



University of Stuttgart
Institute of Geodesy

Cost-effective seafloor geodesy with GNSS-acoustic measurements from a wave glider

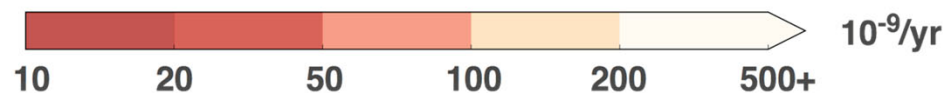
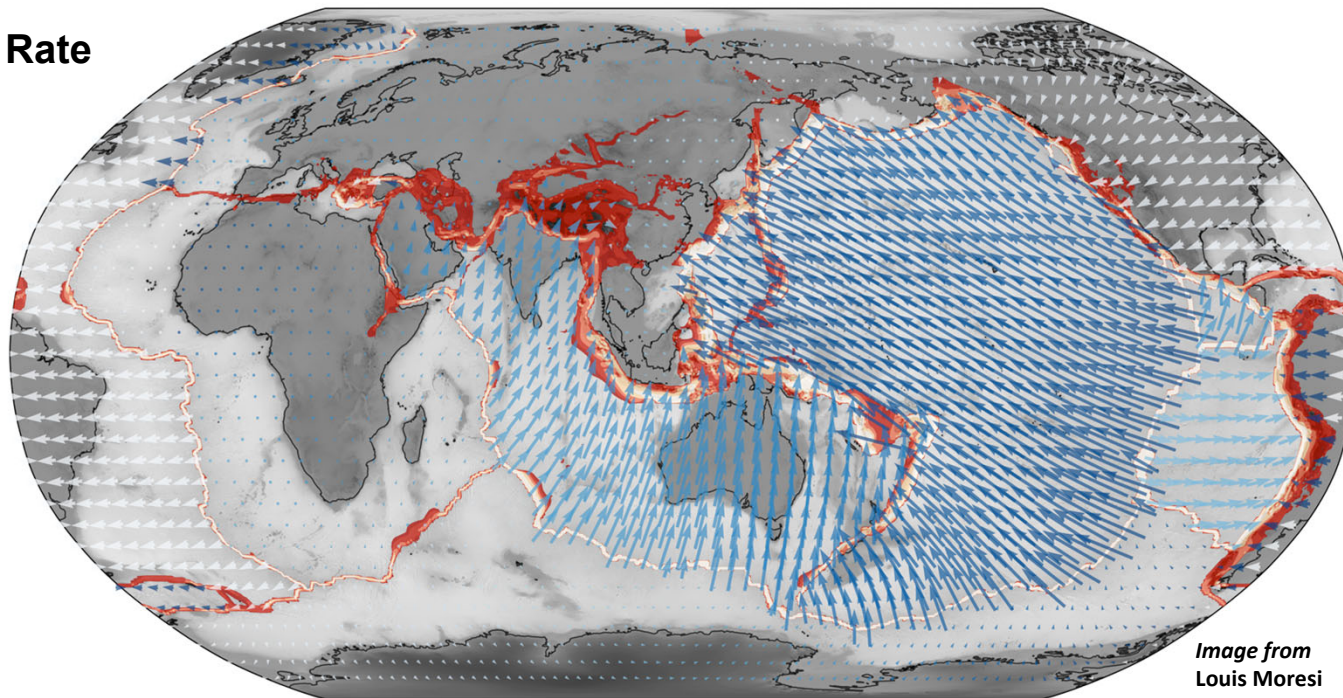
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¹Universität Stuttgart

