New Earthquake Classification Scheme for Mainshocks and Aftershocks in the NGA – West2 Ground Motion Prediction Equations (GMPEs)

Kathryn Wooddell

kxwl@pge.com

EARTHQUAKE CLASSIFICATION: 2008 NGA

❑ 2008 NGA Flatfile:
  ▪ **173** earthquakes
  ▪ **3551** recordings

❑ Treatment of aftershocks is a key difference in the ultimate dataset selection:

  ▪ Models that Include Aftershocks: AS08, CY08, I08 (only for rock sites)
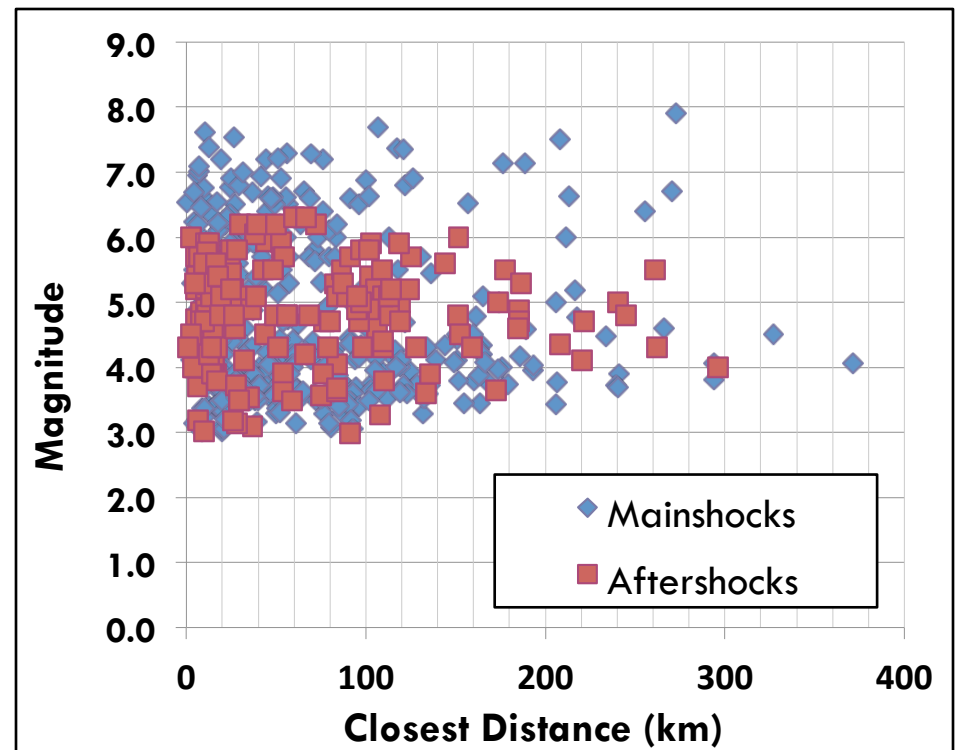 ▪ Models that Do Not Include Aftershocks: BA08, CB08

	AS08	BA08	CB08	CY08	I08
TOTAL EARTHQUAKES: (MS + AS)	135	58	64	125	72
TOTAL AFTERSHOCKS: (AS)	46	0	0	45	~27

* Aftershocks independently classified by each developer team

- ❑ 2012 NGA – W2 Flatfile:
    - **598** earthquakes
    - **19409** recordings

- ❑ Aftershocks (Class 2 Events) are classified using a modified version of the Gardner and Knopoff (1974) declustering algorithm.

- ❑ It is up to each developer team to decide how to incorporate them into the GMPE:
    - Exclude them
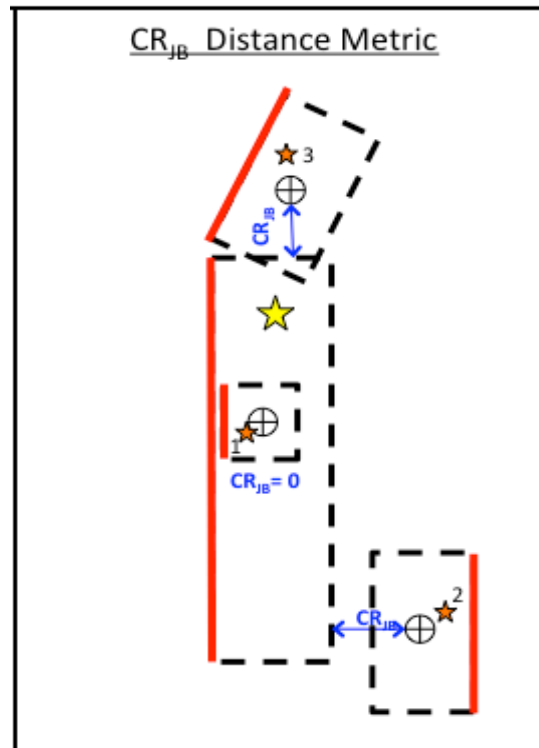   - Include them but account for the difference in ground motion

