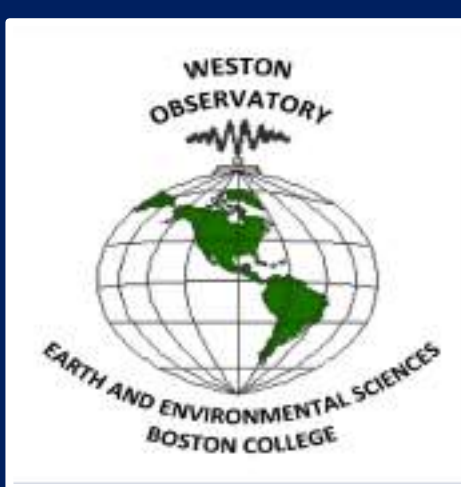


# Raspberry Shake, EQ1, and Research-Grade Seismographs: Pros and Cons of Different Types of Seismographs

for Education, Citizen Science, and Earthquake Monitoring in New England and Texas  
 Alan L. Kafka (Weston Observatory, Boston College) -and- Kristi R. Fink (Texas Educational Seismic Project)



## Pros and Cons of Different Types of Seismographs for Education, Citizen Science, and Earthquake Monitoring

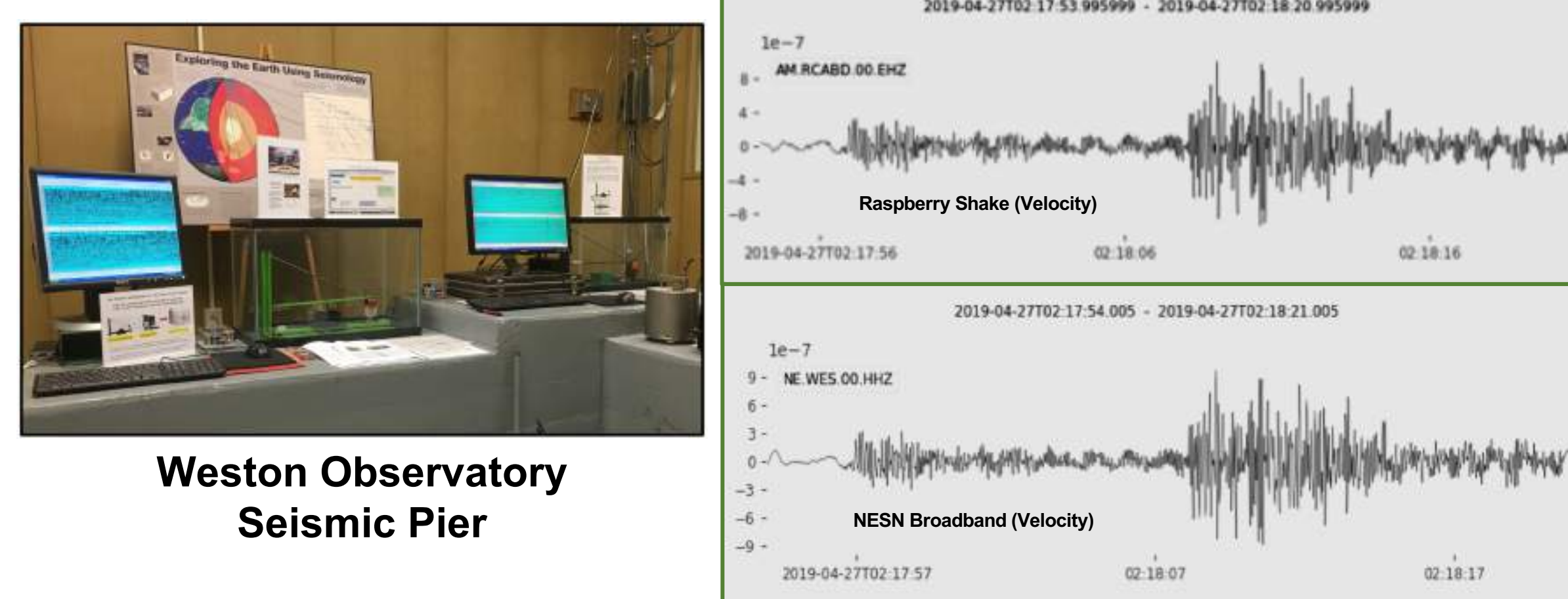
The Texas Educational Seismic Project (TX-ESP), and the Boston College Educational Seismology Project (BC-ESP), share a collaborative mission to turn real-world phenomena into teachable moments for students of all ages and socio-economic backgrounds. In pursuit of our mission, both TX-ESP and BC-ESP use seismology as a medium for inviting students into the world of scientific research and for promoting inquiry-based learning through investigation of earthquakes recorded by classroom seismographs. Seismographs-in-Schools programs, which grew out of efforts to enhance science education through seismology, resulted in many seismic stations operating in schools (and now in other public venues).



