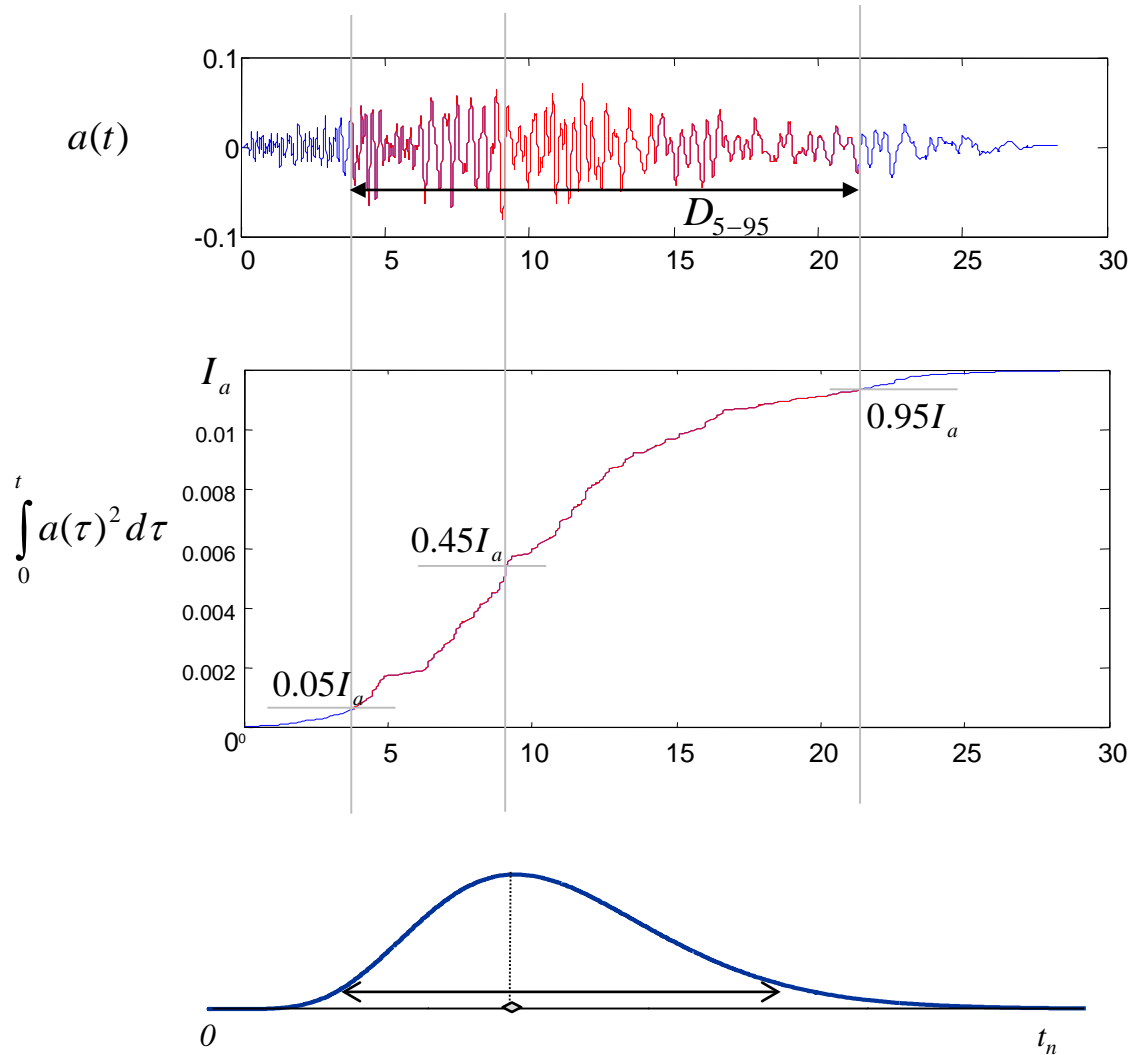


Rezaeian et al. Scalar
Ground Motion
Parameters:

Review (Evolution of Intensity):



Scalar Parameters:

$$I_a = \frac{\pi}{2g} \int_0^{t_n} a^2 dt \quad : \text{Arias intensity}$$

D_{5-95} : Effective duration
(from 5% to 95% I_a)

