Statistical Uncertainty of Median Prediction for Crustal Event

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Taiwan SSHAC Level 3 PSHA Study

Taipei, Taiwan

Epistemic Uncertainty of Median Prediction for Crustal Source

- **Model-to-Model Variability**
  - It is represented by 7 adjusted foreign models and 2 Taiwan models
    - ASB14adj, ASK14adj, Bindi14adj, BSSA14adj,CB14adj, CY14adj and Idriss14adj
    - Phung17 and Chao17
- **Within-Model Variability**
  - Covariance matrix of **4 adjusted foreign model coefficients** are established following **Atik and Youngs (2013) approach** by using selected Taiwan ground motion data
    - ASB14adj, Bindi14adj, BSSA14adj and I14adj
  - Covariance matrix of Chao17 model coefficients are involved
  - Statistical uncertainty model of median prediction proposed by Atik and Youngs 2013 are involved for comparison

Selected GM Data to Develop Covariance Matrix of Adjusted Foreign Model

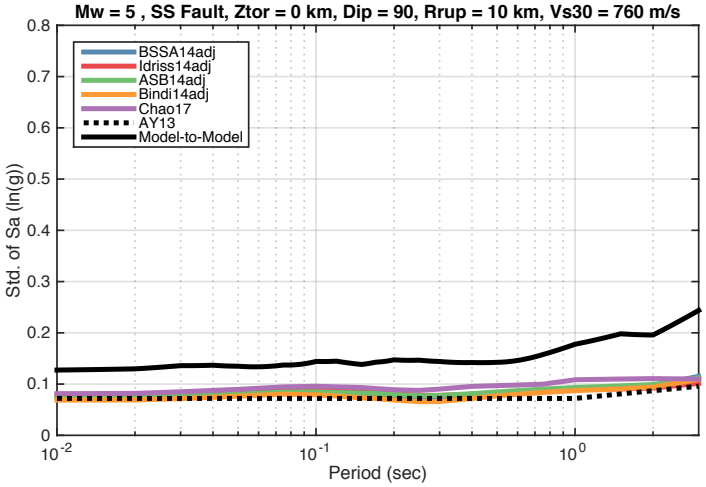
- **We use the same ground motion data as adjusting foreign models to develop the covariance matrix of their model coefficients**

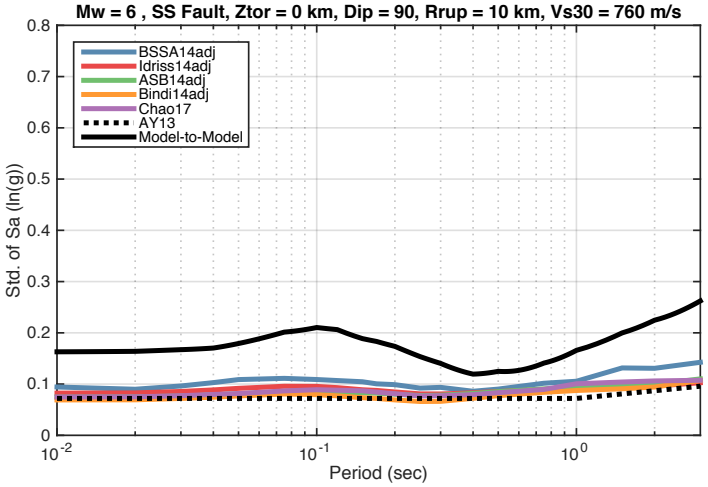
- **Selection Criteria**
  - Source type is either '*Shallow Crustal*' or '*Deep Crustal*'
  - Exclude aftershocks
  - Exclude 1999 ChiChi earthquake
  - $R_{rup} \leq R_{max}$
  - Number of recordings in an earthquake > 15
  - Spectral period (T) < Longest usable period

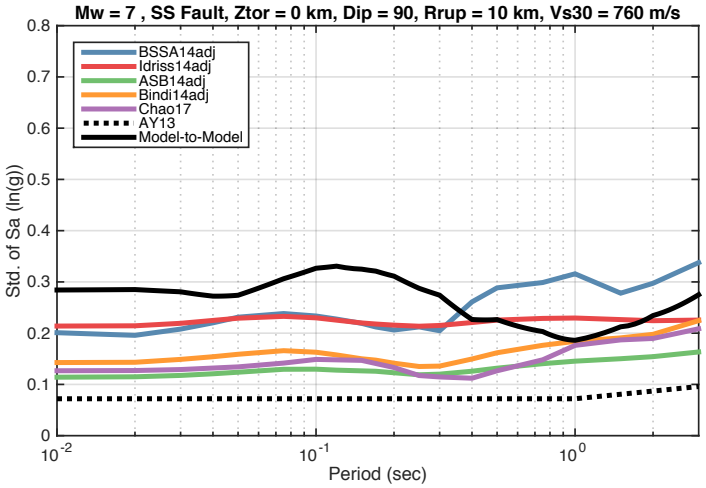
Development of Covariance Matrix for Adjusted Foreign Model