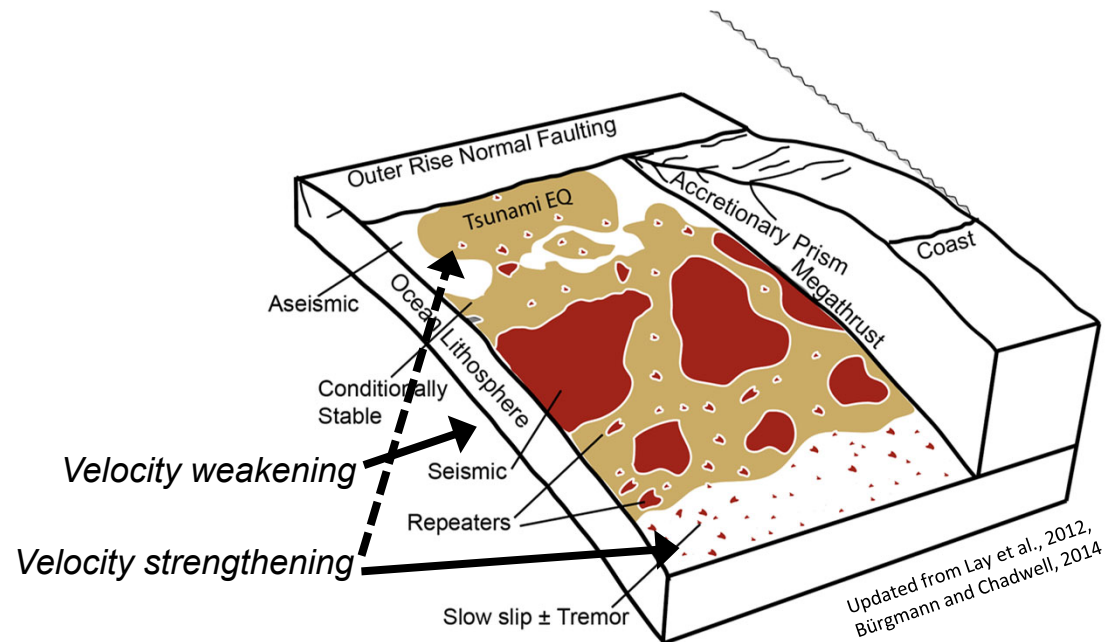
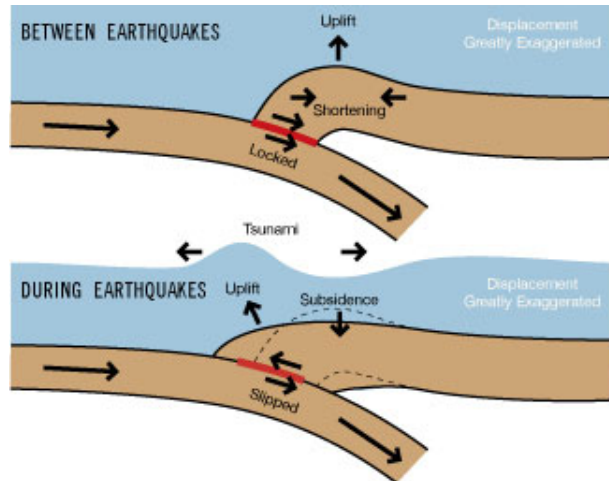


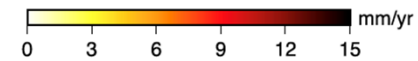
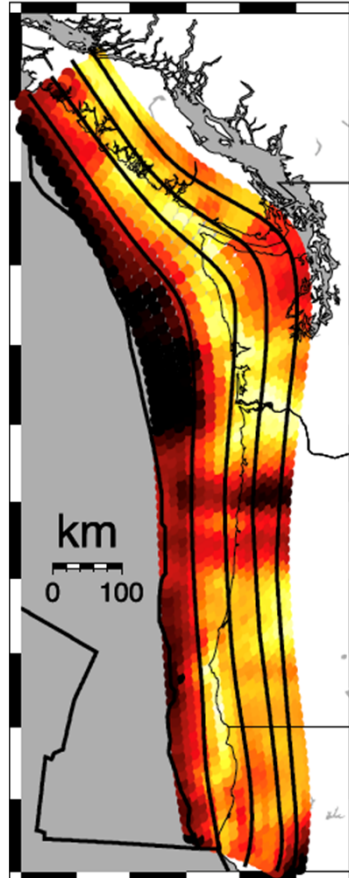


Strain Rate



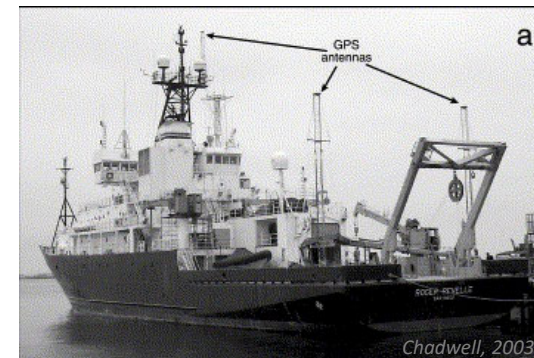
Surface strain rate and plate motion vectors (longest vector = 10cm/yr). Strain is concentrated at the plate boundaries - mostly located under the oceans.