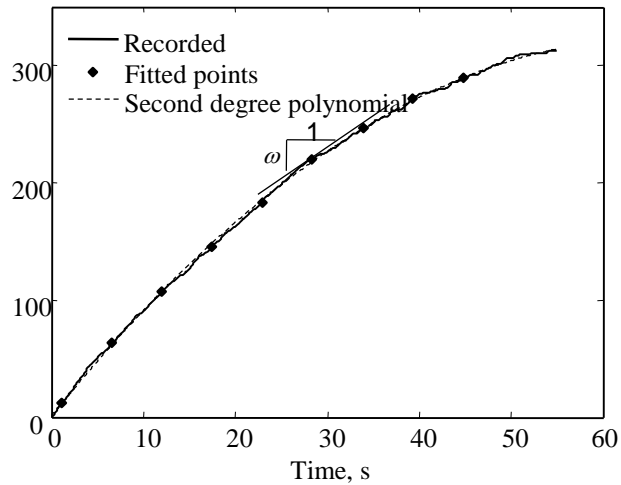
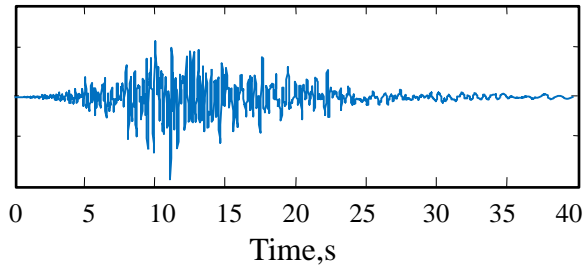
$$\frac{I_a}{D_{5-95}} \quad : \text{Rate of input energy}$$

t_{mid} : Middle of strong shaking
(~ at 45% I_a)

Review (Evolution of Frequency):

A measure of predominant frequency:

Cumulative number of zero-level up crossings



Scalar Parameters:

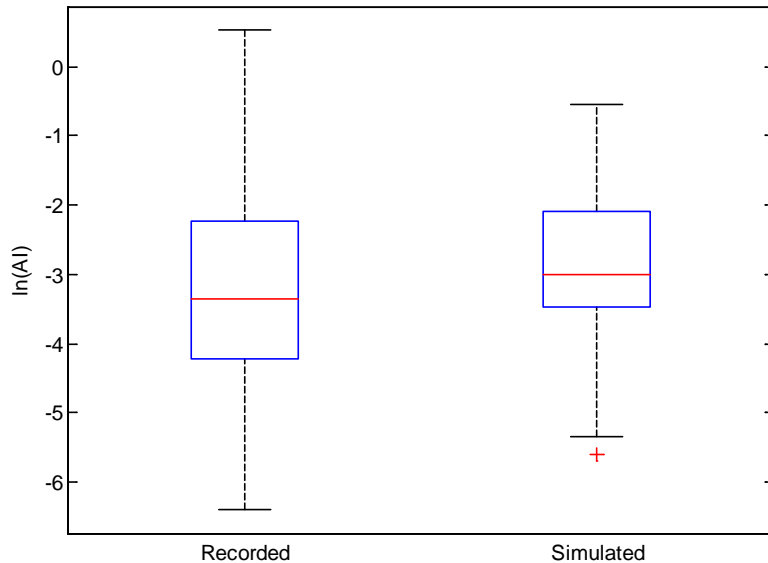
ω_{mid} : Frequency of strong shaking phase

ω' : Rate of change of frequency

Example :

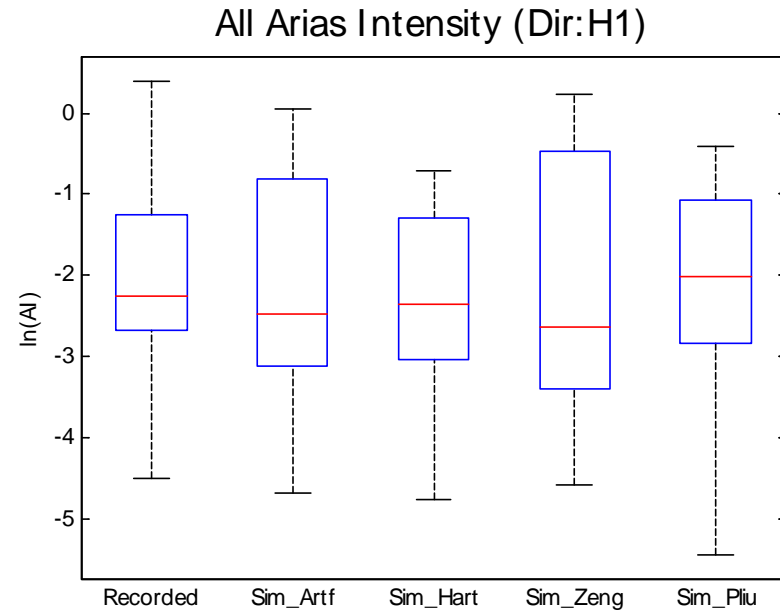
Arias Intensity

121 Records from Northridge on BBP
Rob Graves simulations



In general, simulations overestimate the Arias intensity (less variability).

