

# An examination of three published reports of earthquake precursors

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## Approach:

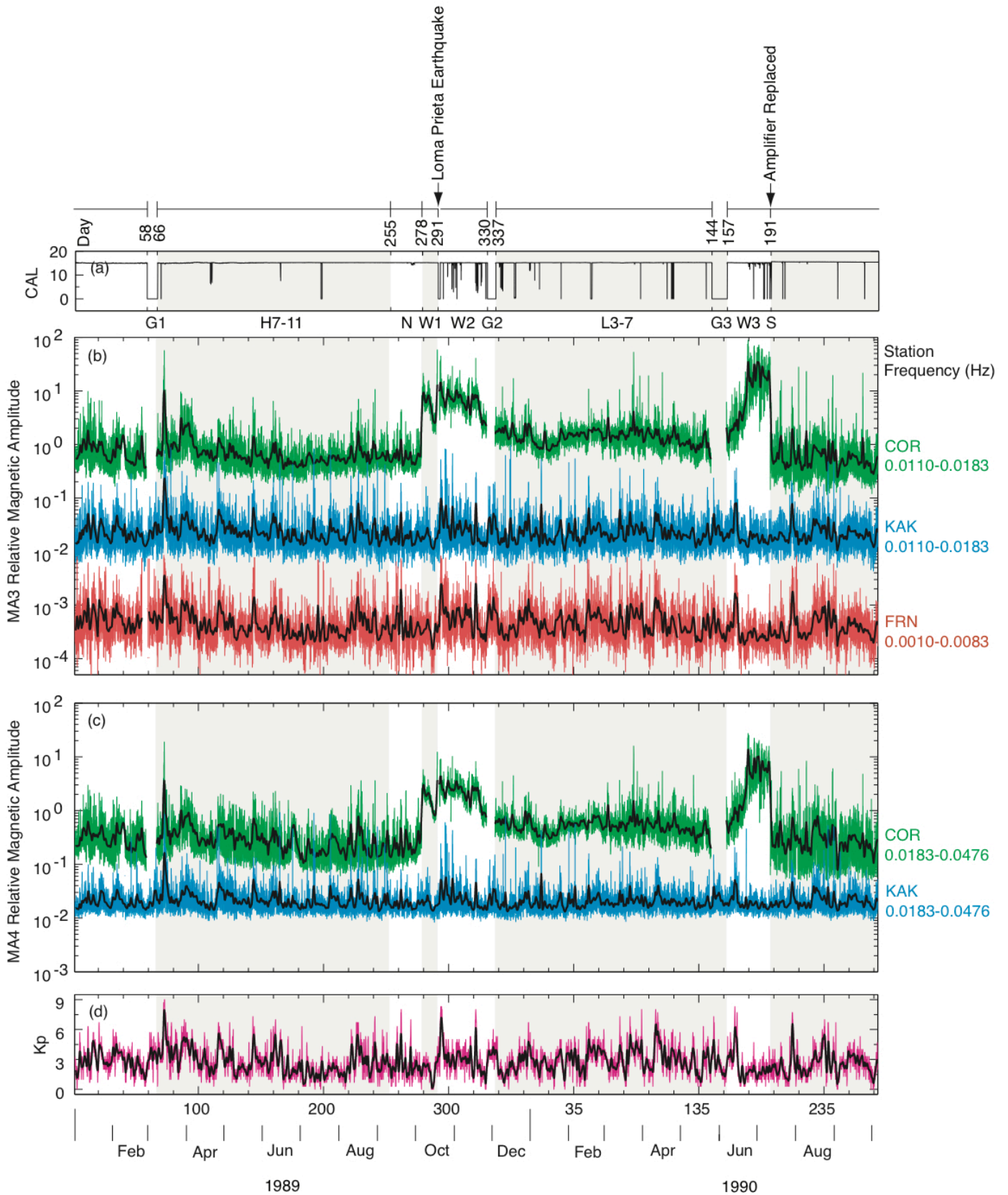
- Examine the original data used to identify a precursor, but in this case we will show long durations of data before and after the earthquake.
- When possible, examine a “control data set” recording the same period of time, but from the other side of the world and far from the earthquake.
- If processing was applied to the data, we perform the same processing.