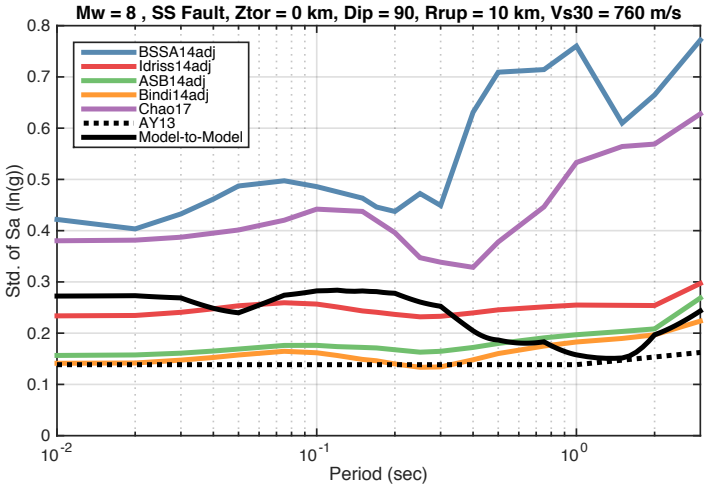
- **In order to avoid complicated partial differential calculation, we only consider the covariance matrix of model coefficients in linear function form**
- **Model coefficients controlling large magnitude scaling which cannot be constrained by selected GM data are assumed as constant and its variability will not be considered**
  - c6 of ASB14adj model
  - c7 of Bindi14adj model
  - c3, c6 and c8 of Idriss14adj model