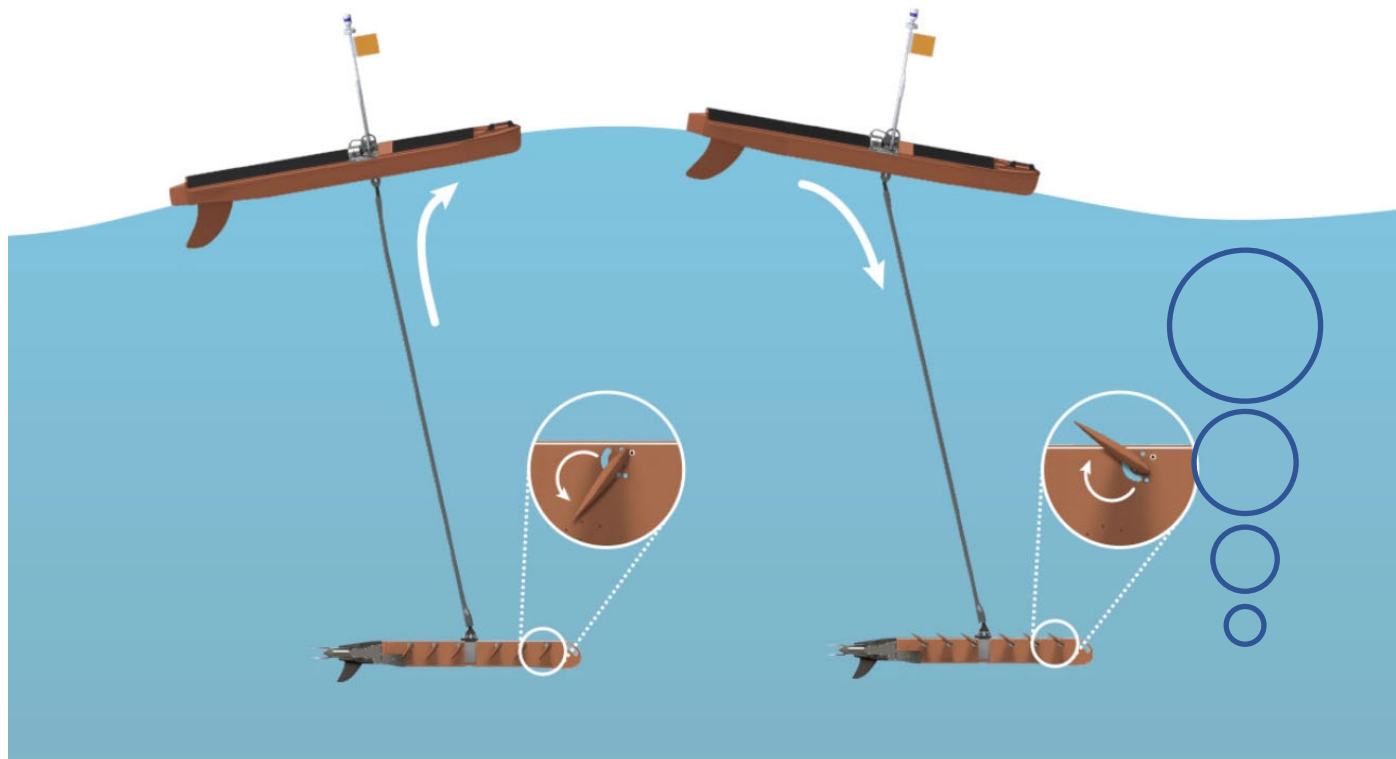


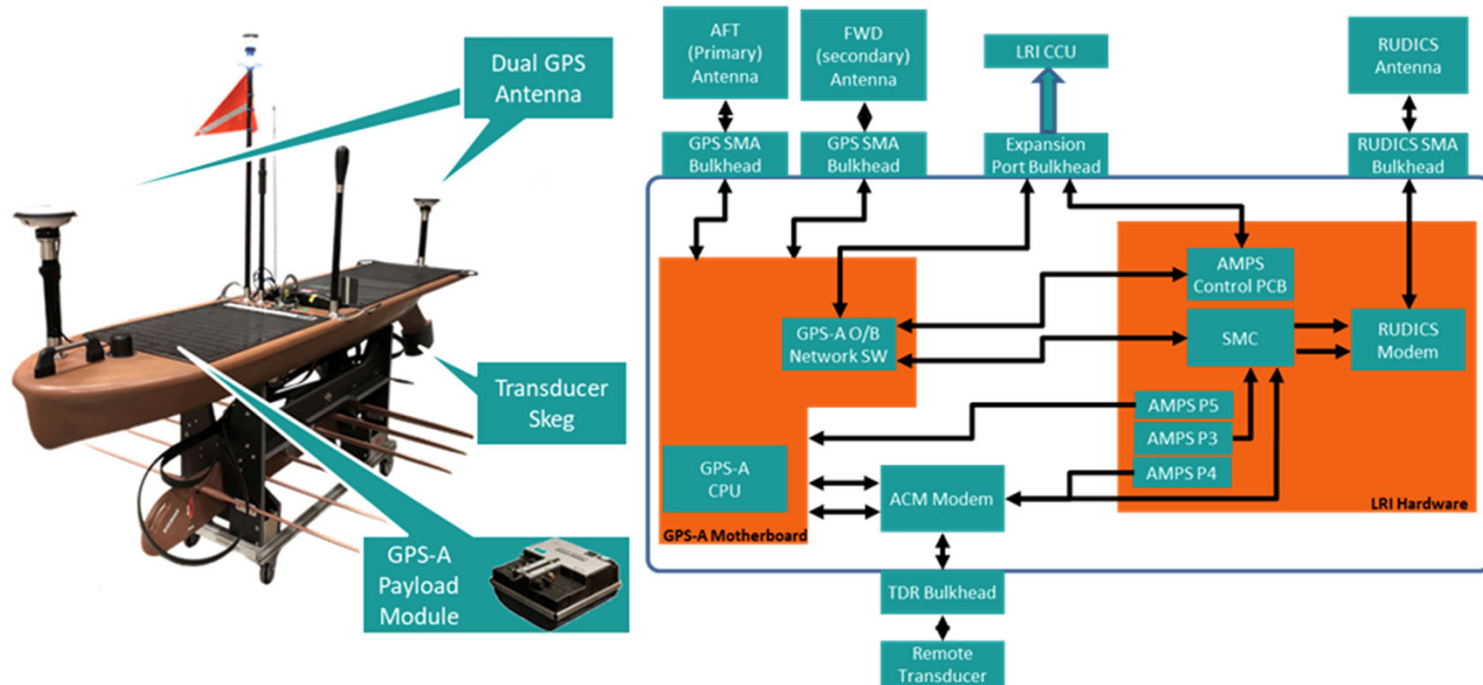


F.F. Pollitz, E.L. Evans, *Implications of the earthquake cycle for inferring fault locking on the Cascadia megathrust*, *Geophysical Journal International*, Volume 209, Issue 1, April 2017, Pages 167–185, <https://doi.org/10.1093/gji/ggx009>

Hydrographentag
24. bis 25. Juni 2026
Lübeck-Travemünde







WaveGlider with Sonardyne GNSS/A module installed. This configuration has the GNSS/A module fully integrated into the Wave Glider command and control system.

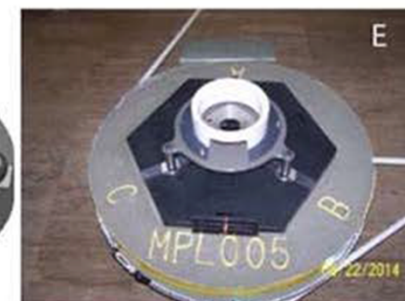
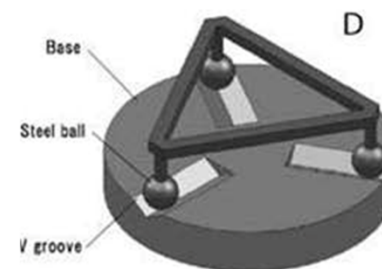
Sonardyne offers subsea acoustic tracking and communication systems operating in two primary frequency bands: Medium Frequency (**MF**) and Low-Medium Frequency (**LMF**)

- **MF (18–36 kHz):** Designed for standard tracking, positioning, and short-to-medium ranges. It provides precise tracking for dynamic positioning (DP) and standard subsea operations.

