Interaction of the Great Sumatra Earthquake with an Antarctic ice shelf rift: Preliminary results from GPS and seismic observations of a rift on the Amery Ice Shelf 2004-2005

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Rifts in the Antarctic ice shelves are large through-cutting fractures that penetrate the entire thickness of the shelf. The largest glaciological fractures on Earth, rifts eventually form the boundaries from which large tabular icebergs calve. Despite the important role that iceberg calving plays in the mass balance of the Antarctic ice sheet -accounting for more than two thirds of the total mass lost to the ocean - very little is known about the processes that cause rifts to initiate and, subsequently to propagate. The relative contributions of glaciological and environmental forces to rift propagation are still unknown -- e.g. how do factors such as storms and ocean swell affect rift propagation? To learn more about rift propagation we have been monitoring a rift on the Amery Ice Shelf using seismometers and GPS. Observations from previous field seasons have shown that the rift propagates episodically in bursts that are neither correlated with winds nor tides. Serendipitously, during the latest field season (2004-5) our instruments were deployed one week before the magnitude 9.3 Sumatra earthquake. Not only is the earthquake clearly visible in our seismic records, but we also see the arrival of T-waves (acoustic waves which propagate through the ocean) as well as the tsunami triggered by the earthquake. This presents us with a novel opportunity to not only study the effects of winds and tides, but also whether the earthquake and tsunami influenced rift propagation. We present preliminary results comparing patterns of seismicity before and after the earthquake which we then use to determine if either the earthquake or tsunami were able to trigger a burst in rift propagation. Based on these results, we discuss the implications for how other other external environmental processes which we haven't been able to directly measure (e.g. ocean swell from large storms) might affect propagation.