Period vs. Epistemic Uncertainty

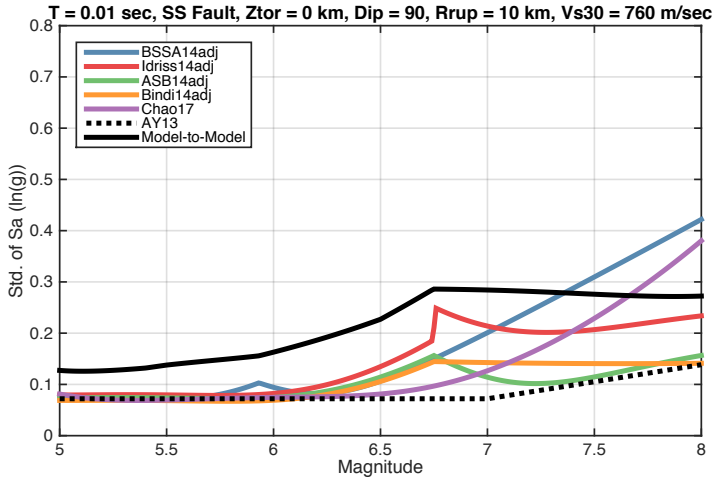


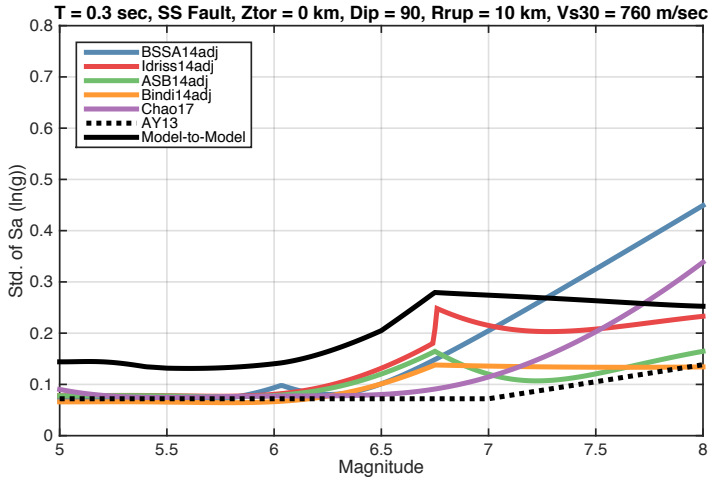


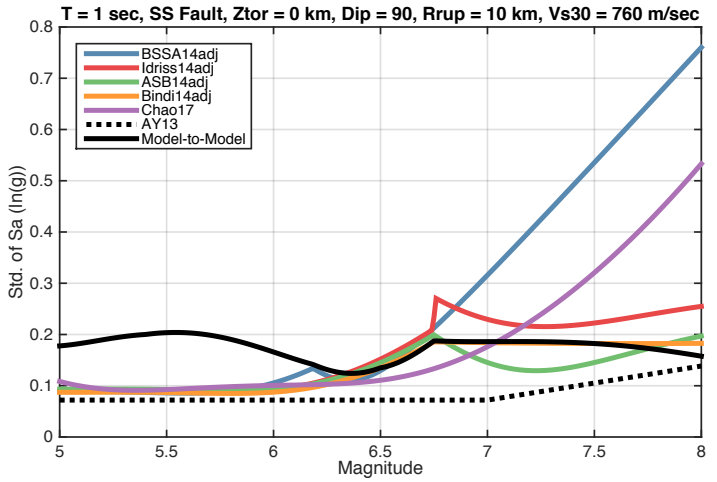


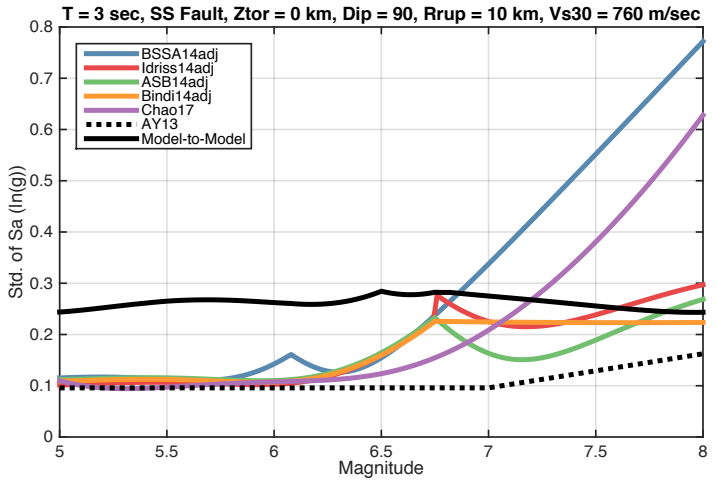


Magnitude vs. Epistemic Uncertainty