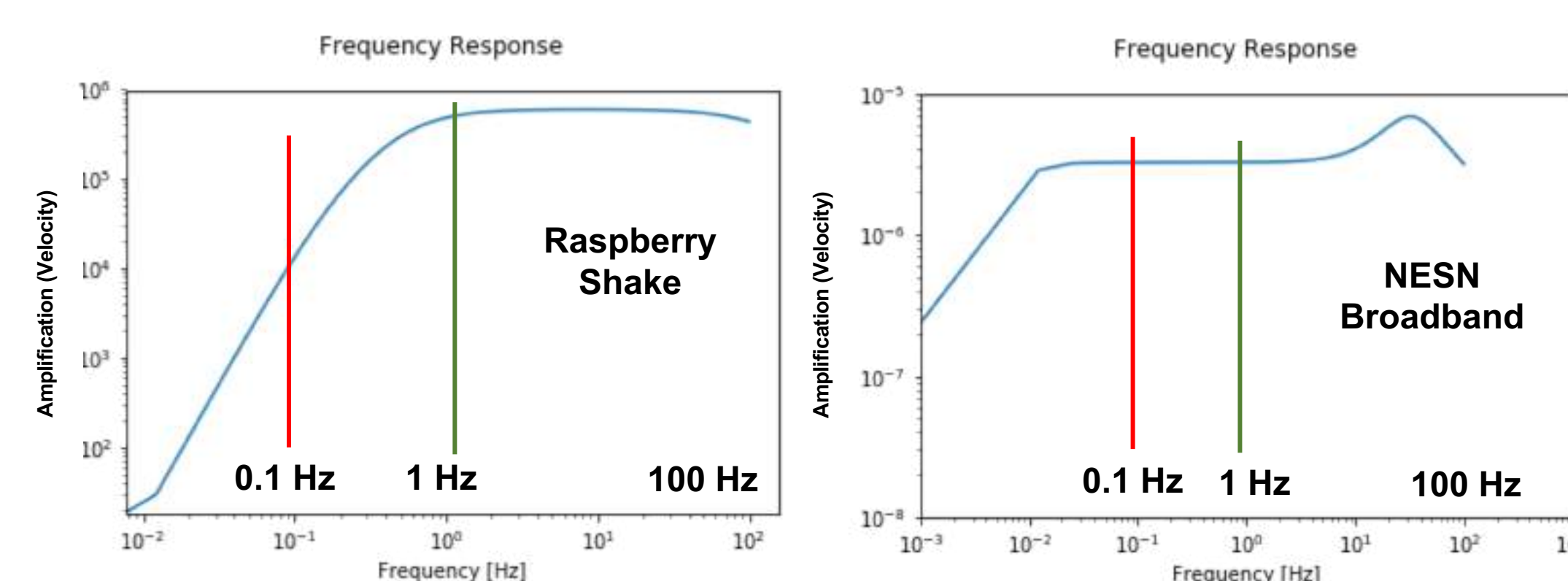
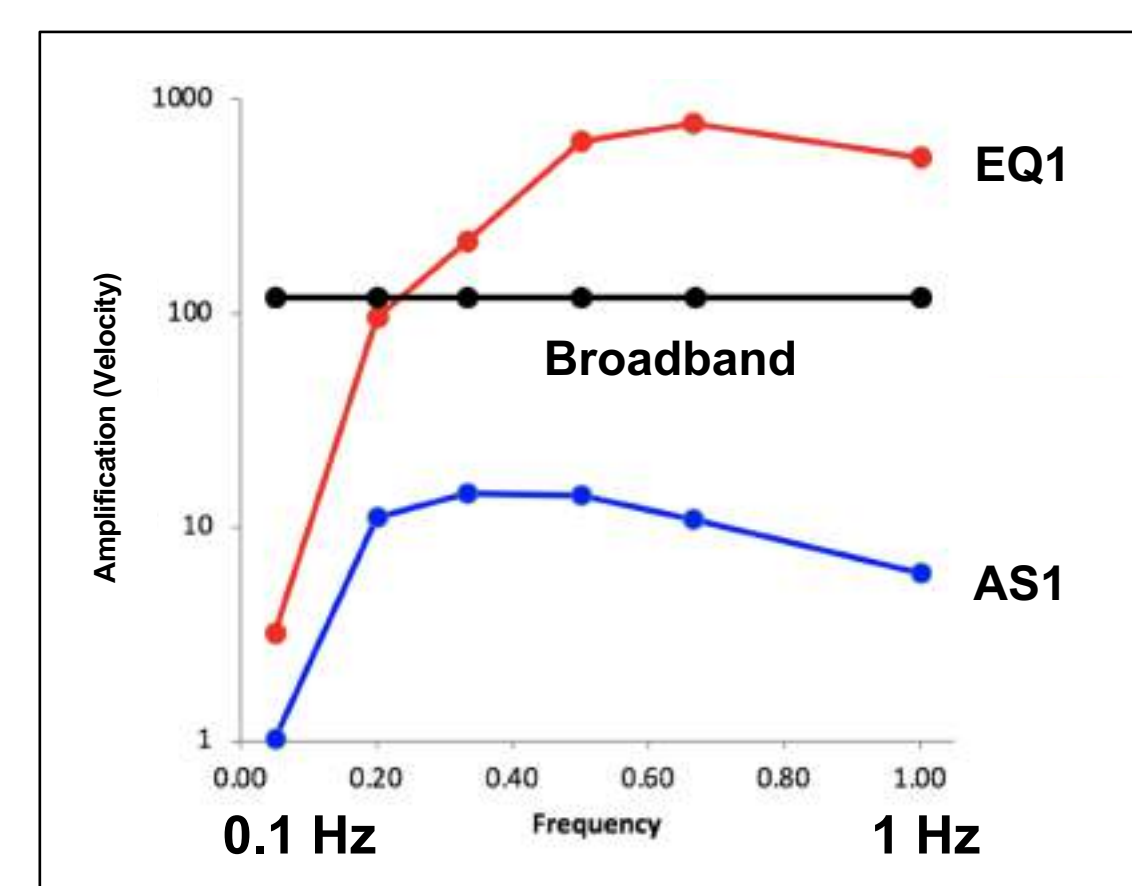
As these Seismographs-in-Schools programs developed, an inevitable question was raised: *Are the educational seismographs used in these programs only suitable for educational purposes focused on large, globally-recorded, earthquakes, or could they also serve as additional instruments for monitoring smaller earthquake seismicity in regional settings?* The recent development of the low-cost "Raspberry Shake" (RS) seismograph, which has an instrument response in the frequency range necessary for regional monitoring, provides opportunities for RS seismographs to serve as additional stations for regional seismic monitoring.

