“Seafloor geodesy and the hunt for shallow slow slip in Cascadia”

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This presentation will give updates on the Near Trench Community Geodetic Experiment deployment of GNSS-Acoustic and bottom pressure instruments, and our ongoing Seafloor Optical Fiber Strainmeter (SOFS) experiment aimed at detecting shallow slow slip near the base of the locked zone in Cascadia. Preliminary velocities now exist for some GNSS-A sites in Cascadia, which will be used to the future to better constrain offshore coupling on the subduction interface. The ongoing SOFS experiment has so far produced 11 months of seafloor extensional strain data on two orthogonal fibers. After correcting for temperature, tides, and instrument settling, we achieve a noise level of 10-20 nanostrain depending on ocean conditions, which is an improvement over previous deployments of similar instruments. Our 11 months of observations includes the time of a large onshore Episodic Tremor and Slip (ETS) event. We hypothesized that offshore slow slip would occur at the same time (within a few days) of the onshore ETS at a location near our SOFS instruments. This hypothesis is based on the results of Bartlow, 2020, which stacked onshore ETS displacements at GNSS sites and inverted them to obtain a time-averaged ETS slip distribution. This slip distribution includes offshore patches near the base of the locked zone. Similar offshore patches are detected in other studies using onshore geodetic data, including Michel et al., 2019 and Nuyen and Schmidt, 2021. We find that our strainmeters detect potential signals of slow slip during the time of the onshore ETS event. I will present these data and argue for the importance of funding to continue this experiment through multiple ETS event cycles.

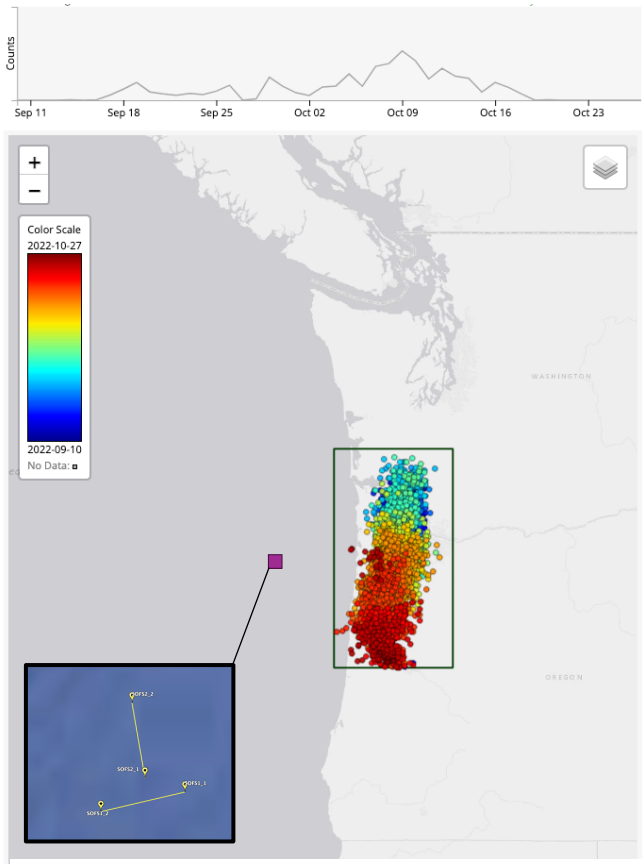

Figure 1. Detected tremor counts from the Pacific Northwest Seismic Network during the September – October 2022 Central Cascadia ETS event. Color indicates date, with blue earlier than red. The location of our two SOFSs instruments is indicated by the blue box. Inset shows the actual orientations of the two SOFS fibers.