- ❑ **CLASS 1**: classically defined mainshocks, foreshocks, triggered events, and aftershocks that occur off of the Class 1 rupture plane or are outside of the time window for aftershocks

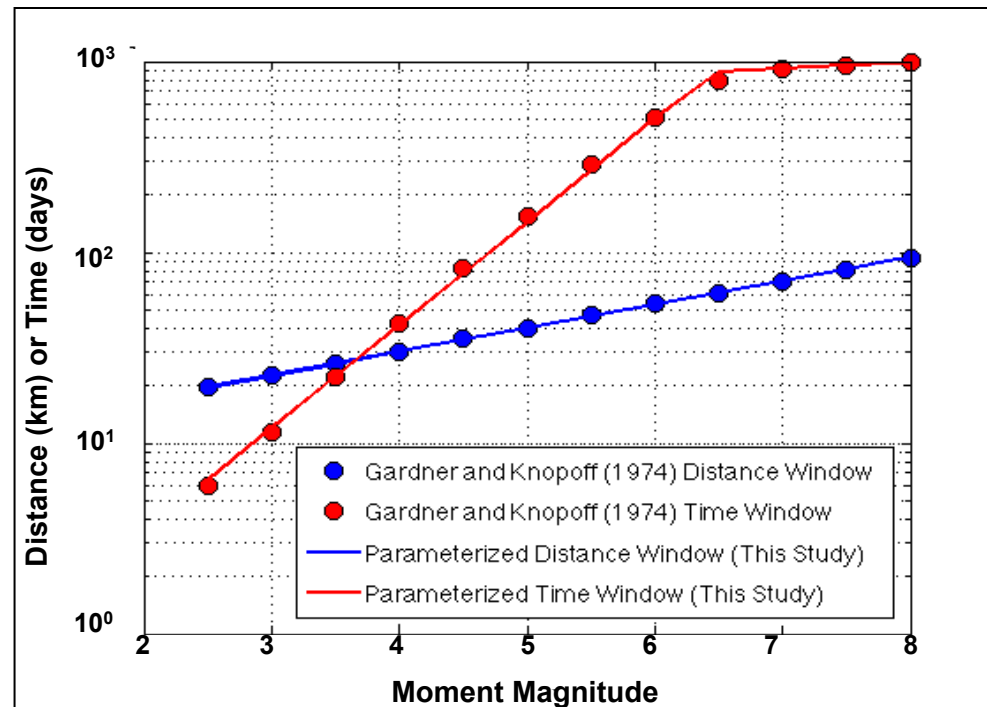- ❑ **CLASS 2**: aftershocks that re-rupture (or are close to) the mainshock rupture plane

- ❑ **CR$_{JB}$**: shortest distance between the centroid of the Joyner – Boore rupture surface of the potential Class 2 earthquake and the closest point on the edge of the Joyner – Boore rupture surface of the Class 1 event