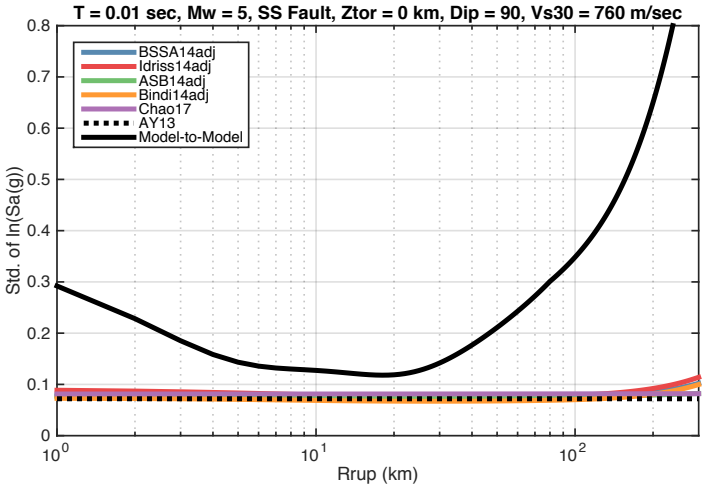


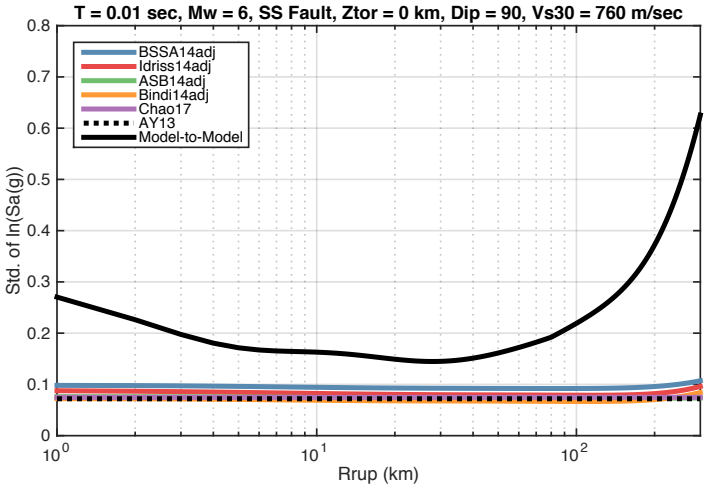


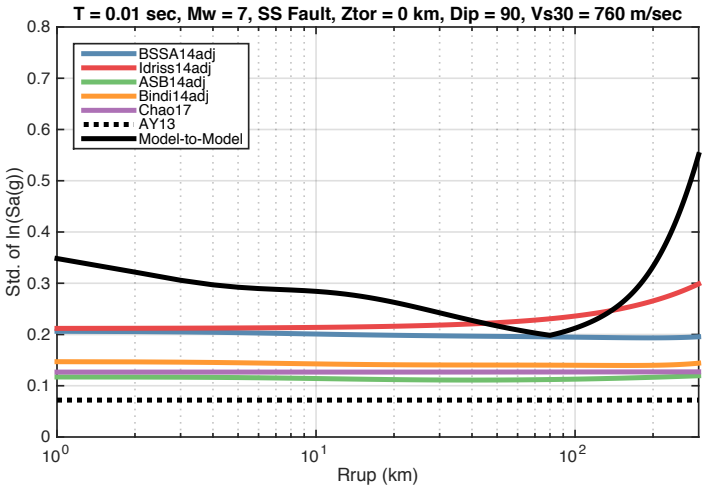


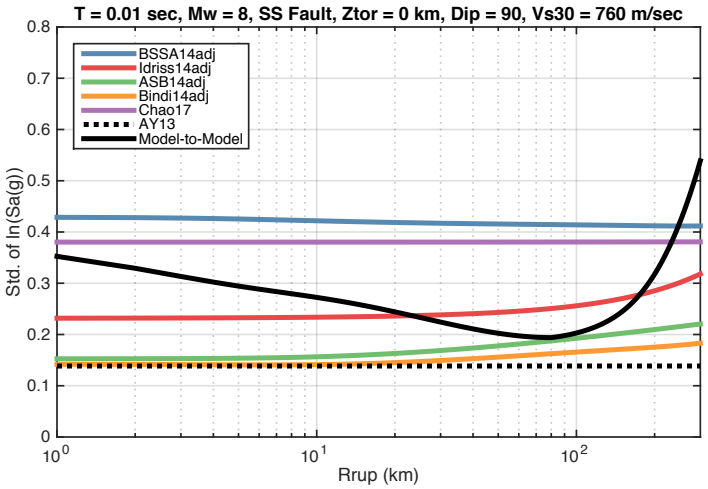


Distance vs. Epistemic Uncertainty for T = 0.01 sec