## Questions to consider:

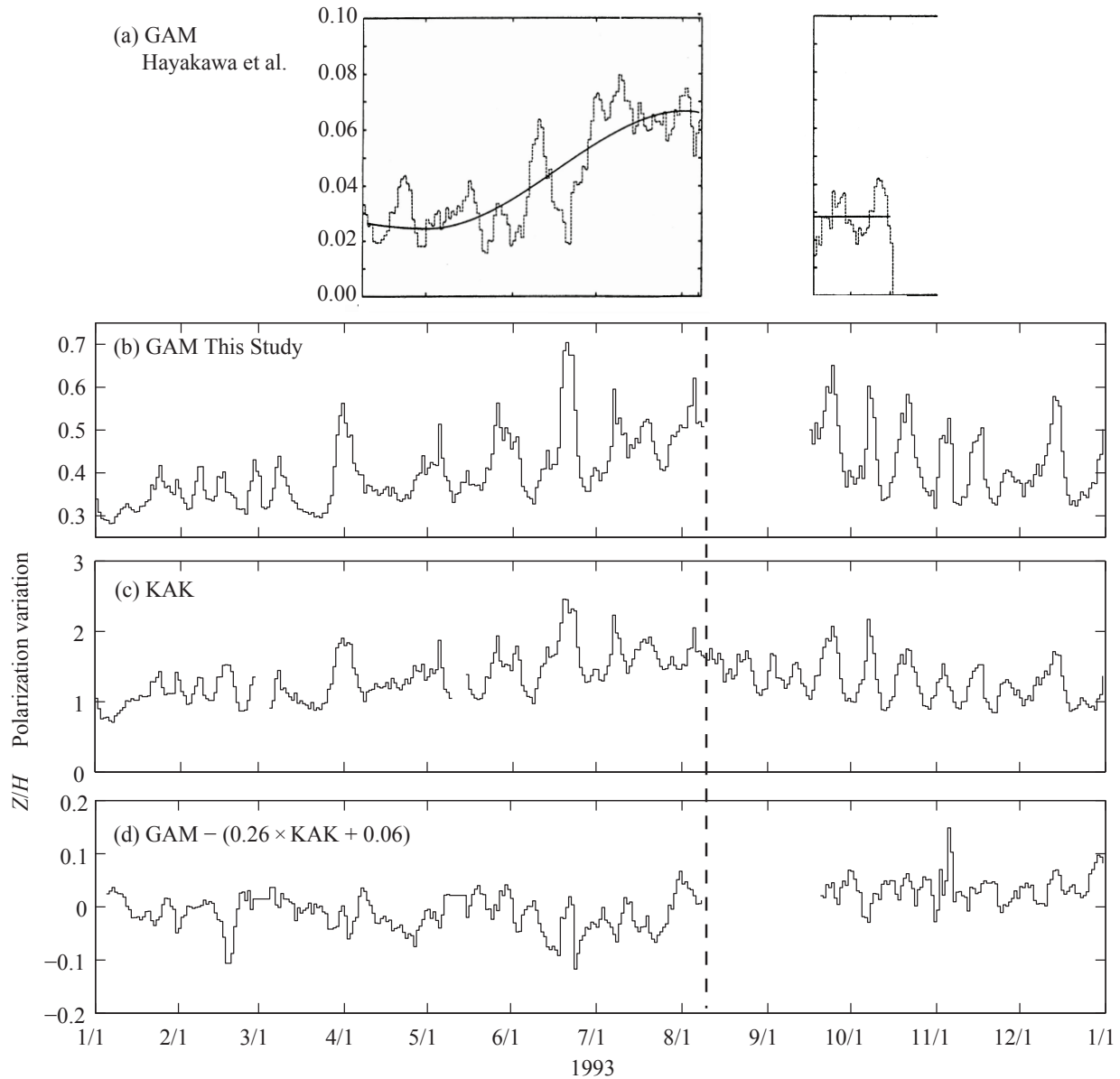
- Is the precursory signal seen only once and just before the earthquake? Or, does the signal occur many times, possibly long before and long after the earthquake?
- Is the precursory signal seen only in the vicinity of the earthquake? Or, is the signal global?
- Is the signal clearly precursory?
- Are the data obviously reliable?
- Are the results reproducible?

