEPARTMENT OF MATHEMATICAL SCIENCES
COLLOQUIUM/RTG SEMINAR

"A large deviation method for the quantification of extreme surface gravity waves"

Abstract: We interpret the formation of rogue waves on the surface of deep water using tools from large deviation theory and optimal control. We compute the instantons of the problem, i.e. the most likely realizations leading to extreme surface elevations via the governing nonlinear dynamics. Strikingly, the larger waves closely follow the instanton evolution, with small extra fluctuations. Our results are validated by Montecarlo and by real experimental data in a wave flume accross a wide range of forcing regimes, generalizing the existing theories in the limiting linear and highly-nonlinear cases.

The results are obtained in the one-dimensional set-up of the flume, but the method is general and can be extended to the fully two-dimensional case of the ocean. In principle, the framework is exportable to other nonlinear physical systems, to study the mechanisms underlying the extreme events and assess their risk.

Giovanni Dematteis, Politecnico Di Torino (DISMA)

Monday, May 6, 2019 4-5pm

Amos Eaton 214

Host: Yuri Lvov

Refreshments served 3:30-4pm Amos Eaton 4th Floor Lounge