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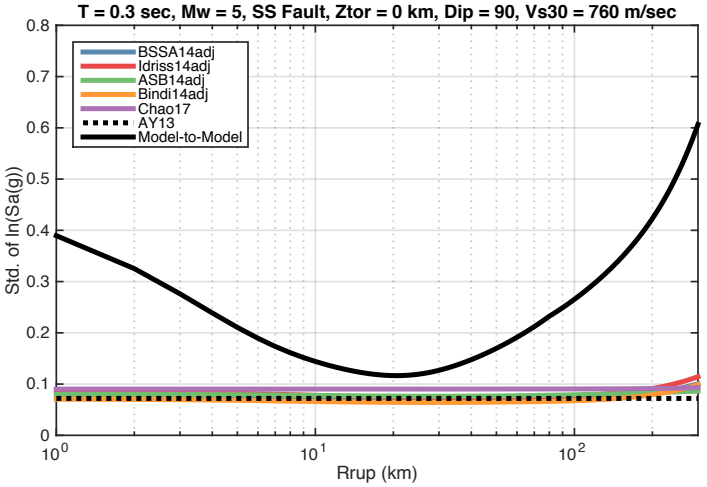
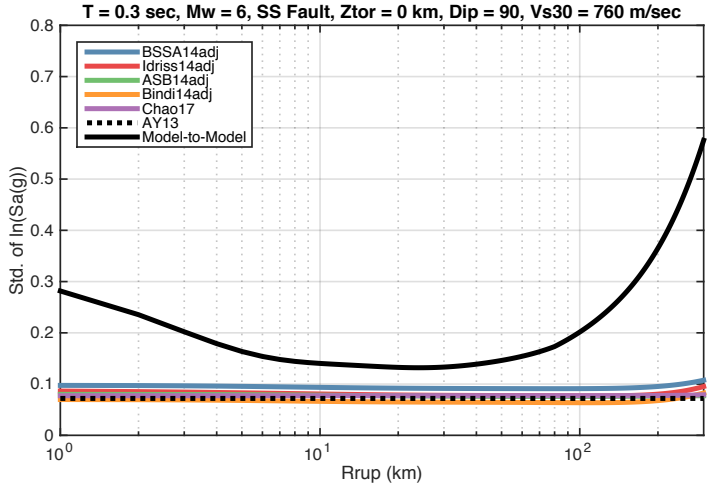
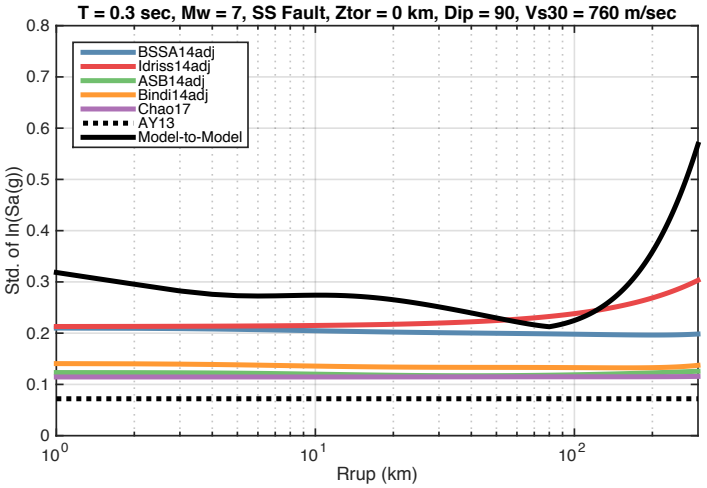
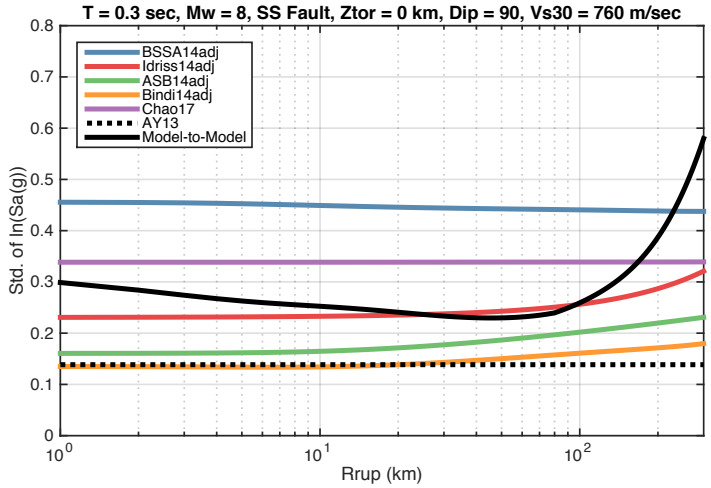
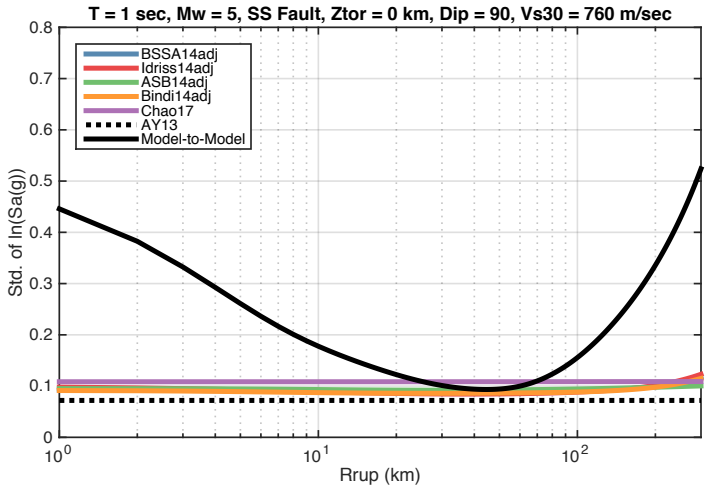


