On the Variability of Earthquake Ground Motion from the Sage Brush Flats High Density Array in Southern California

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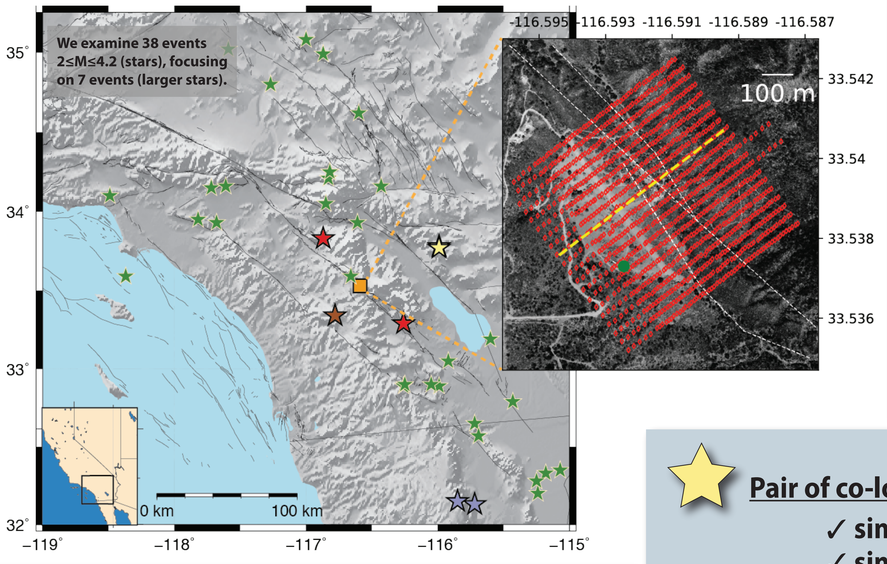
questions

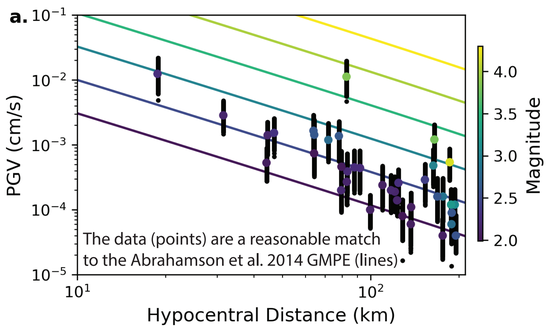
>> Is it appropriate to extrapolate peak ground velocity (PGV) from one location to another?

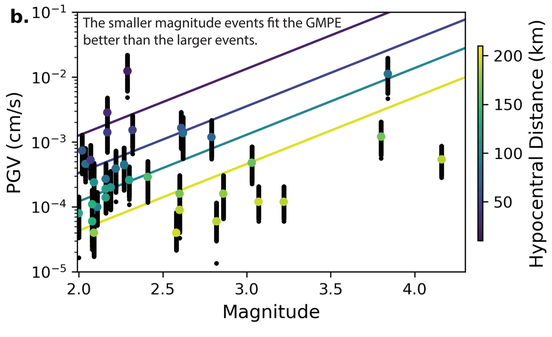
>> What is the spatial variability of PGV within a small spatial footprint?

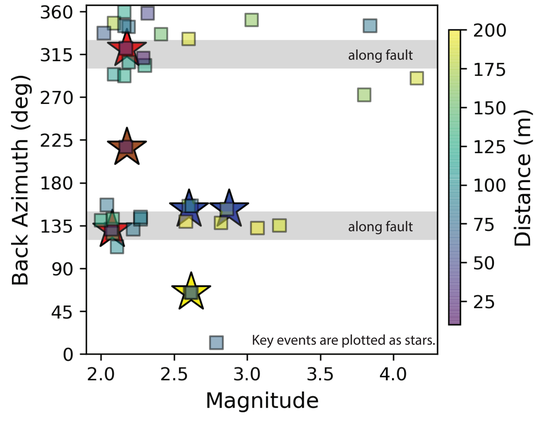
network

- Operational for ~1 month in 2014
- Array of 1088 stations
- Station spacings 10-30 m
- Small footprint (0.6 km by 0.6 km)
- Clark branch of the San Jacinto Fault
- Vertical component only



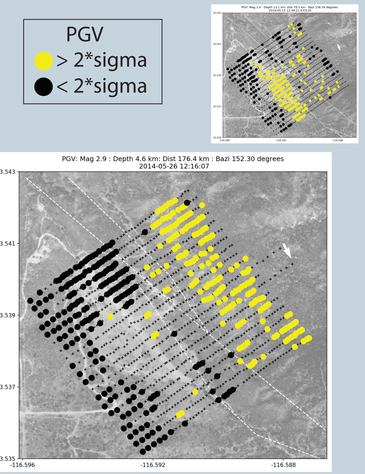




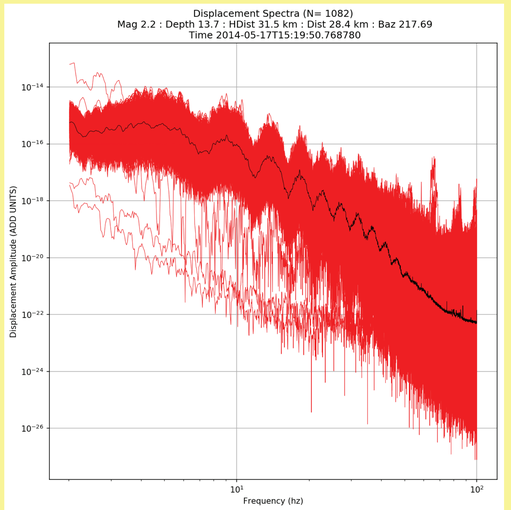


Basin Amplification

Typically, along-fault events produce large PGV within the small western basin structure (smaller inset). However, the pair of Baja events produce large PGV on the eastern part of the array.