42 Records from Northridge
Hartzell et al. (2011) simulations

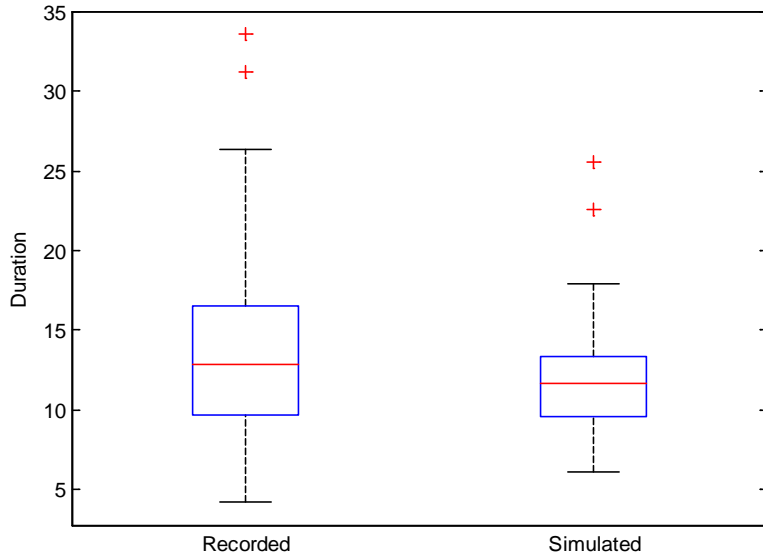


Assess simulations relative to each other (sim_Hart best).

Example :

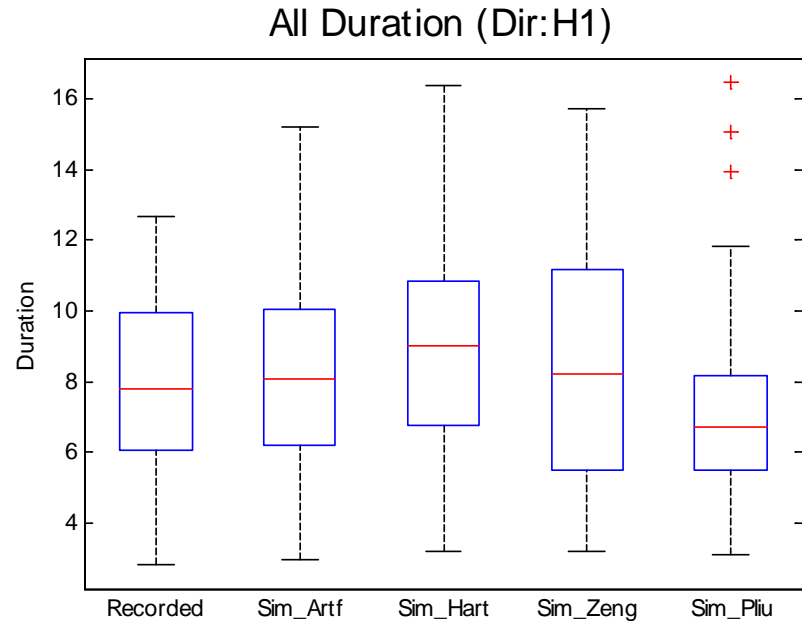
Duration

121 Records from Northridge on BBP
Rob Graves simulations



Variability of simulated durations is lower.

42 Records from Northridge
Hartzell et al. (2011) simulations

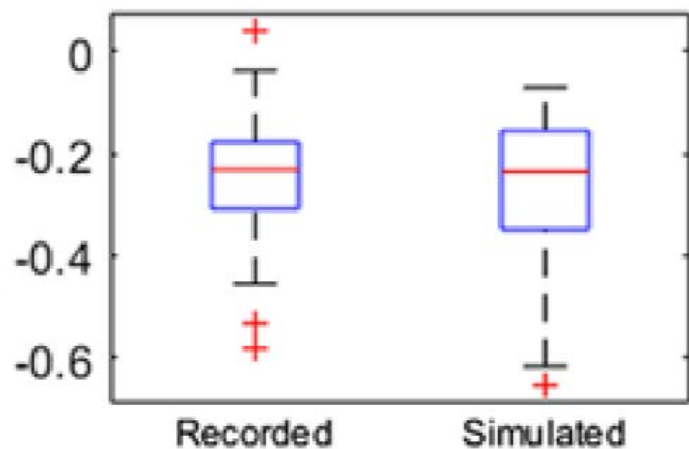


Assess simulations relative to each other (sim_Artf best).