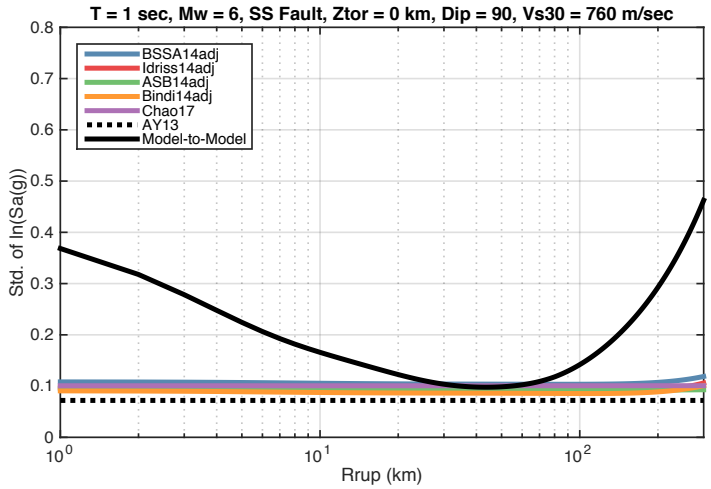


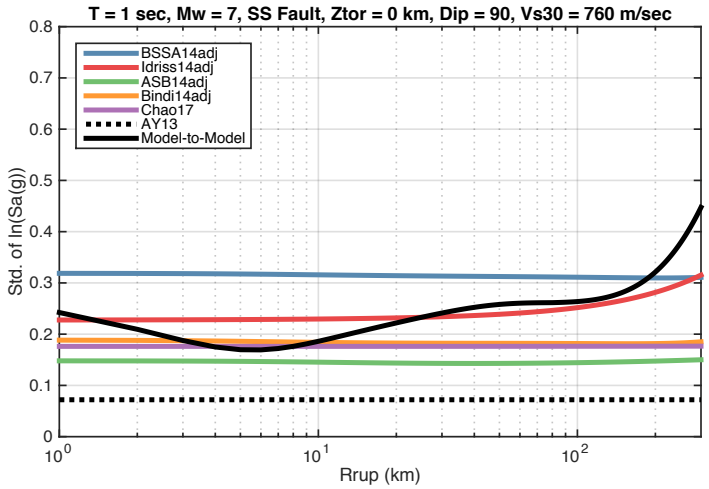


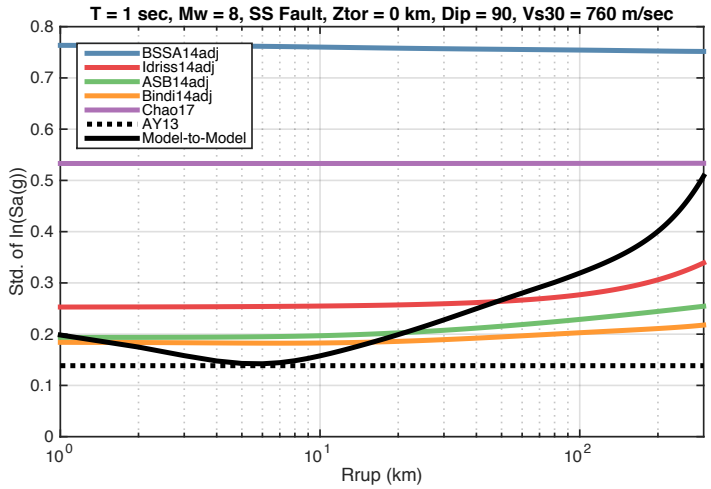


Distance vs. Epistemic Uncertainty for T = 1.0 sec

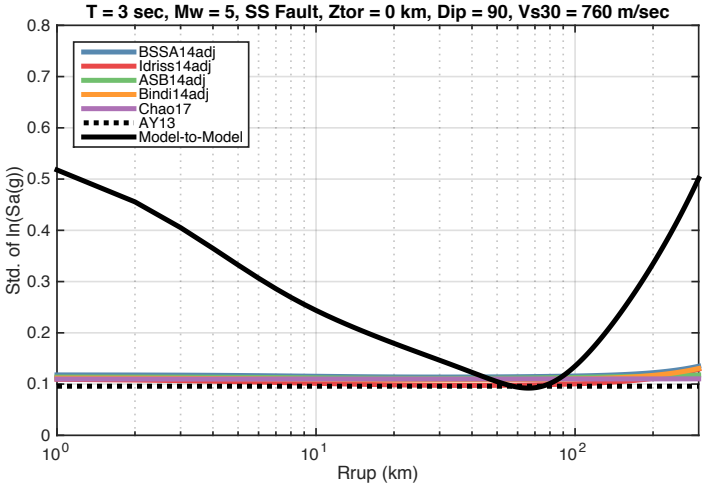


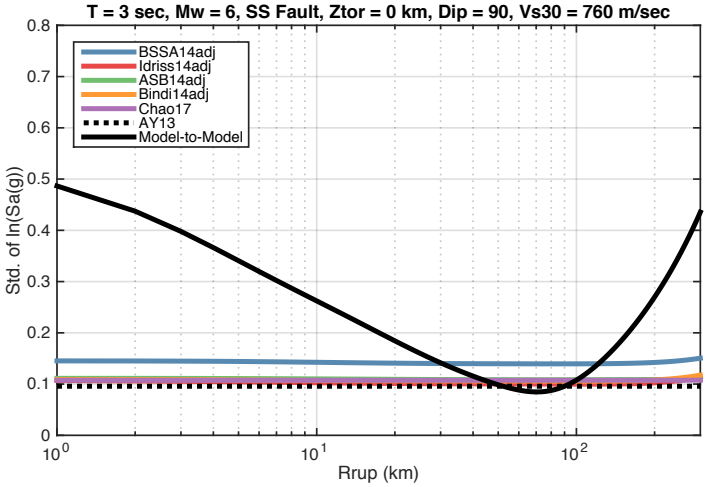


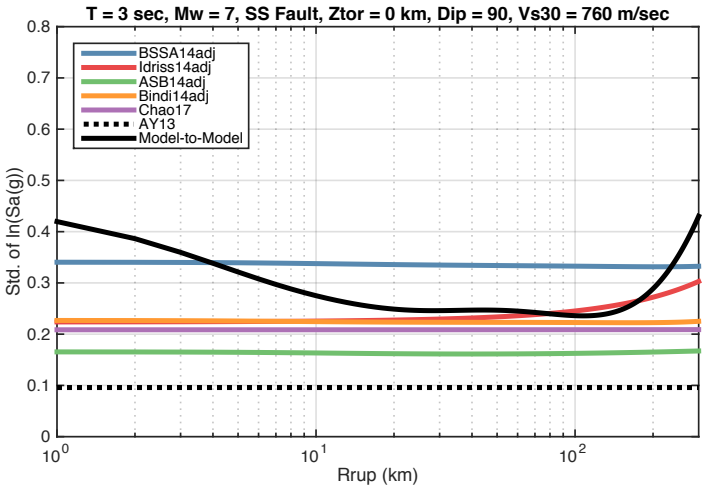