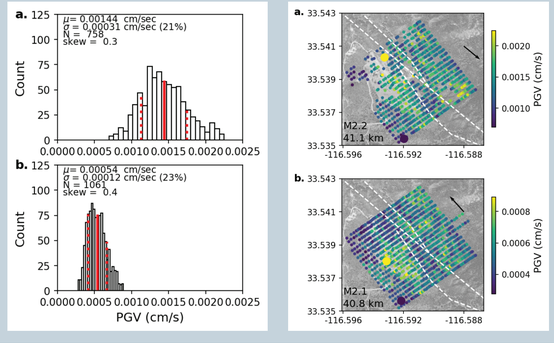


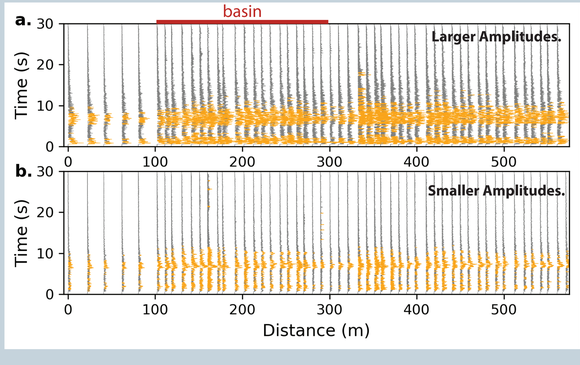
Help us understand what produces these scallops?



Directivity Effects

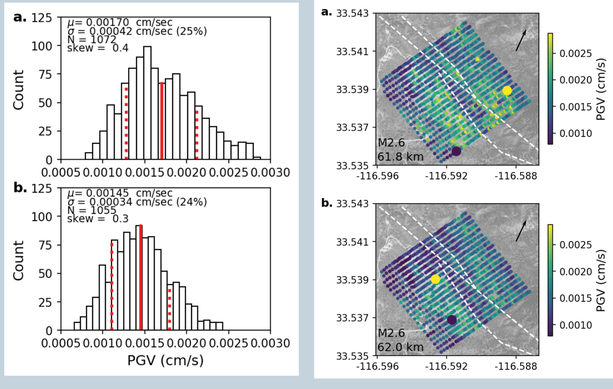
- ✓ two events M2.2 & M2.1
- ✓ depth=17 km
- ✓ Δ=41 km
- ✓different back azimuths

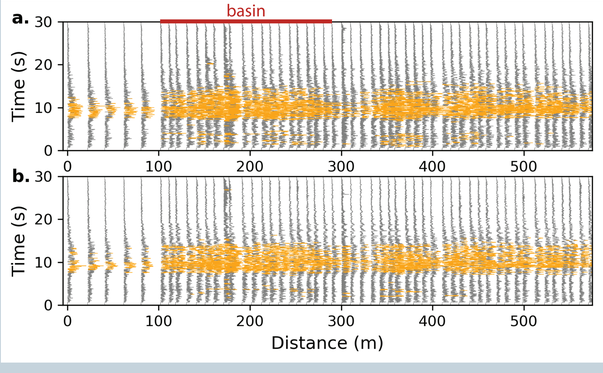




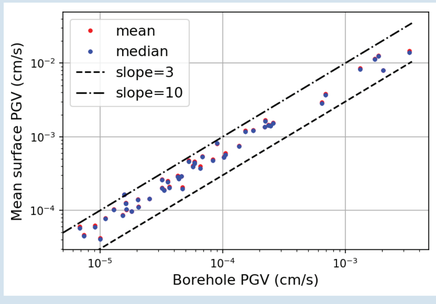
Pair of co-located M2.6 events (repeaters)

- ✓ similar PGV values
- ✓ similar PGV variations
- ✓ similar spatial PGV patterns
- ✓ similar waveform envelopes





Borehole (148 meters) to surface PGV Factor: 3-10



summary

- Observed PGV values are in accordance with the GMPE of Abrahamson et al., 2014.
- Similar events (location, magnitude, depth) produce similar PGVs, variations in PGVs and spatial mapped PGV patterns.
- In general the PGV's within the fault zone are smaller than in the surrounding regions.
- Directivity effects can drastically influence PGVs, producing results that differ by 167%.
- The pair of Baja events produced large PGVs in the eastern part of our network.
- The PGV variability is extensive, often creating resonance and amplification within the basin structure, west of the fault strands.
- The upper ~148 m of the crust alters the PGV values by a factor of 3-10.
- Variations in PGV within our small study area range between 20-37% of the mean.

acknowledgments

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