

Overview/Abstract for 2021 OVPR proposal
A seismic nodal array investigation to the Turkana Basin, Kenya

Turkana Basin, located in northern Kenya, is unique worldwide and holds strong scientific significance. With its exceptional fossil record, widespread and dateable volcanic deposits, spanning nearly 30 million years, and central position in the East African Rift System (EARS), the Turkana Basin provides a natural testbed to study the interaction between geophysical, climatic, and biotic processes in a single basin with remarkable detail. Connecting these scientific themes is the subsurface seismic structure (including both the sedimentary basin and crust) that bears the signature of complex geological history and landscape evolution. This subsurface structure, detectable by tomographic images made by seismic records, however, has not been well constrained for this region because of a gap in observational instrumentation. In this proposal, we team up with the Turkana Basin Institute to address this challenge by deploying 180 seismic nodes crossing the Lake Turkana and analyzing the continuous seismic data collected. Particularly in this 15-month project, we will perform three aspects of work: 1) take a 40-day field trip to northern Kenya and set up a 220-km long, dense seismic nodal array to record ~ 1 month of continuous seismic record. 2) applying a variety of modern data processing and imaging techniques to the recorded seismic data and construct the first high-resolution structural image of the sedimentary basin and underlying crust along the seismic profile; and 3) closely working with graduate and undergraduate students from Stony Brook, community college interns from Long Island, and local Kenya students in all aspects of the work, from data collection to synthesis of the result. These activities, if funded, will allow us to: 1) test the feasibility of deploying this nodal array in a desert environment; 2) establish an efficient workflow for future, larger-scale seismic deployment in this region; and 3) establish a framework of outreach activities to attract a diverse next generation of geoscientists. Fulfilling these objectives will lay a foundation for us to submit future NSF proposals to perform a large-scale field deployment in the Turkana Basin area to fill a crucial observational gap of seismic instrumentation in the EARS. Additionally, the proposed work will also advance the PI's career as a tenure-track faculty member at Stony Brook University by establishing a close collaboration with the Turkana Basin Institute and jumpstarting an ambitious plan of putting out seismic arrays in other tectonically interesting areas globally.