Fault Displacement Modeling & Data Needs for Displacement Hazard Maps

Participants:

Chris Milliner (JPL, Caltech)

Brian Chiou (CalTrans)

Mark Petersen (USGS)

Timothy Dawson (CGS)

Rui Chen (CGS)

Earlier participants:

Chris Wills (retired)

Tianqing Cao (retired)

David Schwartz (USGS)

Arthur Frankel (USGS)

Start from: Approach and models in Petersen et al. (2011, BSSA)

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Model Improvements & New Modeling Ideas Using FDHI Database

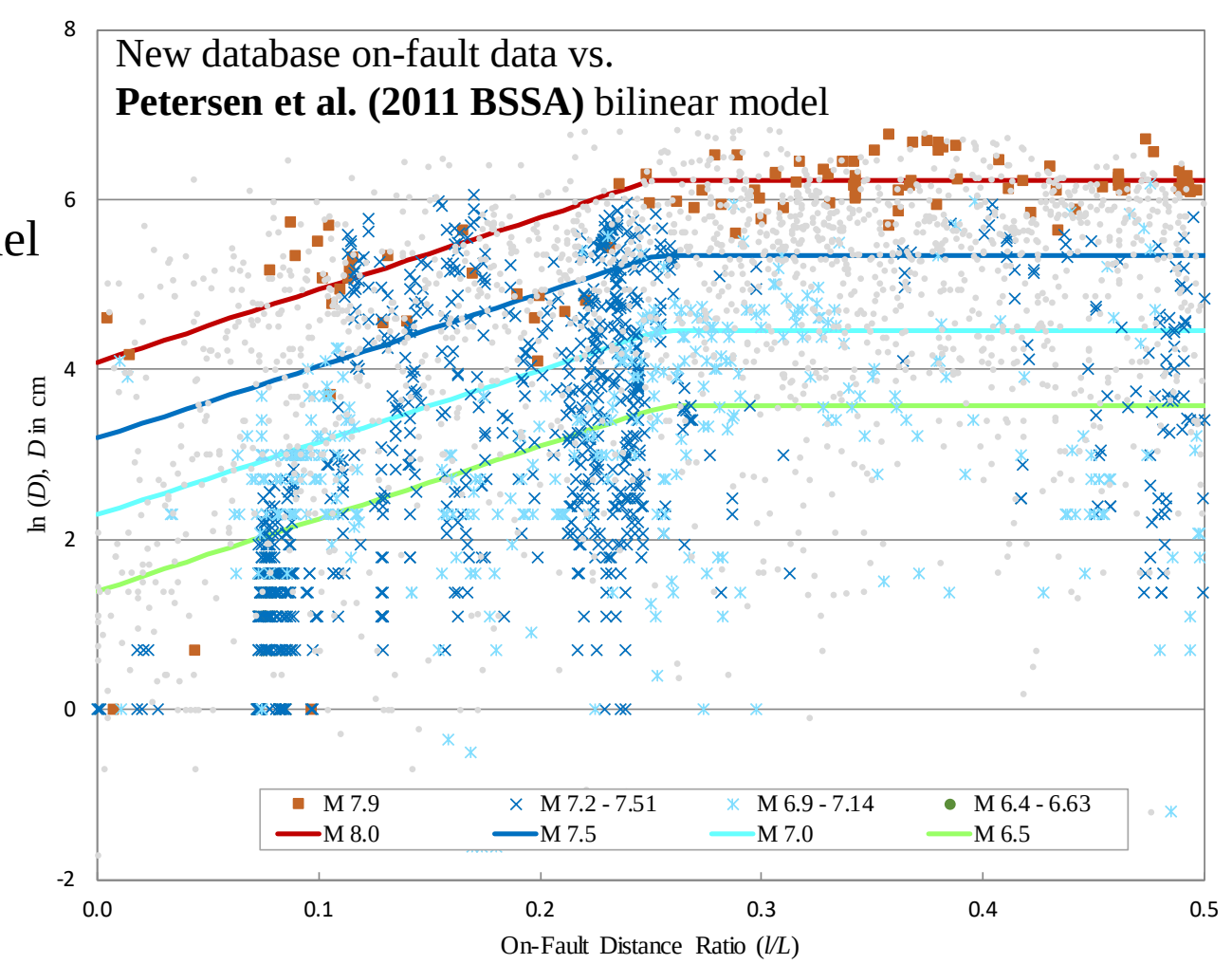
$$\lambda(D \geq D_0)_{xyz} = \alpha(m_0) \int_{m,s} f_{M,S}(m,s) P[sr \neq 0|m] \int_{r} P[D \neq 0|z,r,sr \neq 0] P[D \geq D_0|\, l/L\,, m, D \neq 0] f_R(r)\, dr dm ds$$

Re-evaluate component models (field-based measurements):

- Can we improve existing models or shall we model data differently?
- Displacement models ($P[D \geq D_0|\, l/L\,, m, D \neq 0]$)
- Rupture probability ($P[D \neq 0|z,r,sr \neq 0]$)

How to use pixel-based deformation data?