Example :

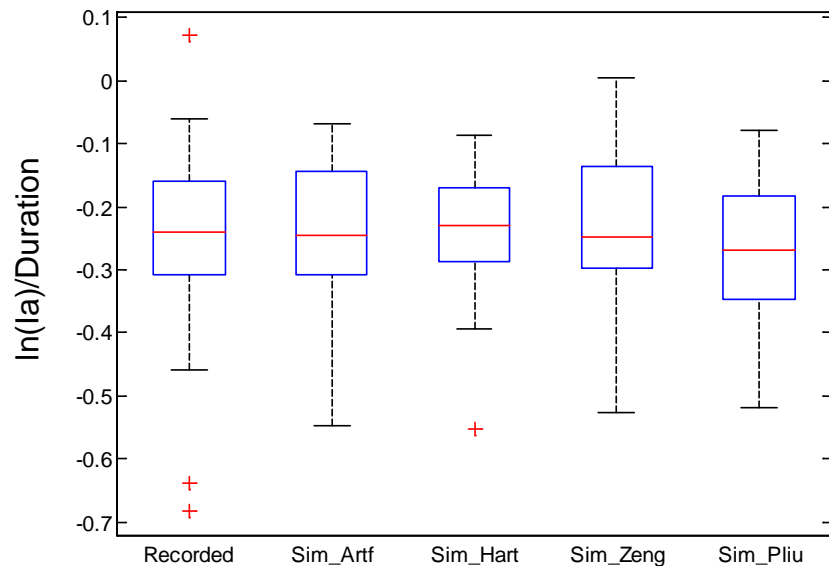
Arias Intensity / Duration

121 Records from Northridge on BBP
Rob Graves simulations



Overall, the rate of input intensity is in good agreement with recordings.

42 Records from Northridge
Hartzell et al. (2011) simulations

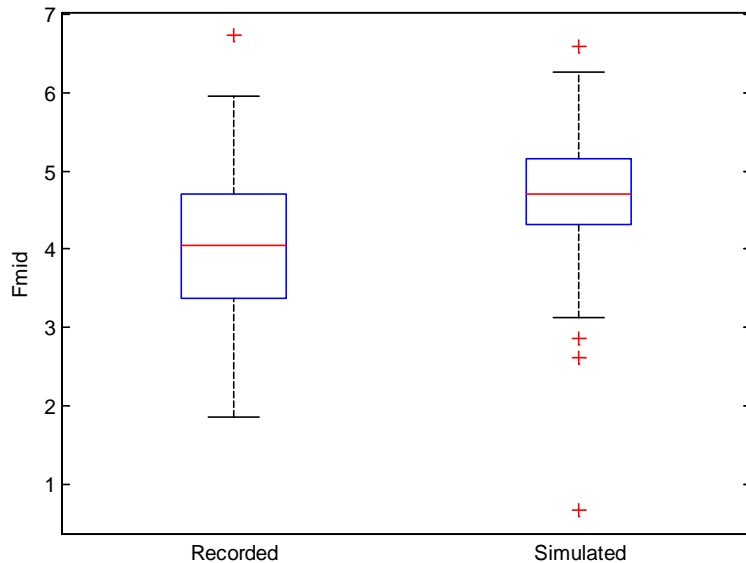


Assess simulations relative to each other (all pretty good).

Example :

