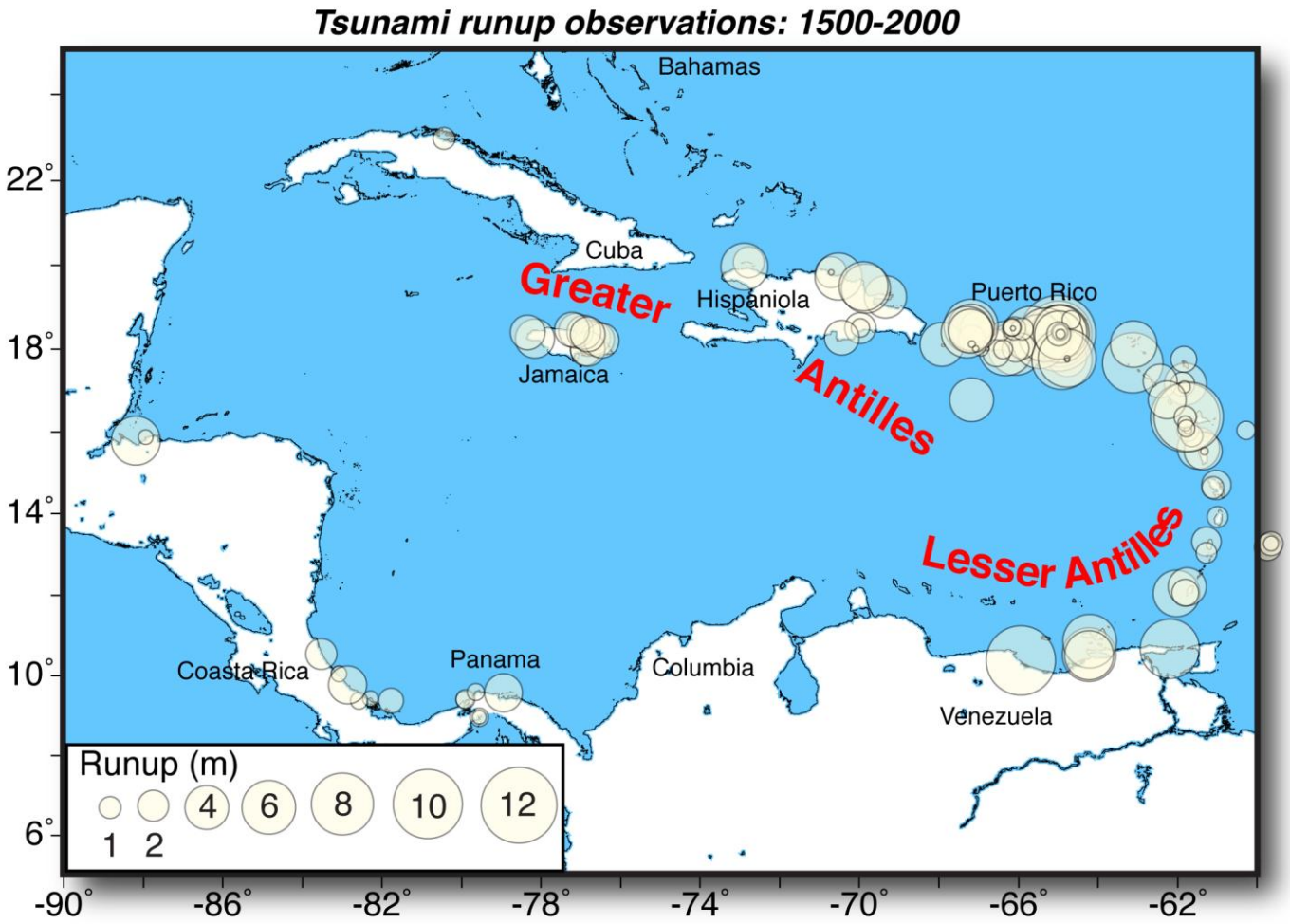
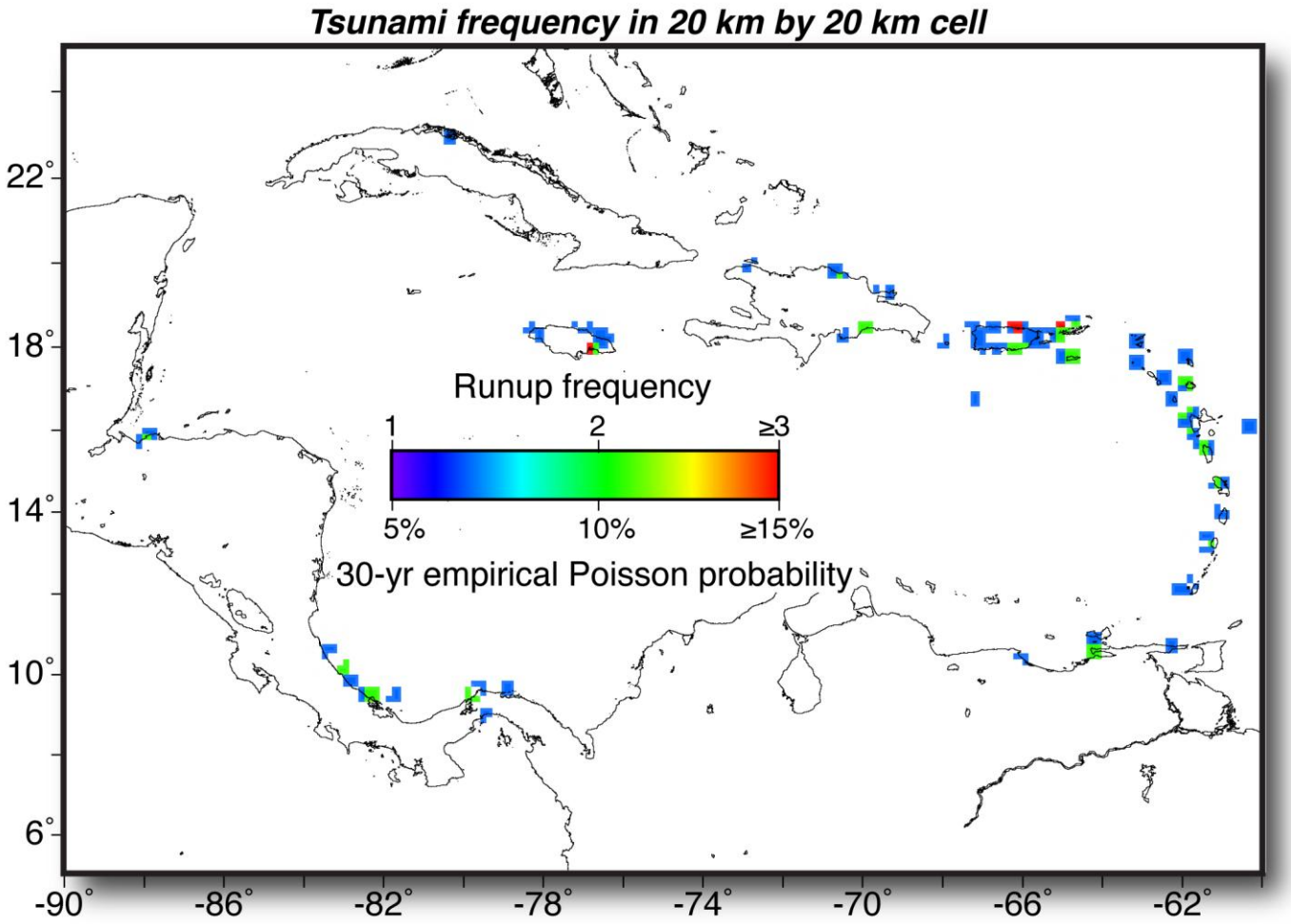
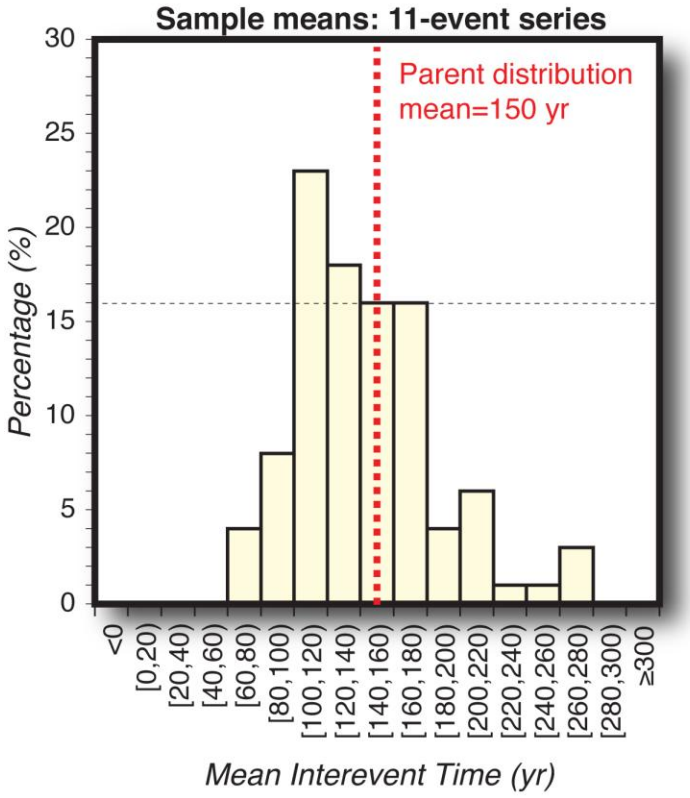
Tsunami probability in the Caribbean region