# 1989 Ms 7.1 Loma Prieta Earthquake

## Fraser-Smith et al. (1990)

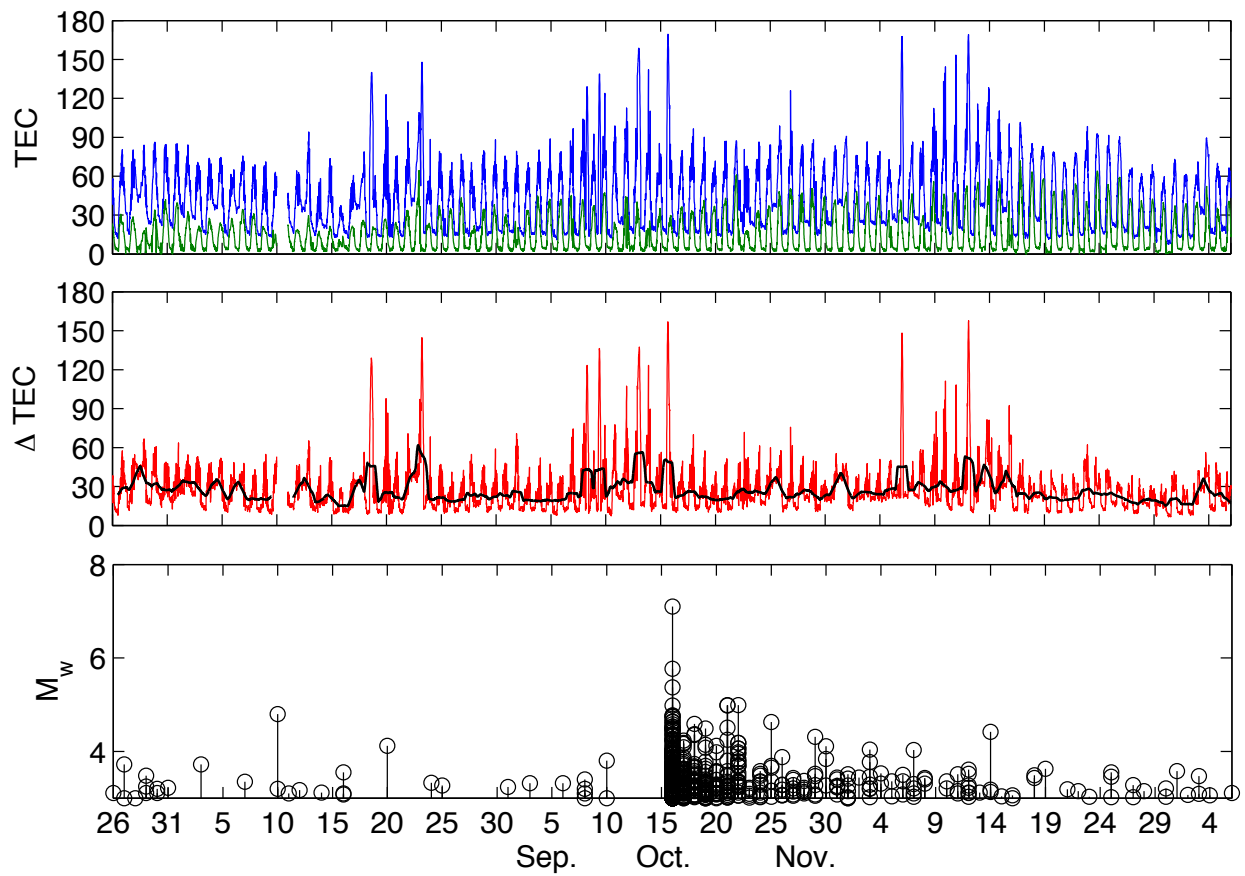


# 1993 Ms 7.7 Guam Earthquake Hayakawa et al. (1996)



# 1999 Mw 7.1 Hector Mine Earthquake

Pulinets et al. (2007)



From these results we might consider the following inter-related issues:

- False positives. Does the method yield signals that might be misidentified as precursory?  
→ Look at long time series of data.
- Localization. Does the signal arise in the vicinity of the earthquake?  
Or, is it actually a global signal?  
→ Look at a global distribution of data.
- Multiple sensors. Is the signal recorded on more than one sensor?  
Or, could the signal be attributed to problems with an individual sensor?  
→ Need to see precursory signals in multiple sensors.
- Consistency. Has the method been shown to work more than once?  
Or, have individual results required “tuning”?  
→ Test the method on more than one earthquake.
- Reproducibility. Can other researchers duplicate the result?  
→ Requires clear documentation and open-access to data.

Publications:

- Thomas, J. N., Love, J. J. & Johnston, M. J. S., 2009. On the reported magnetic precursor of the 1989 Loma Prieta earthquake, *Phys. Earth Planet. Int.*, 173, 207-215.
- Thomas, J. N., Love, J. J., Johnston, M. J. S. & Yumoto, K., 2009. On the reported magnetic precursor of the 1993 Guam earthquake, *Geophys. Res. Lett.*, 36, L16301, doi:10.1029/2009GL039020.

