I am Dr. Robert McCoy, Director of the Geophysical Institute (GI) at the University of Alaska Fairbanks. The GI was established by an act of Congress in 1946 at the end of WWII which called for the:

"*establishment of a geophysical institute at the University of Alaska…dedicated to the maintenance of geophysical research concerning the arctic regions*"

The primary motivation for the creating the GI was to mitigate impacts to high frequency communication caused by the space weather effects on the ionosphere but also because of the diverse and abundant natural hazards in the Arctic. The people of Alaska are reminded about these hazards regularly. Ash from the ongoing eruption of the Pavlof volcano caused the cancellation of more than 70 flights, and delayed my own trip here to DC by two days. In January, shaking from a magnitude 7.1 earthquake under Cook Inlet was so strong that it ruptured gas lines and caused fires that destroyed 4 homes in the town of Kenai.

Important hazards in Alaska that fall under the purview of the USGS include:

- Volcanoes - we have 52 historically active volcanoes, with a new eruption on the average about every three months. About 85% of air traffic from Asia passes over these volcanoes including 50,000 passengers per day. Alaska Volcano Observatory (AVO) is charged with monitoring these volcanoes, as a partnership between the USGS, the GI, and the state of Alaska.

- Earthquakes – Alaska is by far the most seismically active state. Last year the Alaska Earthquake Center (AEC) recorded and located 40,000 earthquakes in Alaska (about one every 13 min). The second largest earthquake ever recorded was in Alaska and 90% of US earthquakes above magnitude 6 are in Alaska.

- Tsunamis – Alaska has been battered over time by numerous tsunamis and the shoreline of Alaska still bears the marks of the residue from the tsunami generated by the 1964 "Good Friday Earthquake". Tsunamis from this and several other Alaska earthquakes have crossed the Pacific to cause severe damage and casualties in Hawaii and the west coast.

- Snow, ice, permafrost and glaciers: We have a coastline larger than the rest of the US with extensive sea ice, more permafrost than an area twice the size of Texas and more than 100,000 glaciers. Most of those glaciers are losing mass rapidly.

- Space weather: Throughout the winter months (weather permitting) residents of Alaska are treated to glorious displays of auroral activity. While unforgettably beautiful, this space weather effect plays havoc with a wide range of communication and navigation systems including HF, satellite communications and GPS navigation. Large magnetic storms can drive geomagnetically induced currents threatening power grids and potentially causing large area power outages.

For 70 years the GI has performed research and educated students in a wide range of geophysical phenomena in Alaska and around the world but our mission extends beyond research to operations. The GI is Alaska's largest in-state source of natural hazards research and monitoring. We install, maintain, and operate sensor networks and analyze data to provide hazard warnings and assessment to the State of Alaska and the nation. In Alaska we partner with the Alaska Division of Geological & Geophysical Surveys (ADGGS) and the USGS to operate the Alaska Volcano Observatory (AVO), the Alaska Earthquake Center (AEC) and the College International Geophysical Observatory (CIGO). Additionally, we operate seven other research facilities for satellite downlink, mapping, infrasound monitoring, unmanned aircraft, sounding rockets and active ionospheric heating.

The partnership between the USGS and the GI has been mutually beneficial to both organizations for decades. The USGS providing federal standards, resources, and authority, while the GI provides in-state expertise, coordination with state government, and a tight connection to Alaska's research university.

The AVO, established in 1988, leverages the resources and unique capabilities of the GI, DGGS and USGS and is physically distributed across all three organizations. Because the vast majority of explosive domestic volcanic eruptions occur in Alaska, AVO is not only at the forefront of monitoring, it is also the source of much of our understanding about how eruptions unfold. AVO is the model for how a volcano observatory can be operated as a joint partnership between the USGS and state entities.

The AEC was established in 1989 specifically to unite the separate earthquake monitoring efforts being carried out at the time by the USGS and the GI. Uniting earthquake monitoring under one organization, housed at the GI, has been highly efficient, and is an ideal way to promote close consultation and joint messaging during earthquake crises. Today the AEC is the Alaska partner to the Advanced National Seismic System[1]. Because of Alaska's size and dynamic geology, the vast majority of large earthquakes in the United States are assessed and reported under the auspices of the AEC. The successful partnerships between the GI and the USGS is an excellent example of cooperation called for by the President in 2013 to help respond to natural and man-made disasters in the Arctic[2].

The GI supports the USGS efforts to establish and maintain congressional authorizations for the nation's hazards including the establishment of the National Volcano Early Warning System (NVEWS), the re-authorization of the National Earthquake Hazards Reduction Program (NEHRP), and the re-authorization of the Tsunami Warning, Education, and Research Act (TWERA). Living in a state with so many real natural hazards the GI is highly motivated to promote and support the adoption of these landmark congressional authorizations.

An initiative of the National Science Foundation, EarthScope, the final stage of which has recently come to Alaska provides a great potential to enhance hazards monitoring in the state. The EarchScope project has the Plate Boundary Observatory (PBO) and

USArray subprograms and will support the temporary deployment of diverse geophysical instrumentation across Alaska which will used monitoring and research for earthquakes, volcanoes, and tsunamis. The geodetic GPS data provided by the PBO has provided unprecedented resolution of deformation across Alaska, and enables diverse studies including volcanoes, glacier changes, hydrology, and snow depth. These data are currently informing the next generation of the USGS earthquake hazard maps. Earthquake activity in areas of Alaska that have long remained beyond of the reach of the ANSS will finally be revealed as the USArray seismic array continues be deployed. The USArray has the potential to harden real-time geophysical data collection to ensure continuity of operations and to lay a foundation for earthquake early warning. The PBO brought much-needed geodetic monitoring to several Aleutian volcanoes, and the infrasound component of USArray has now measured the atmospheric disturbance of eruptions hundreds of miles away. Together, USArray and the PBO have the potential to transform tsunami-warning capabilities by offering very rapid assessment of the largest earthquakes—a historically challenging task.

Transforming EarthScope assets deployed temporarily into a long-term facility requires coordinated effort and resources. The numerous vested parties in the state and at the federal level must be engaged so that the facility benefits as many stakeholders as possible. The financial support for this facility should come from a broad spectrum of agencies. All large collaborative efforts need leadership, however, and the long-standing partnership between the GI and the USGS can provide exactly that. The two organizations working together can harness the many resources and assets both in and out of state.

In 2017, under the Administration's new National Space Weather Strategy, the USGS Geomagnetism Program will be enhanced to provide improved geomagnetic monitoring with expanded international cooperation and data exchange to help address geomagnetic storm risk to the national power grid and electronic systems.

There is nothing new about all these natural hazards in Alaska, they have been occurring for millions of years. What is new is that as the globe warms and polar ice recedes, the nation is becoming aware of the importance of the Arctic and that because of Alaska, the US is an Arctic nation. Those coming to Alaska for research, investment, or operations should be aware of the diversity and magnitude of the natural hazards in Alaska. The GI is prepared to continue to partner with ADGGS and the USGS to monitor and help mitigate natural hazards in Alaska.

[1]Assessment of Seismic Monitoring in the United States: Requirement for an Advanced National Seismic System, http://pubs.usgs.gov/circ/1999/c1188/circular.pdf

[2]National Strategy for the Arctic Region, https://www.whitehouse.gov/sites/default/files/docs/nat_arctic_strategy.pdf