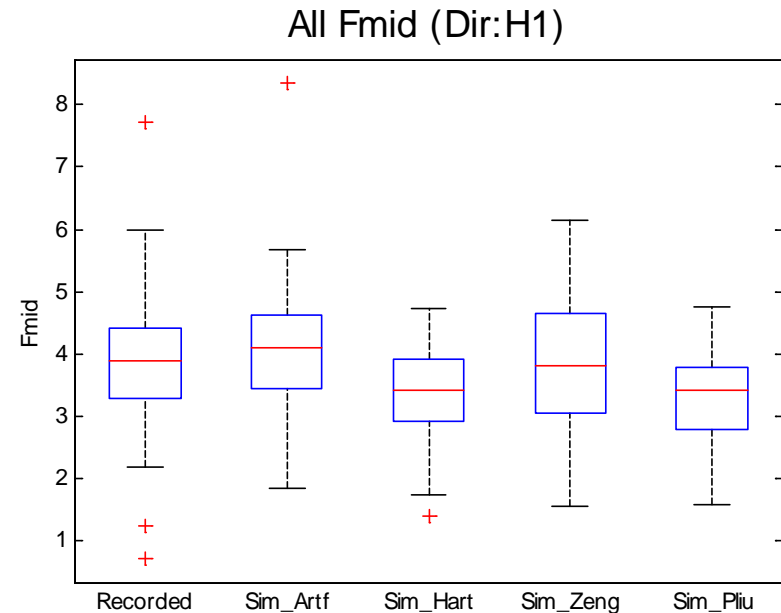
Mid Frequency

121 Records from Northridge on BBP
Rob Graves simulations



Simulations overestimate frequency at the middle of strong shaking, but the rate of frequency decay is faster (more negative numbers for ω')

42 Records from Northridge
Hartzell et al. (2011) simulations

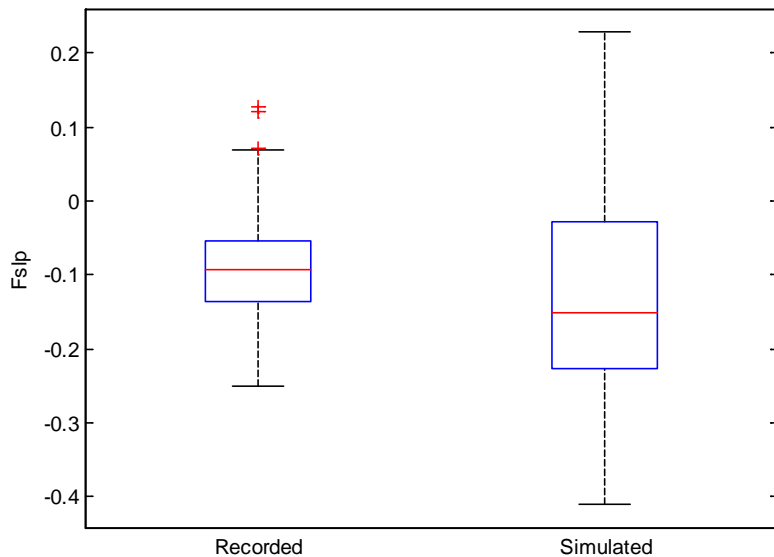


Assess simulations relative to each other.

Example :

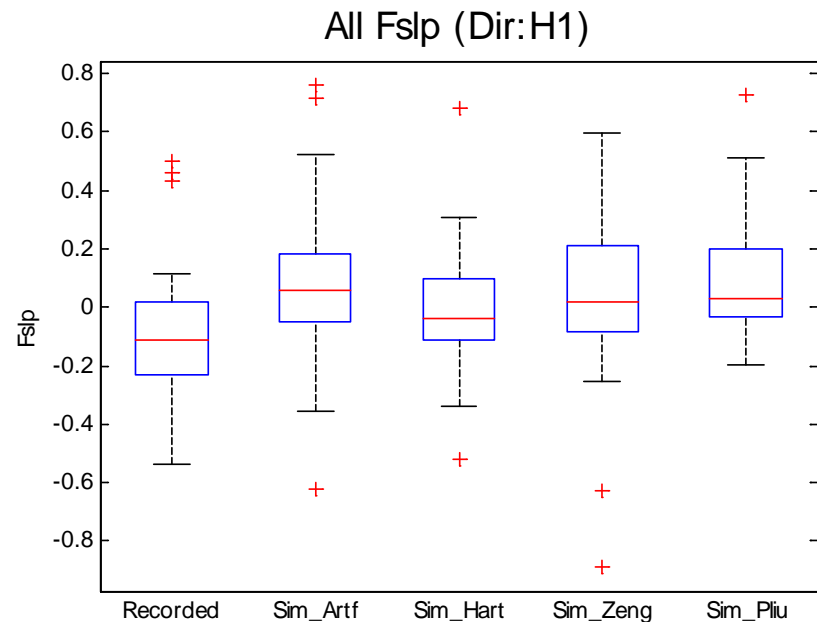
Rate of Change (Slope) of Frequency

121 Records from Northridge on BBP
Rob Graves simulations



Simulations overestimate frequency at the middle of strong shaking, but the rate of frequency decay is faster (more negative numbers for ω')

42 Records from Northridge
Hartzell et al. (2011) simulations



Assess simulations relative to each other.



Thank You