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CR$_{JB}$ Distance Metric

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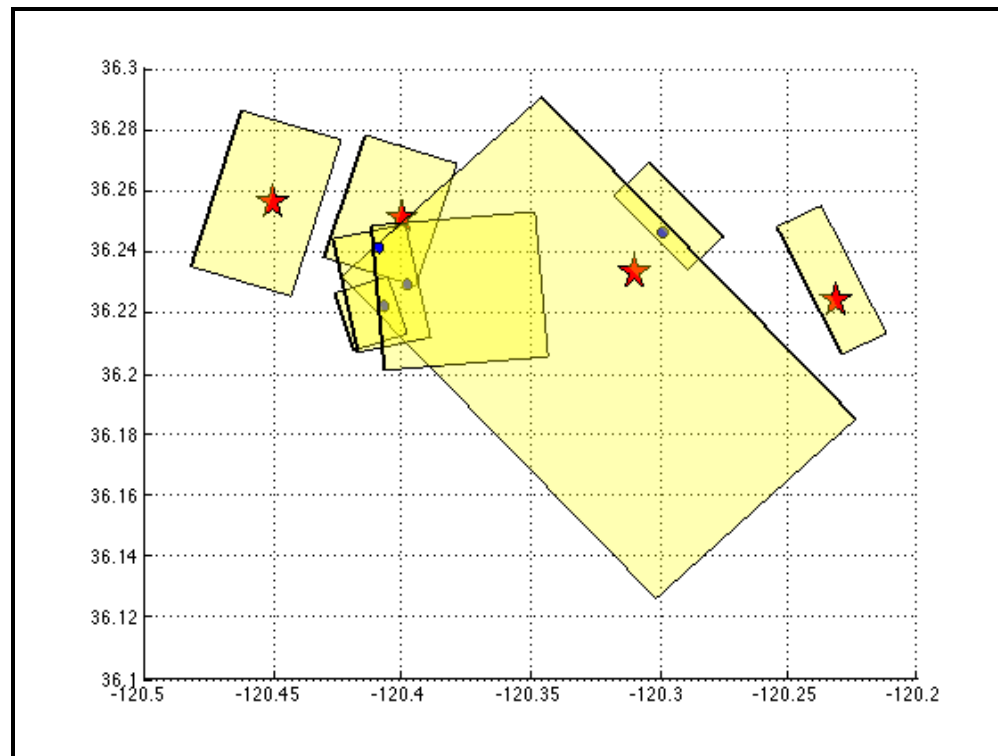
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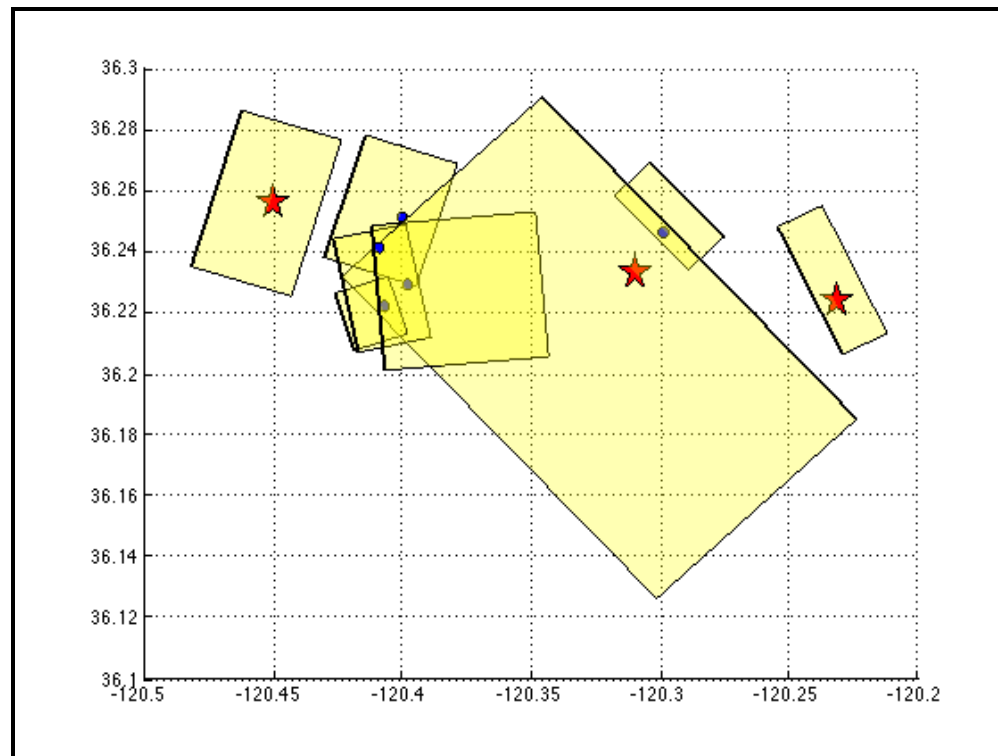☐ **CLASS 2**: aftershocks that re-rupture (or are close to) the mainshock rupture plane