Here we explore the extent to which the RS seismograph compares with the EQ1 educational seismograph and a more expensive, research-grade seismograph commonly used for regional seismic networks and global monitoring. We find that the affordability, flexibility, and technical capability of the RS is well suited for recording both regional earthquakes and more distant global earthquakes, thus enabling an opportunity for students of all ages and socio-economic backgrounds to monitor and study earthquakes "in their own back yard" as well as across the globe.

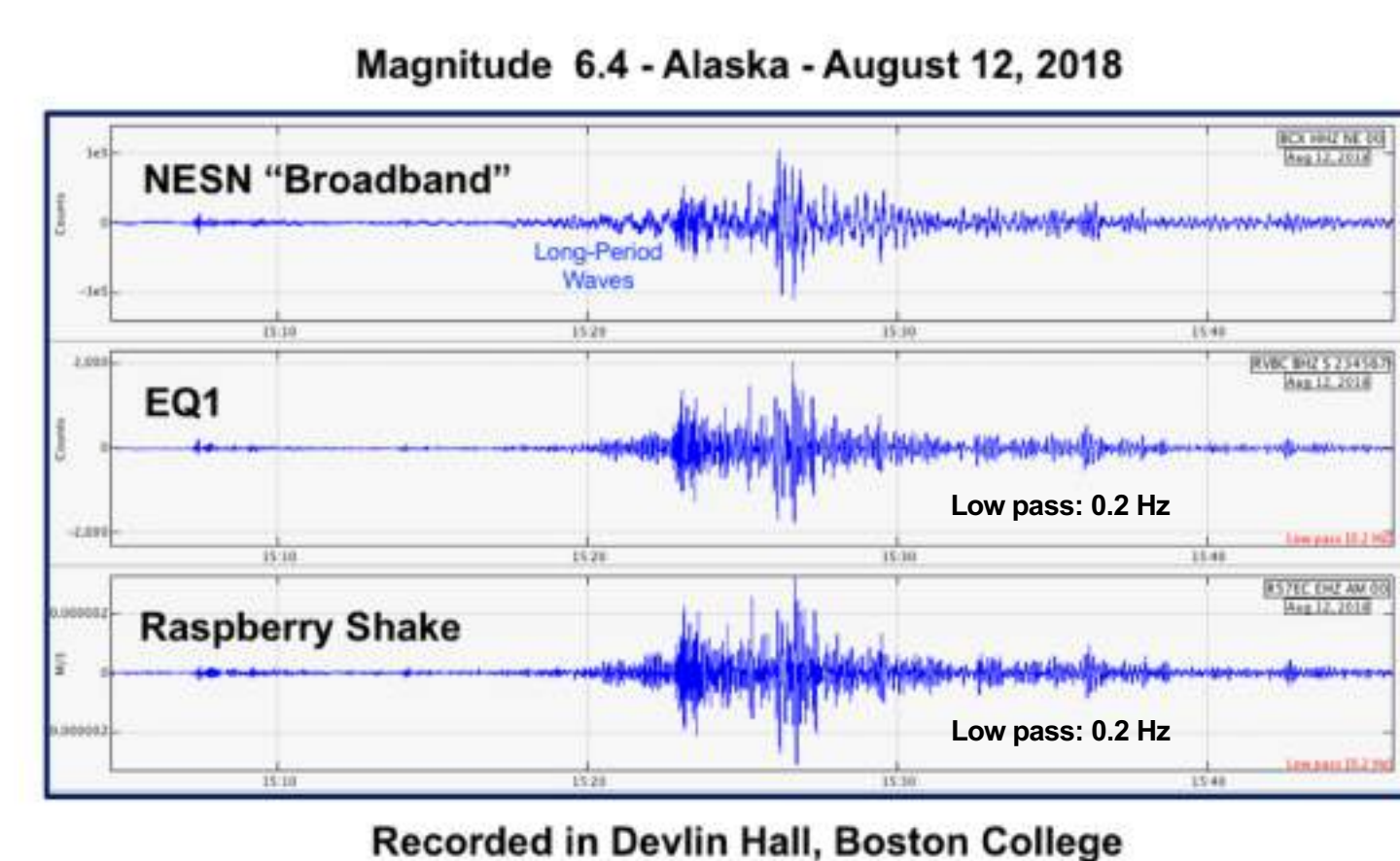
## The Seismographs



## Instrument Response

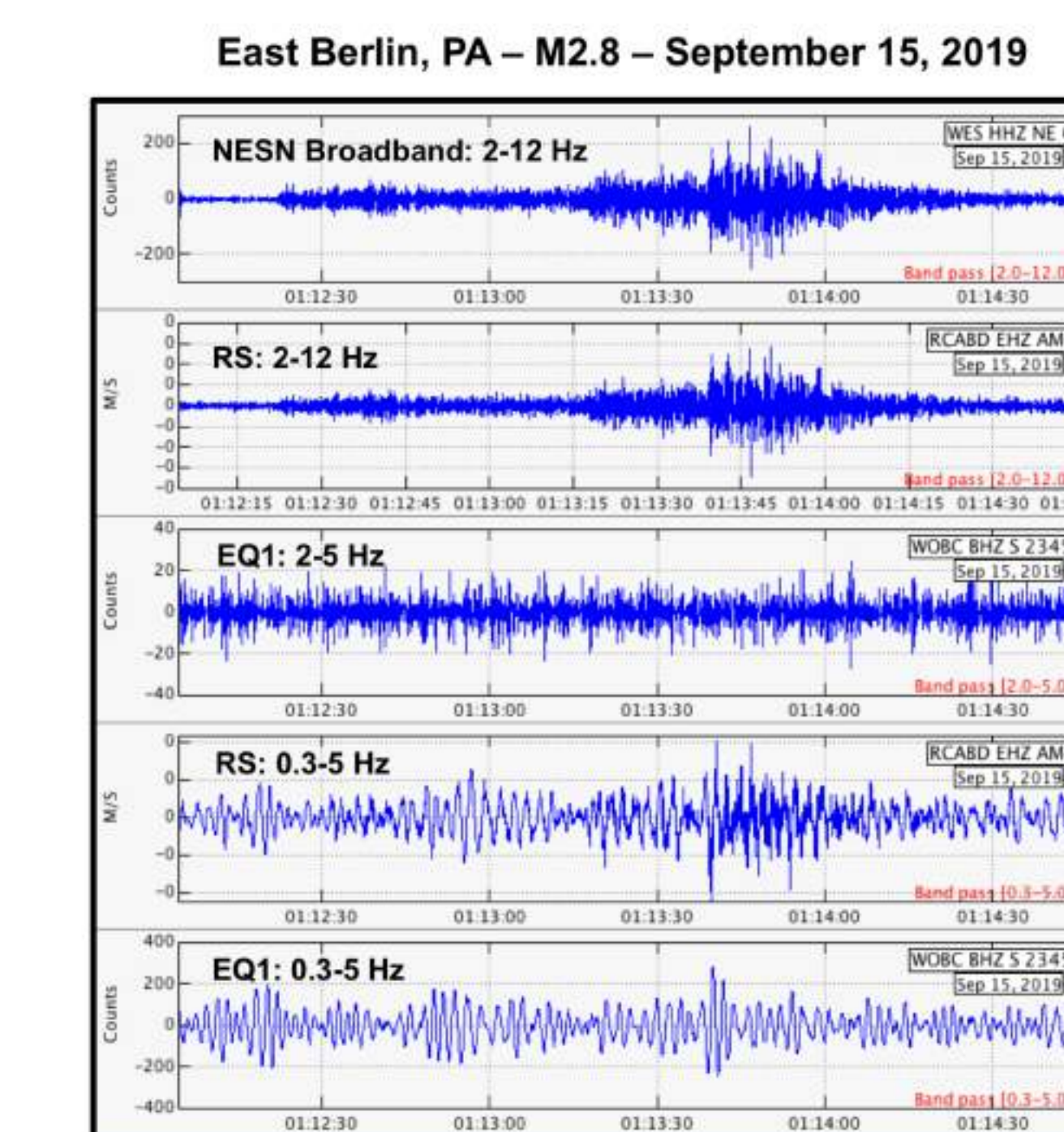
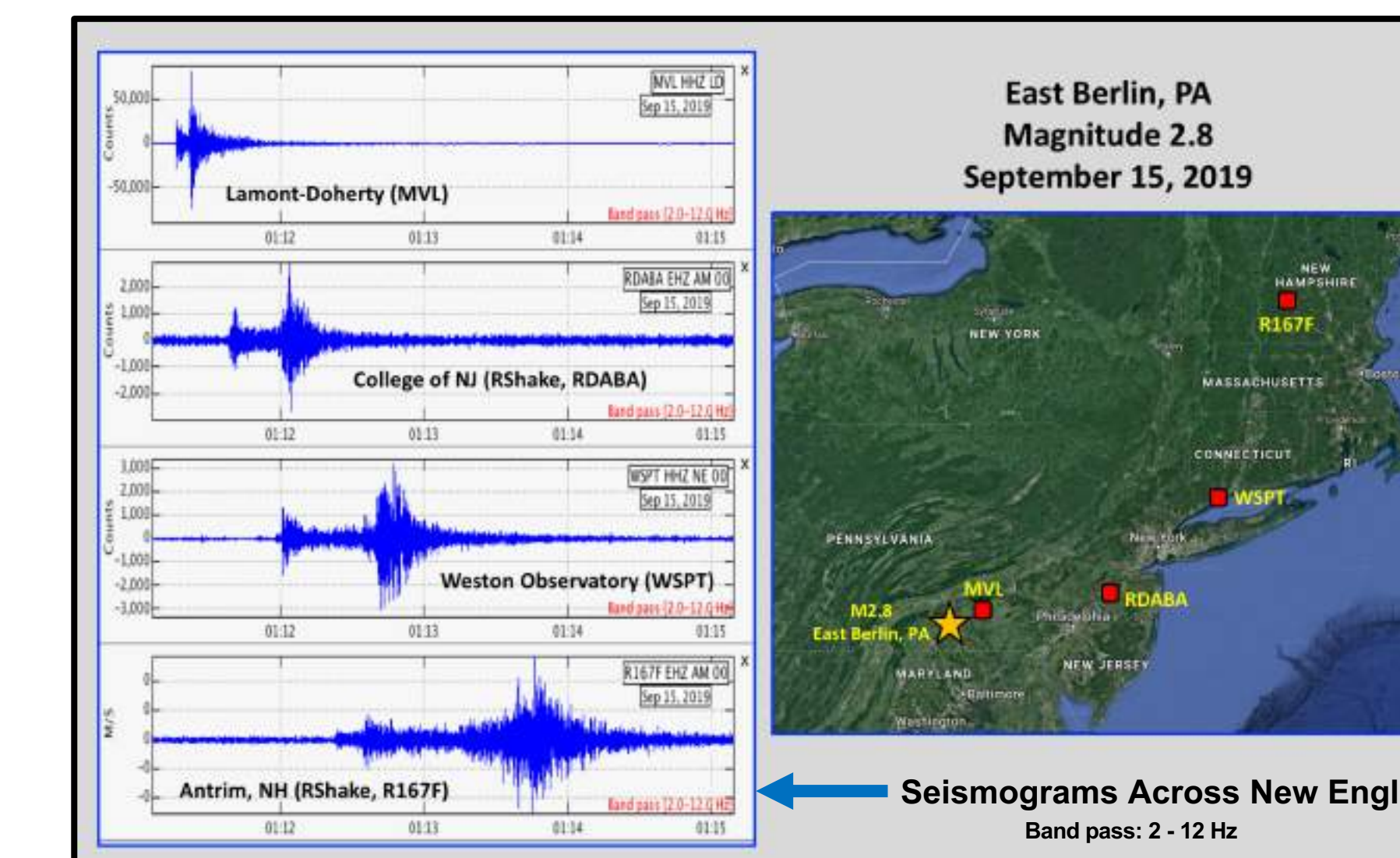
