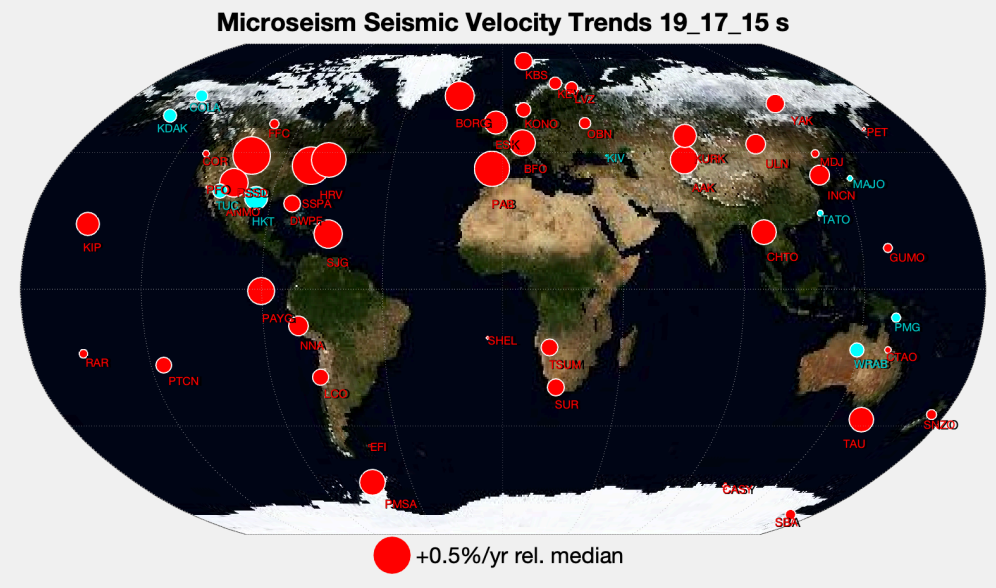
# Global Trends in Microseism Amplitude on a Warming Planet

**Richard C. Aster**

***Department of Geosciences, Warner College of Natural Resources, Colorado State University***

Earth's microseism wavefield is incessantly excited by wave-wave and wave-solid-Earth coupling processes that are the dominant global long-period seismic source process in the absence of earthquakes. The primary and secondary microseism bands reflect integrated and geographically extensive ocean wave normal and shear tractions applied to the solid Earth and are thus uniquely integrative proxies for large-scale ocean wave state. Previous microseism studies have utilized multiple metrics to explore spatiotemporal trends in storm intensity, storm tracking, sea ice extent and ocean wave attenuation, and other variability in the weather and climate system. I will summarize results from a new frequency-domain analysis incorporating continuous long-operational calibrated global seismic data from as early as the late 1980s through to the near-present to extract frequency-domain primary and secondary microseism intensity metrics and assess and interpret their periodic and secular regional- to global-scale signatures. A number of atmospheric reanalysis and wave modeling studies have recently indicated that Earth's storm and ocean surface wind intensity is changing and, in many regions, is increasing across multi-decade time scales under the influence of climate change attributed storm intensification. Secular change is particularly apparent in the 20 – 14 s period primary microseism band, which most directly reflects ocean wave amplitudes along Earth's near-coastal regions for ocean depths less than about 100 m. This analysis shows that a late 20$^{th}$ – early 21$^{st}$ century trend in increasing storm intensity at high significance for the vast majority of global broadband stations with long operational durations and high degrees of data completeness. Particularly strong and coherent trends are apparent for the northern Atlantic and Southern Oceans with regional primary microseism amplitude and seismic energy trends exceeding 0.5% and 1% per year, respectively.




Primary microseism (20 – 14 s) vertical-component velocity trends in percent per year relative to long-term median (radius is proportional to amplitude; area proportional to energy) for global seismographic stations with more than 20 years of operation and greater than 80% data completeness. White rims indicate trend significance greater than 3 $\sigma$.