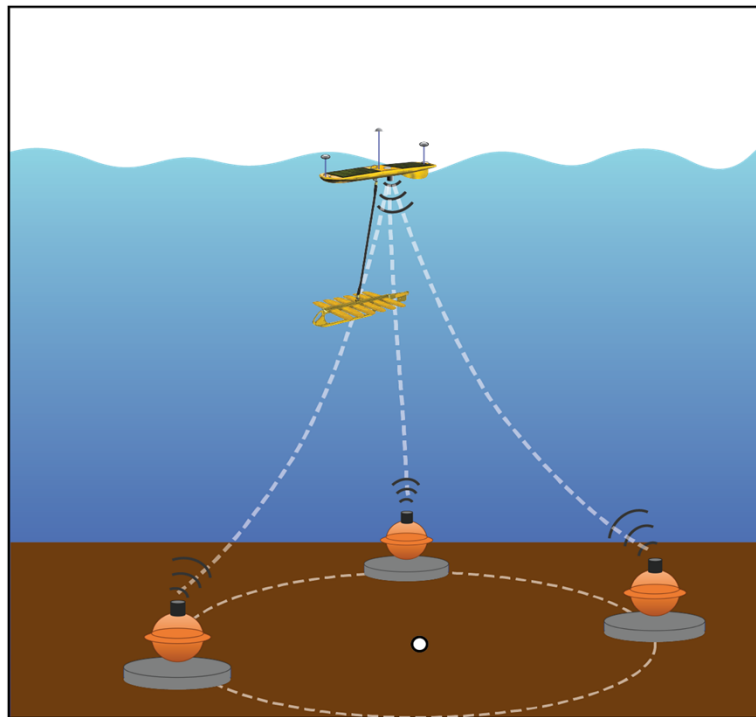
- **LMF (14–19 kHz):** Optimized for deep-water and ultra-long-range applications. These systems, used in Sonardyne's 6G technology, allow for tracking targets at distances beyond 11,000 meters and to depths of 6,000 meters.



“LMF is just better!” - *Sonardyne Engineer, Mar 2026.*



Center-point Survey strategy

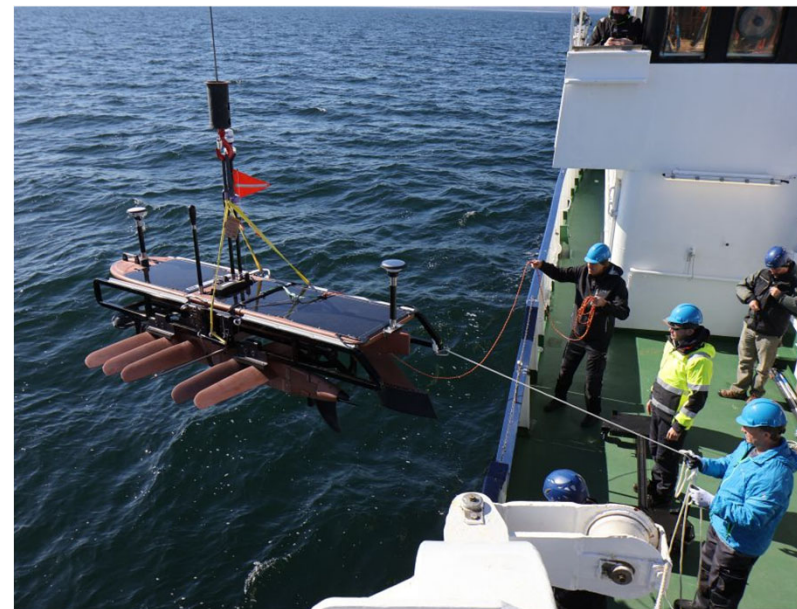
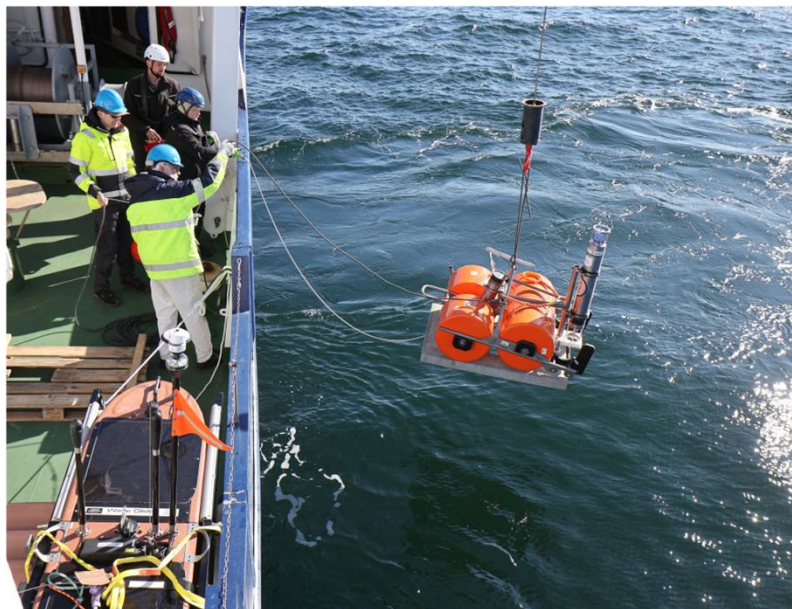