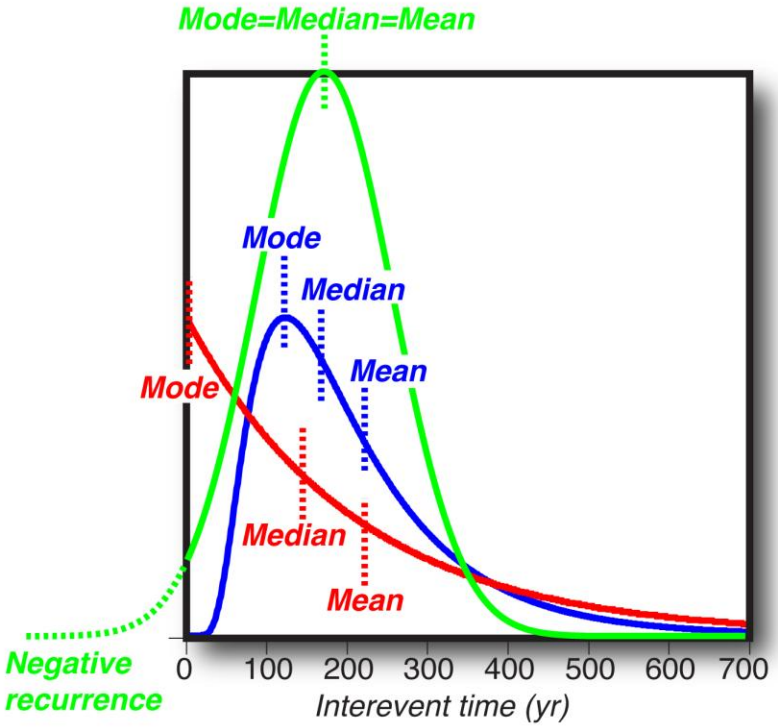


Empirical runup frequency on coastal grid



Taking the mean of an 11-event sample has a small chance (~15%) of representing a skewed