- Probabilistic strain analysis (Chris), or
- Total displacement + zone width, or
- Shapes of strain or displacement profiles across fault?



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Data Needs for Probabilistic Displacement Hazard Maps

Uncertainty in location of surface rupture for future events, $f_R(r)$

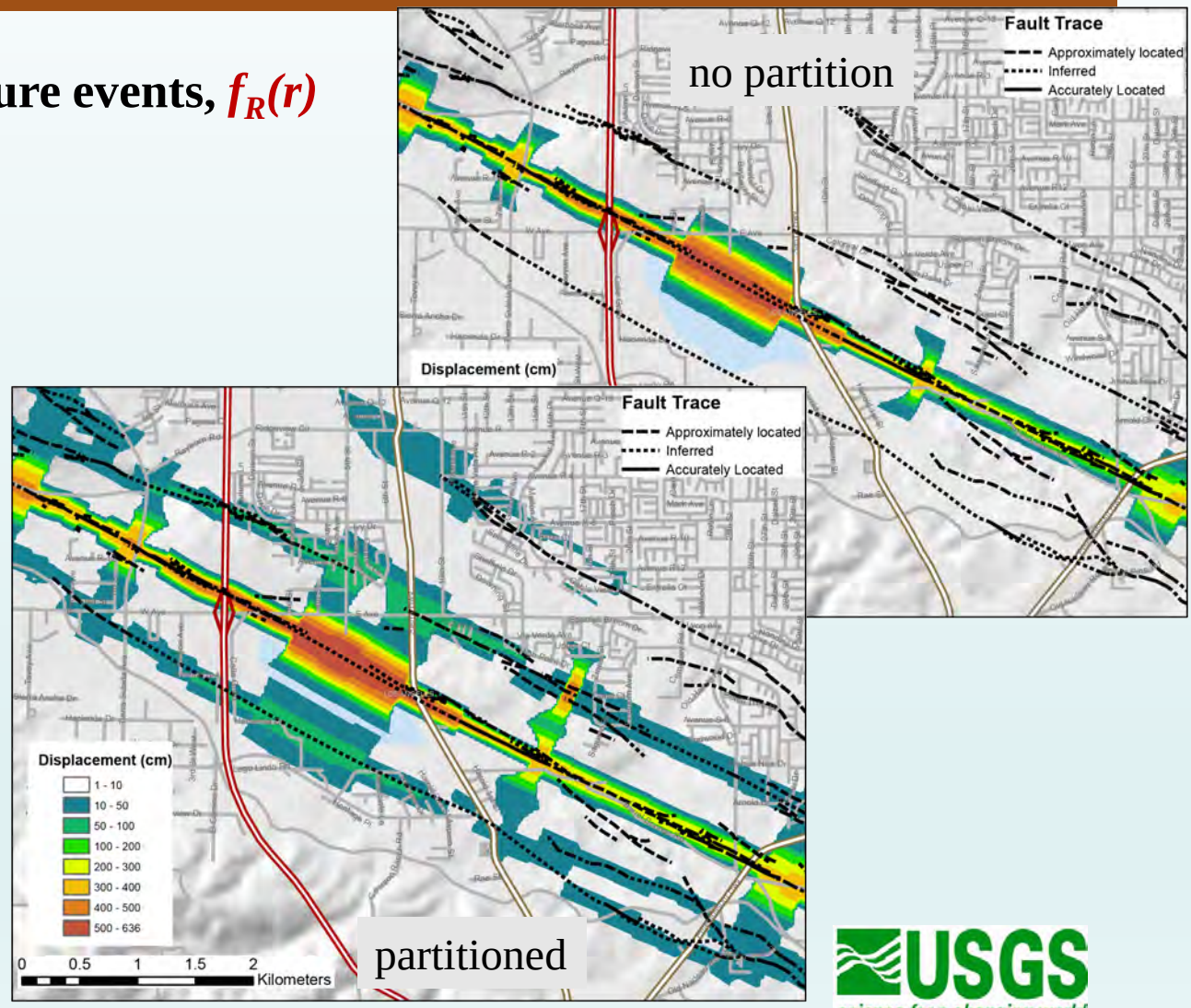
- Epistemic uncertainty:
  - Depends on the fault map used in PFDHA
- Aleatory variability:
  - Paleoseismic studies (trenches with multi events)

Handling multiple branches

- Partition displacement (within event)
- Assign likelihood of rupture (between events)

Handling fault geometric details (bends, vertices)

- Level of detail depends on application
- Rely on GIS (polyline-based) for mapping?



(Chen and Petersen, 2011, Earthquake Spectra)

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