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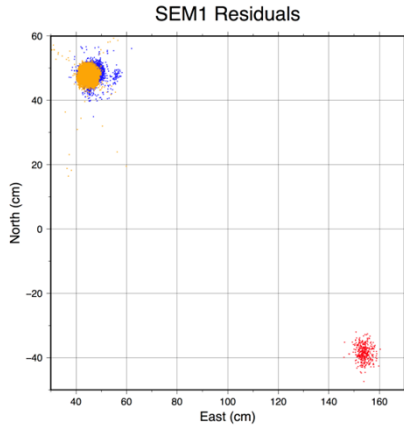
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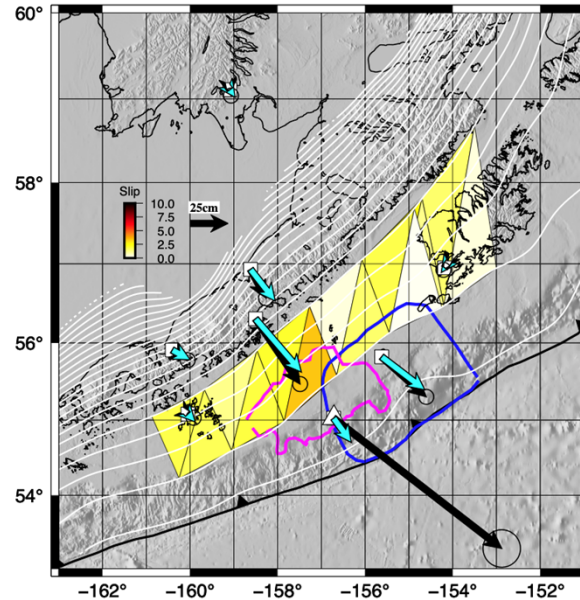




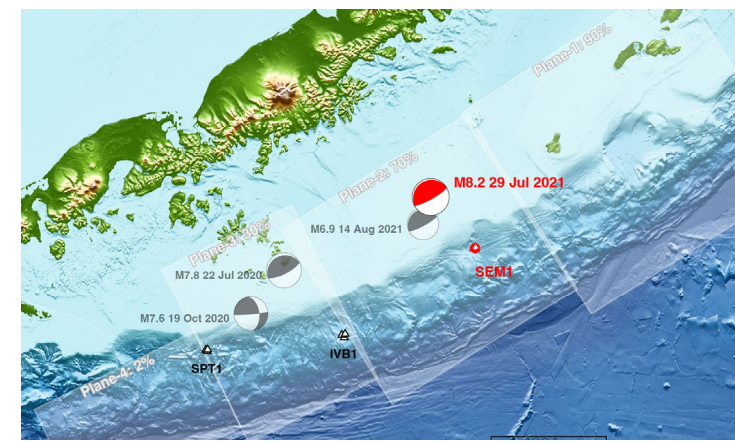




Other studies of the event - using only land-based GNSS - concluded that slip on the megathrust only occurred up to a depth of 20 km.



From Brooks et al., 2023



With the GNSS-A data our models required slip near the top of the fault. This slip is likely to be "afterslip" as the shallow portion of the system responded to the stresses from the earthquake.