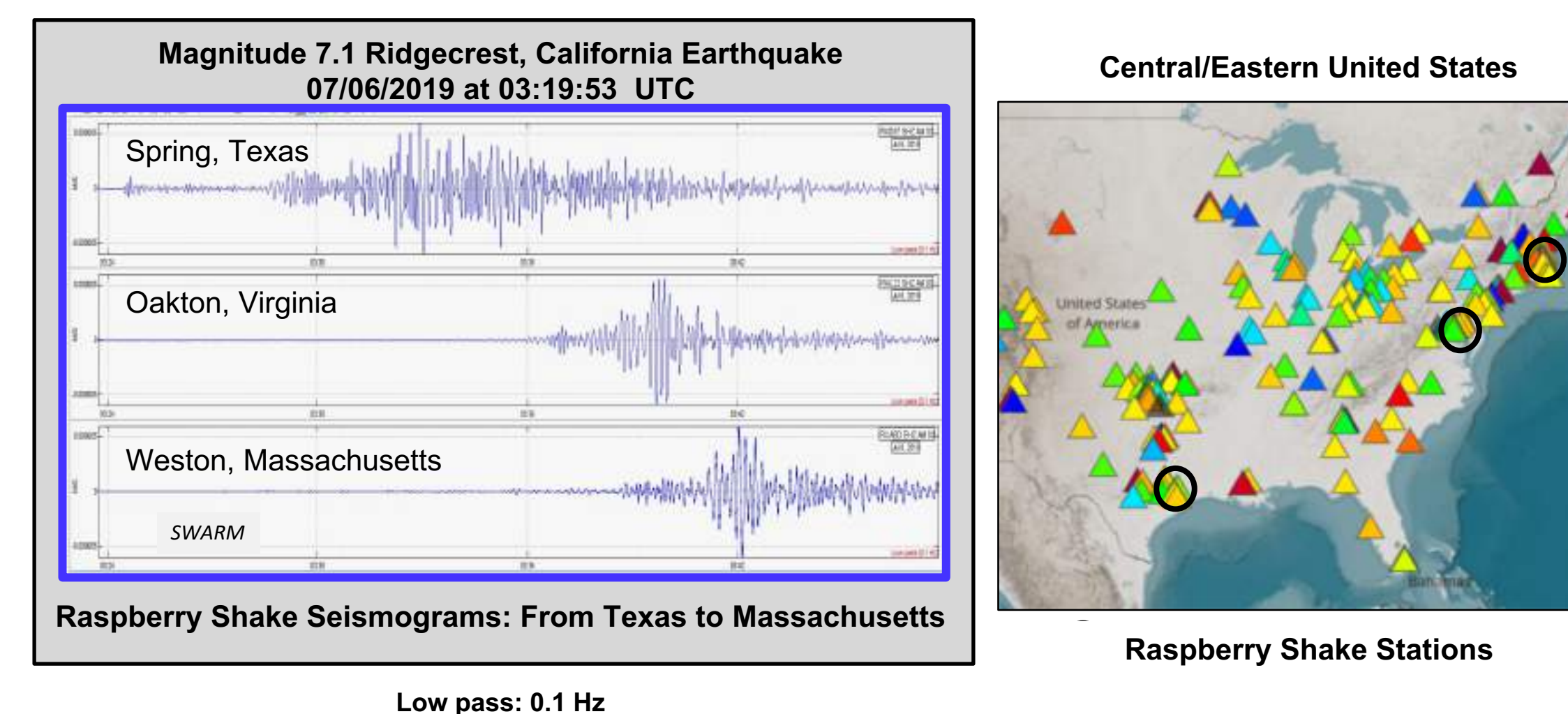
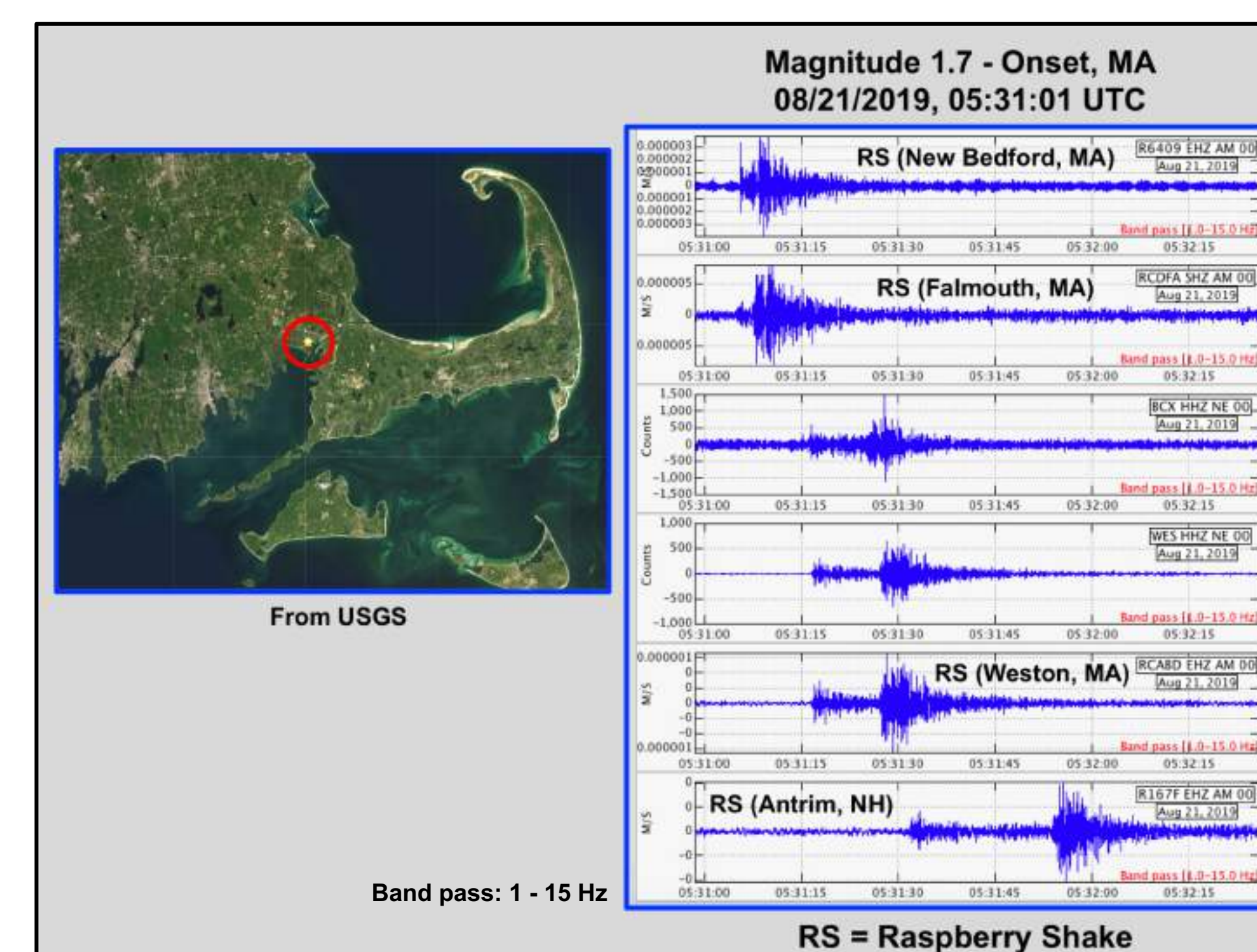
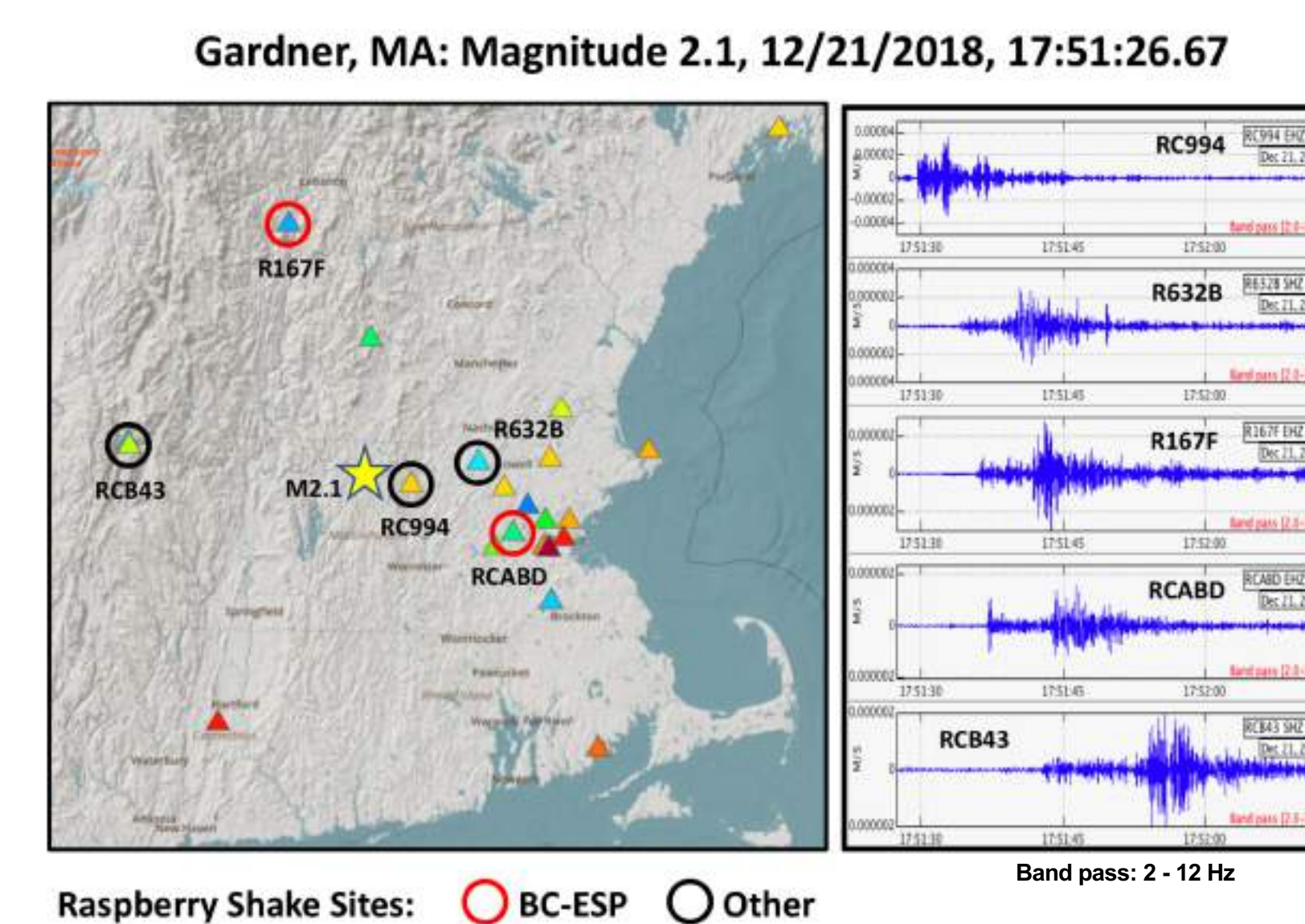
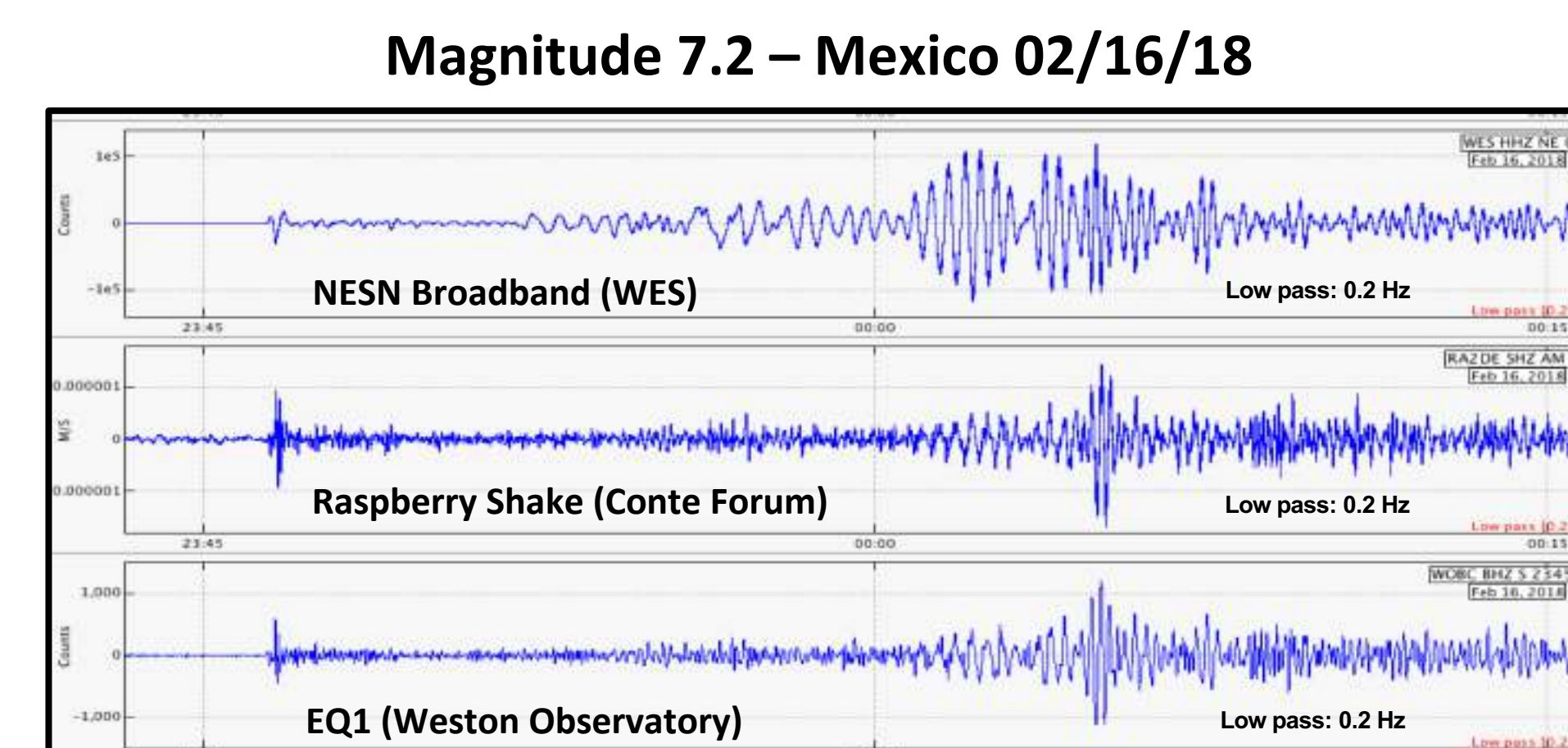


