# Subglacial bathymetry beneath the Pine Island Glacier ice shelf from airborne gravity, constrained by autonomous underwater vehicle data

*Atsuhiro Muto and Sridhar Anandakrishnan*
*Dept. of Geosciences and Earth and Environmental Systems Institute,*
*The Pennsylvania State University*

Nearly two decades of satellite observations have revealed that Pine Island Glacier (PIG) is experiencing acceleration in its flow speed and rapidly losing mass. Oceanic influence has been identified to play a key role in the mass loss of PIG; warm Circumpolar Deep Water (CDW) penetrates in to Pine Island Bay and under the ice shelf, causing several tens of meters per year of melting under the ice shelf which leads to its thinning and speed-up of the flow. The delivery of the heat to the bottom of the ice shelf from the ocean is controlled by the bathymetry and the configuration of the cavity beneath the ice shelf that allows the access of the CDW. However, the subglacial cavity configuration is poorly known except along a few survey lines of an autonomous underwater vehicle (AUV) that was conducted in 2009 (Jenkins et al., 2010).

Here we present models of the subglacial bathymetery underneath the ice shelf of PIG inverted from the airborne gravity data acquired by the Operation IceBridge. Our aim is to improve the existing bathymetry model by constraining the inversion with several profiles of the seabed depth beneath the ice shelf gathered by an AUV. Gravity inversion is an inherently non-unique problem and interpretation of the result needs caution. Therefore, we attempt to quantify the uncertainty of the model by examining statistical measures of large number of models obtained by a method based on Simulated Annealing, as well as comparing the model given by a different approach (Parker-Oldenbergôs algorithm).