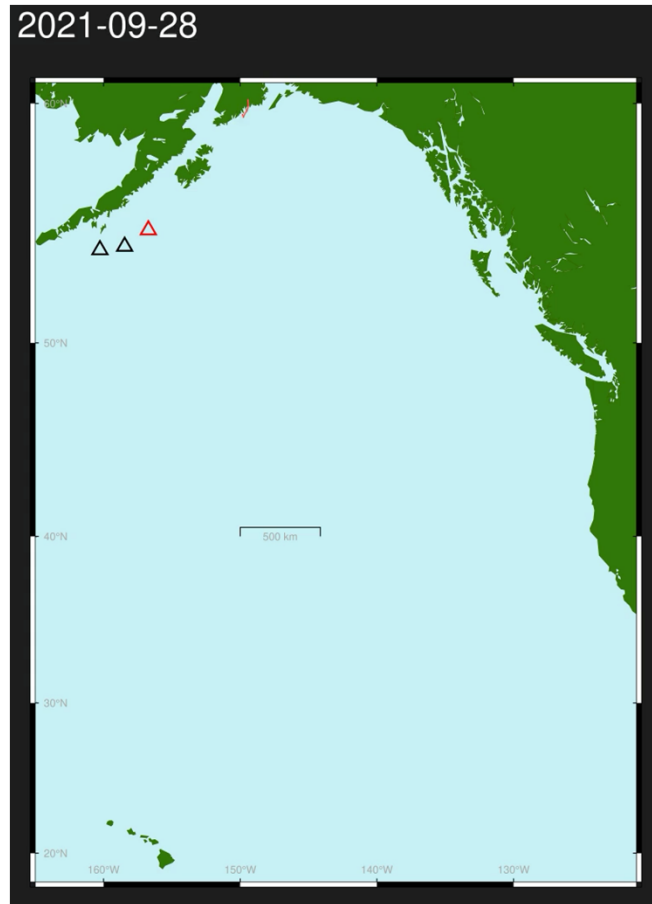
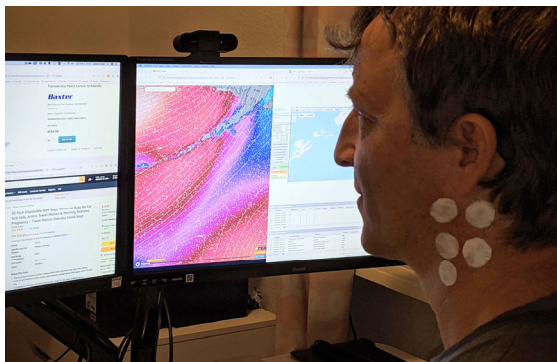
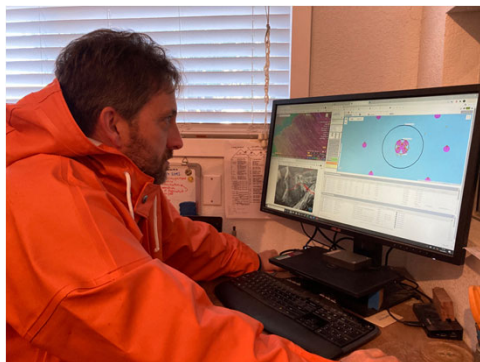
Wave Glider Alaska Winter 2021-2022 GNSS-A Mission

Short winter days, storms, strong currents, and cloud cover made this an extremely challenging deployment