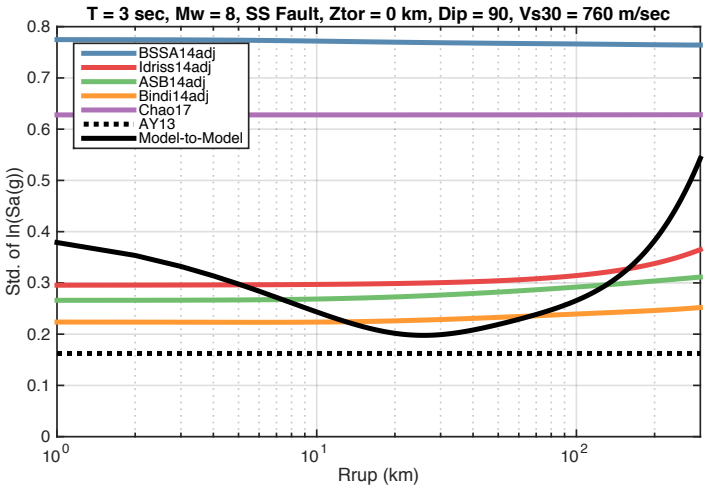


Distance vs. Epistemic Uncertainty for T = 3.0 sec

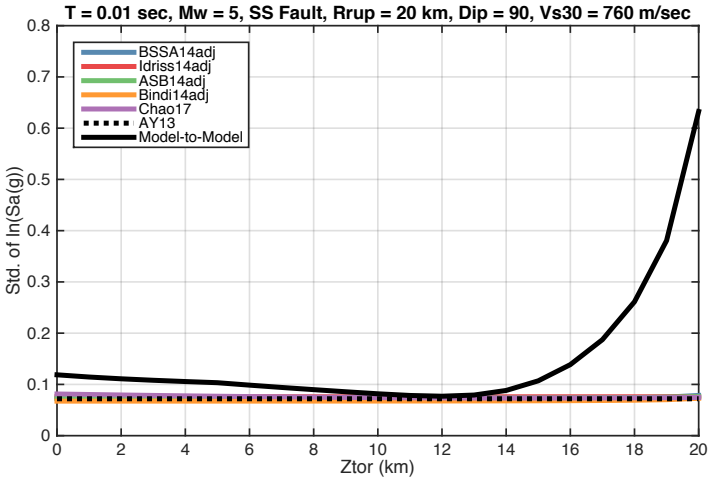


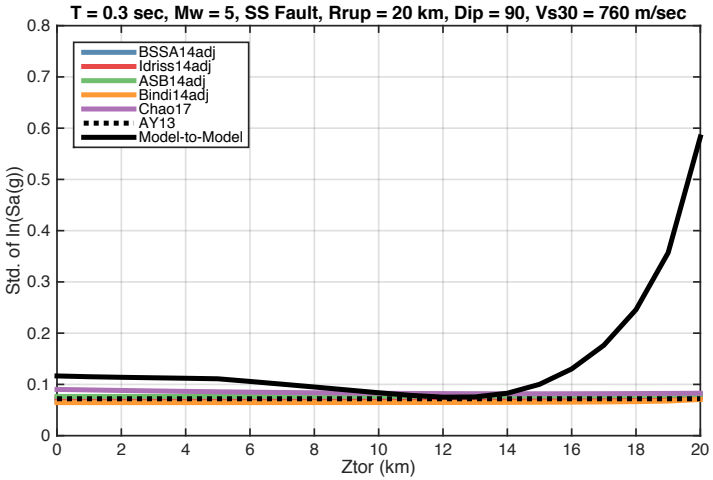


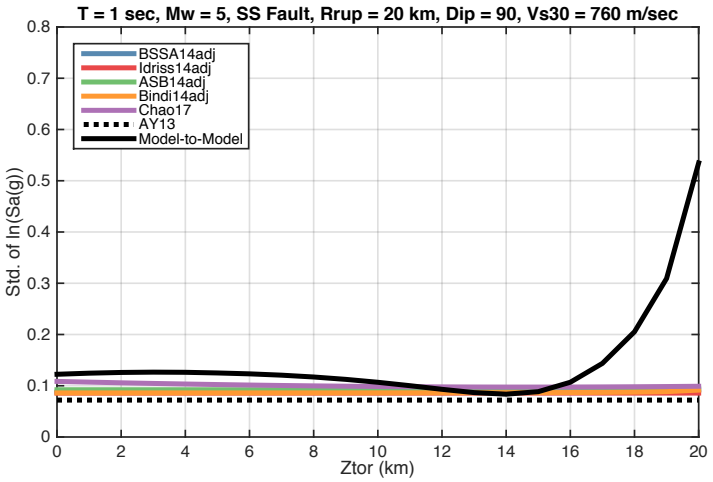


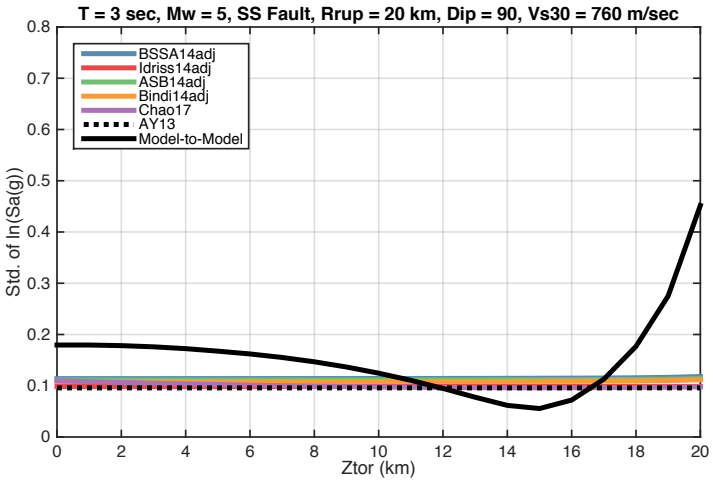


Ztor vs. Epistemic Uncertainty for Mw 5.0