## Instrument Comparison



Magnitude 6.4 earthquake in Alaska, recorded by three different seismographs.

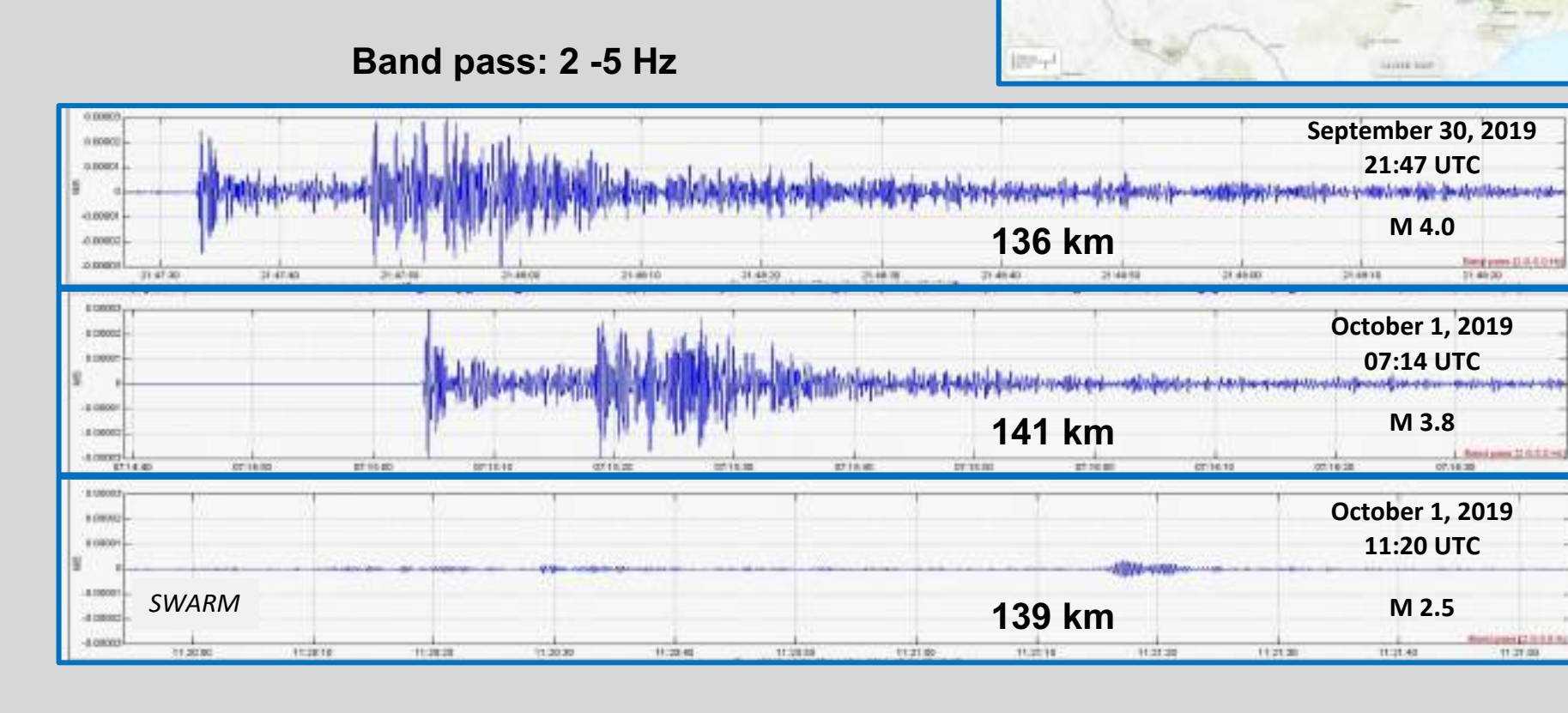
## What We Are Recording



Seismographs Collocated at the Weston Observatory Seismic Pier

## Detecting Small Earthquakes Located Near Snyder, TX Observed on Seismographs Recorded in Lubbock, TX September 30 – October 01, 2019

Magnitude 2.5 to 4.0 earthquakes observed on Raspberry Shake seismographs at 136 to 141 km distance from the epicenters.



## Magnitude 3.1 Earthquake Near Monahans, Texas September 06, 2019 at 15:55hrs UTC

Magnitude 3.1 earthquake observed on Raspberry Shake seismogram at 281 km distance from the epicenter.