Mission Duration = 155 days

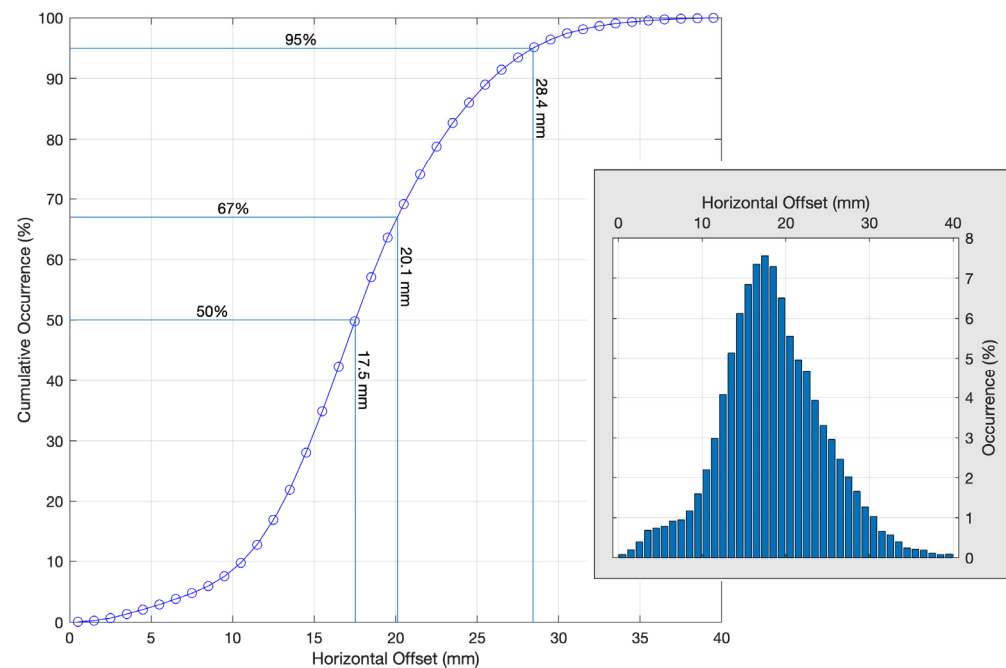
Distance Traveled = 5444 km

Avg Speed = 0.40 m/s (0.78 kts)



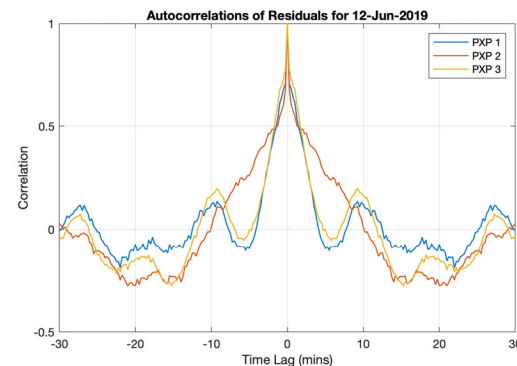
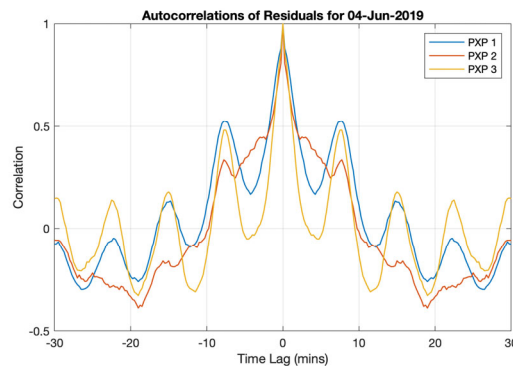
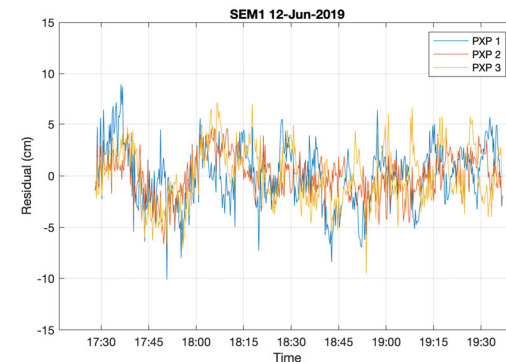
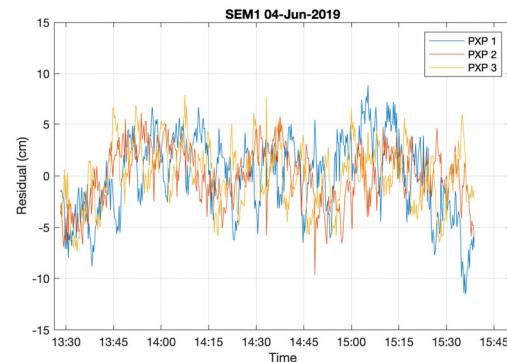


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$$s_{\bar{x}}^2 = \frac{s_x^2}{N} \left(1 + 2 \sum_1^k \hat{\rho} \right)$$

$\hat{\rho}$





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Kermadec Trench (GEOMAR lead)

