The title for my talk is: The role of multiphase flow in Nature’s extremes

Abstract: How fast can ice sheets disintegrate? Why do volcanoes erupt? When do induced earthquakes pose unacceptable risk? How can we limit the destructive reach of tsunamis? The common denominator of what at first glance might seem like disparate systems is multiphase flow. The dynamic interactions between multiple solid and fluid phases - such as rock and wastewater, ice and meltwater, magmatic mush and gas - give rise to drastic nonlinearities that govern abrupt change. This talk explores the role of multiphase instabilities in the onset and evolution of extreme events for different natural settings including induced seismicity, Antarctica, and basaltic volcanoes and discusses why it is beneficial to study these problems within a common multiphase framework. To bridge the drastically different scales, my group develops a suite of customized numerical models at a wide range of spatial and temporal scales.

On the next page, please see the four examples of the kinds of extreme events I will discuss in my talk: View of a shear margin on the Ronne Ice Shelf (Maria-Jose Vinas, NASA DC-8), eruption of Stromboli volcano in Italy (Tom Pfeiffer, VolcanoDiscovery), the damage created by induced earthquakes in Oklahoma (Jim Beckel, The Oklahoman), and the Japan tsunami washing onshore.