

New Earth and Planetary Science Discoveries Enabled by the Optical Fiber Sensing Revolution

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Optical fiber sensors constitute the biggest revolution in geophysical and environmental sensor technology since digitization. Although traditional sensors have been refined through decades of incremental progress, optical fiber sensors provide an entirely new lens with which to study fundamental processes. These sensors are particularly advantageous for systems that require high spatial and temporal resolution (i.e., on the order of 1-10m spatial scale and 100 s to 100 kHz sampling rate). The UW Fiber Lab has deployed these technologies in Antarctica, Greenland, Alaska, New Zealand, and at a dozen sites in Europe and the lower United States. The main focus of this research has been on studying Earth's cryosphere, submarine, urban, and otherwise difficult-to-instrument environments. This talk will focus specifically on use cases where basic knowledge has been gained regarding the calving front of large, ocean-terminating glaciers in Greenland, paleoclimatic history of the Antarctic ice sheet, monitoring of clean energy systems, and earthquake detection and ground motion hazard characterization. The presentation will conclude with a forward looking discussion regarding the rapid pace of development of basic optical physics and engineering, and the prospects for future growth at the intersection of optical fiber sensor technology and basic geoscience research.