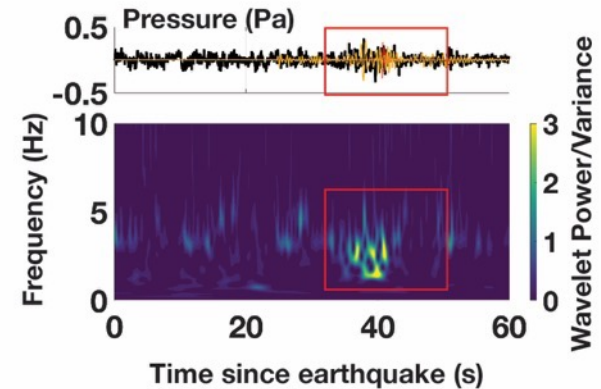
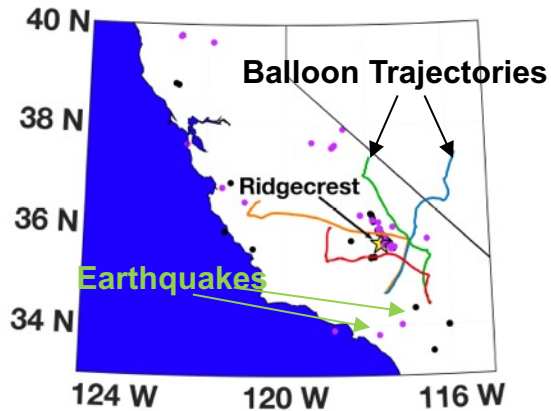




First Balloon-Based Detection of Earthquake

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- Solar-heated “heliotrope” balloons launched from the southern Mojave desert floated past the Ridgecrest area at 18-24 km altitude.
- Sensitive barometers suspended from the balloons recorded acoustic signals. Data recovered from the balloons were processed with sophisticated algorithms to search for correlations with earthquakes that had occurred during their flight.
- The acoustic signature of a magnitude 4.2 event detected on a balloon at 4.8 km altitude on July 22, 2019.
- Successful collaboration between JPL, Caltech’s Seismological Laboratory, Sandia National Laboratories, using software tools originally developed at ISAE-SUPAERO in Toulouse, France.

The Ridgecrest balloon campaign and data analysis was supported by JPL’s Strategic and Spontaneous Concepts R&TD Program, the NASA ROSES 2019 PSTAR program (NASA HQ Manager: Mary Voytek), and the Keck Institute for Space Studies (KISS) at the California Institute of Technology.

Brissaud, Q., Krishnamoorthy, S., and Jackson, J. M. *et al.* (2021) “The first detection of an earthquake from a balloon using its acoustic signature”, *GRL* (doi: 10.1029/2021GL093013)

Science or Technology Question: Can earthquakes be detected using acoustic waves from a balloon? If yes, we could detect Venusquakes from the cool upper atmosphere without having to develop seismometers that could operate on the surface at 460 C.

Data & Results: We detected the acoustic signature of a magnitude 4.2 earthquake from a distance of 78 km at an altitude of 4.8 km, matching the characteristics predicted by our numerical models. Comparison of balloon observations with measurements from ground-based seismometers indicated that structural properties of the crust properties such as layering may be characterized using the balloon-recorded signature.

Significance: The acoustic coupling of quakes into the atmosphere is 60 times stronger on Venus than Earth, due to its dense atmosphere. Thus, quakes will be more easily detected from balloons on Venus. The surface of Venus is riddled with fractures and volcanic structures that are potential sources of seismic activity. Many planetary scientists believe that this Earth-sized planetary sibling is still active and that seismic observations will enable us to probe its interior.