## Accuracy and Uncertainty of TexNet Absolute Seismic Event Location in West Texas

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## Where are the earthquakes?



## Problems: stations only at surface + velocity model error



## Problem: stations only at surface $\rightarrow$ horizontal rays at depth



## Problem: velocity model error $\rightarrow$ incorrect times and rays



## Surface stations + model error $\rightarrow$ large hypocentral error









## Single event absolute errors – Different models, station sets

### Random N/2 stations excluded in turn, PB02 may be excluded

25-50km station spacing





## Best: calibration with ground-truth sources



## Best: calibration with ground-truth sources



## Assume hydraulic fracturing may cause earthquakes

#### → Proxy Ground-Truth









### Assume fracturing may cause earthquakes $\rightarrow$ Proxy ground truth



















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#### **Conclusions:**

- Accurate absolute location of seismic events is difficult but critical to monitoring and explaining human-induced seismicity.
- For the Delaware Basin, western Texas, relocation using different velocity models and station subsets shows 4–5 km absolute epicentral and depth error.
- We associate fracturing and seismicity to develop Probabilistic Proxy, Ground-Truth station corrections to improve absolute event locations.
- Always fewer a-causal associations: supports assumption fracturing may cause earthquakes.
- Spatial patterns and statistics of west Texas seismicity relocated with PPGT corrections suggest improvements in absolute location accuracy.



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