$CR_{JB} = 0$ km

DEFINITION OF NEW TERMS

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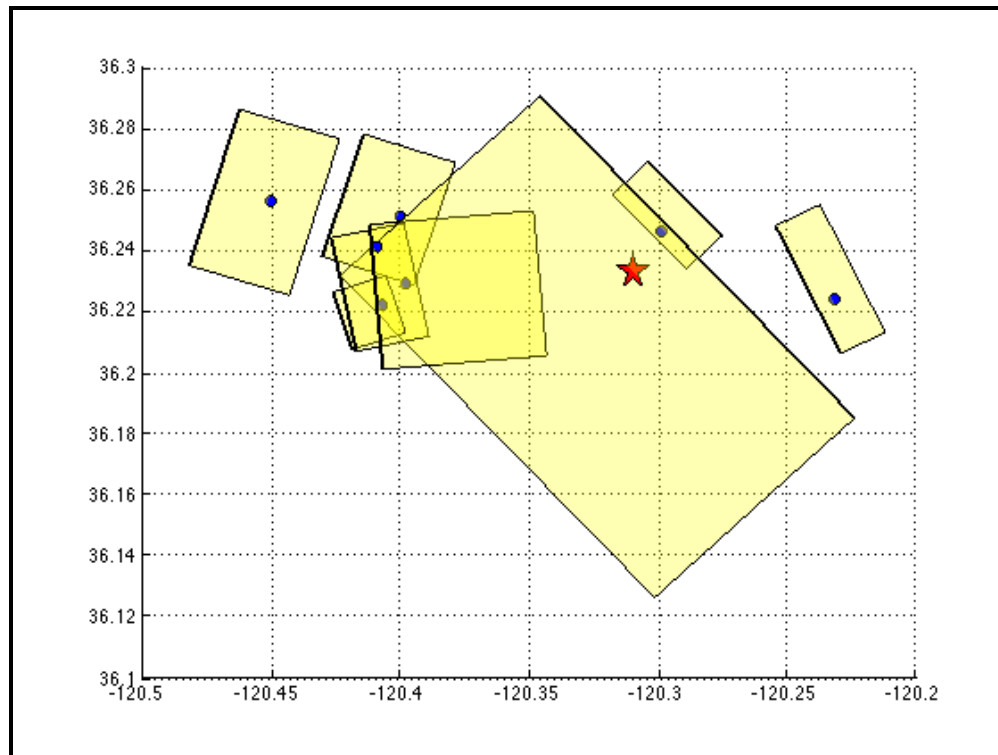❑ **CLASS 2**: aftershocks that re-rupture (or are close to) the mainshock rupture plane
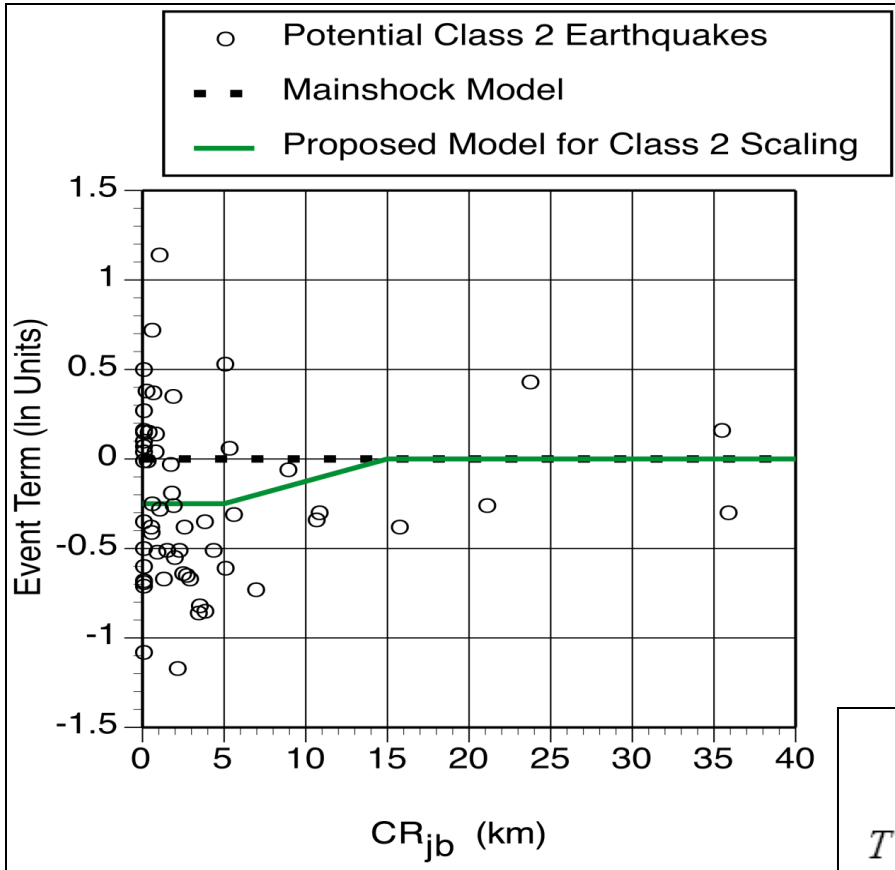

CR_{JB} = 2 km

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CR_{JB} = 5 km

$$T(CR_{JB}) = \begin{cases} c_1 & for\, CR_{JB} \leq 5\,km \\ c_1\left[\dfrac{CR_{JB}-5}{10}\right] & for\, 5 < CR_{JB} < 15\,km \\ 0 & for\, CR_{JB} > 15\,km \end{cases}$$

Thank You!

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