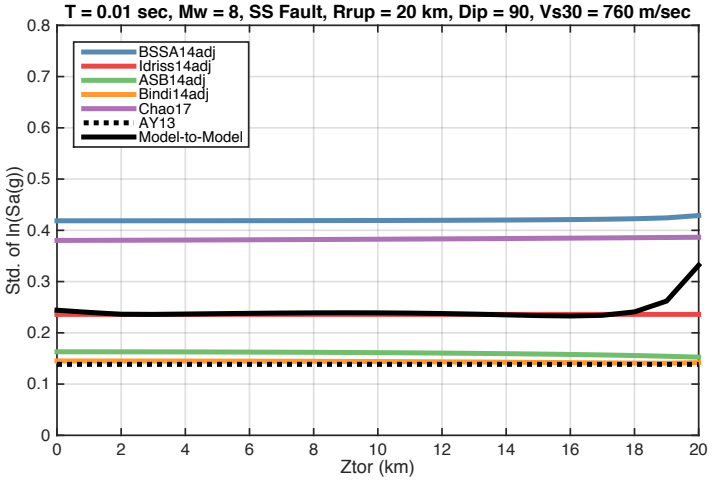


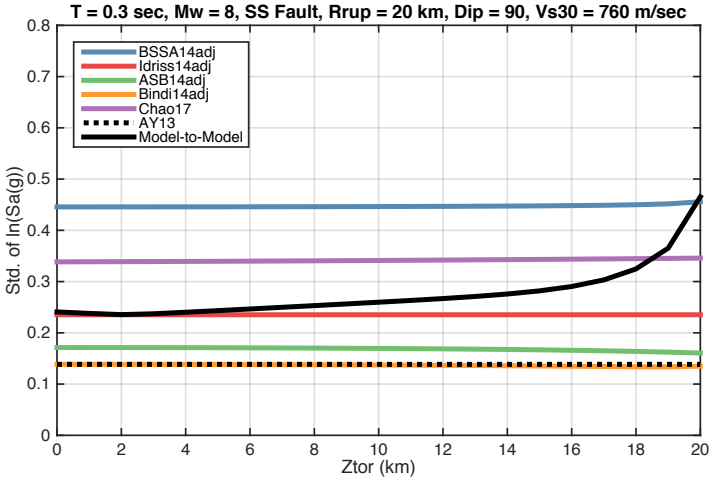


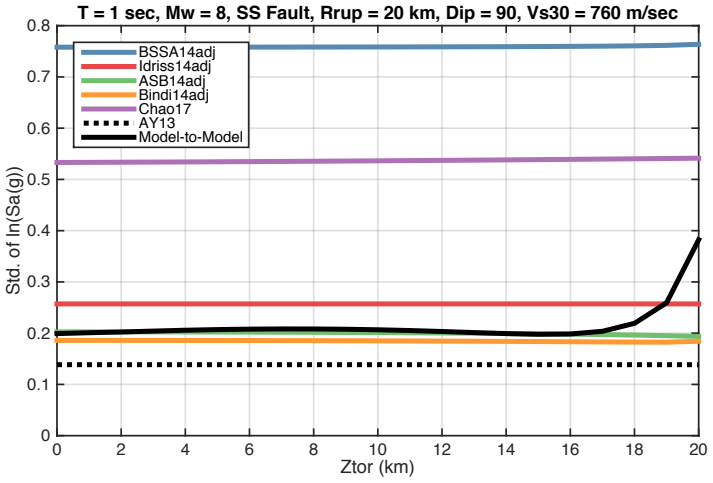


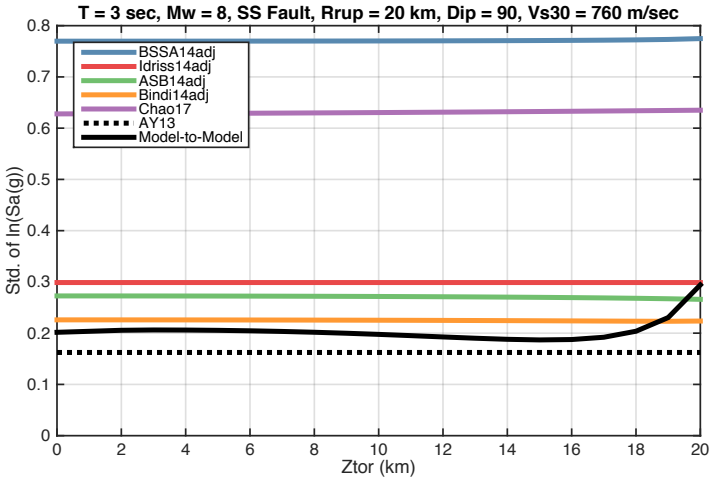


Ztor vs. Epistemic Uncertainty for Mw 8.0









Thank You for Your Attention !!

Questions ?

Summary and Discussion