parent distribution





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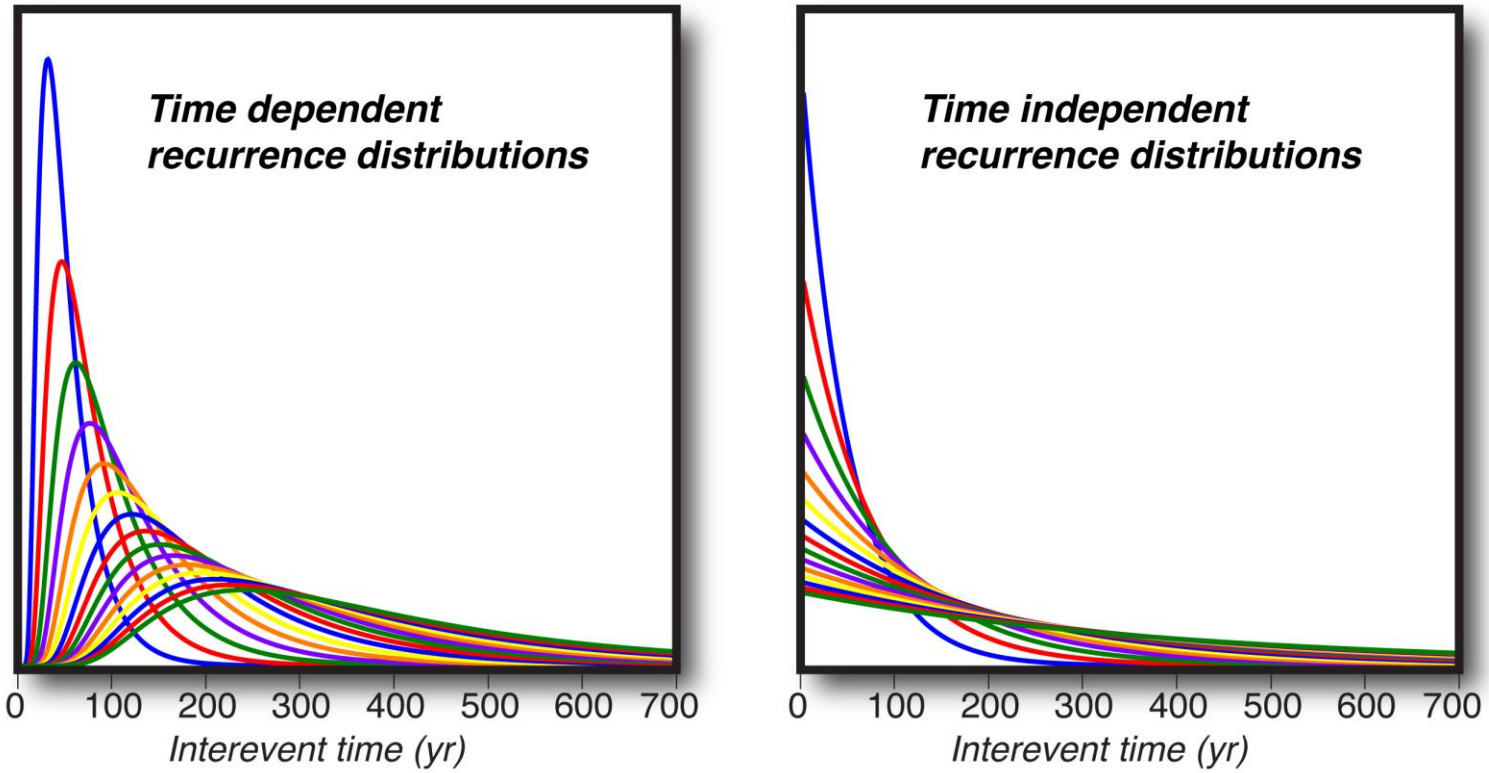
Monte Carlo method samples all parts of all recurrence distributions

We don't care so much about mean, mode etc because distribution characteristics are predefined



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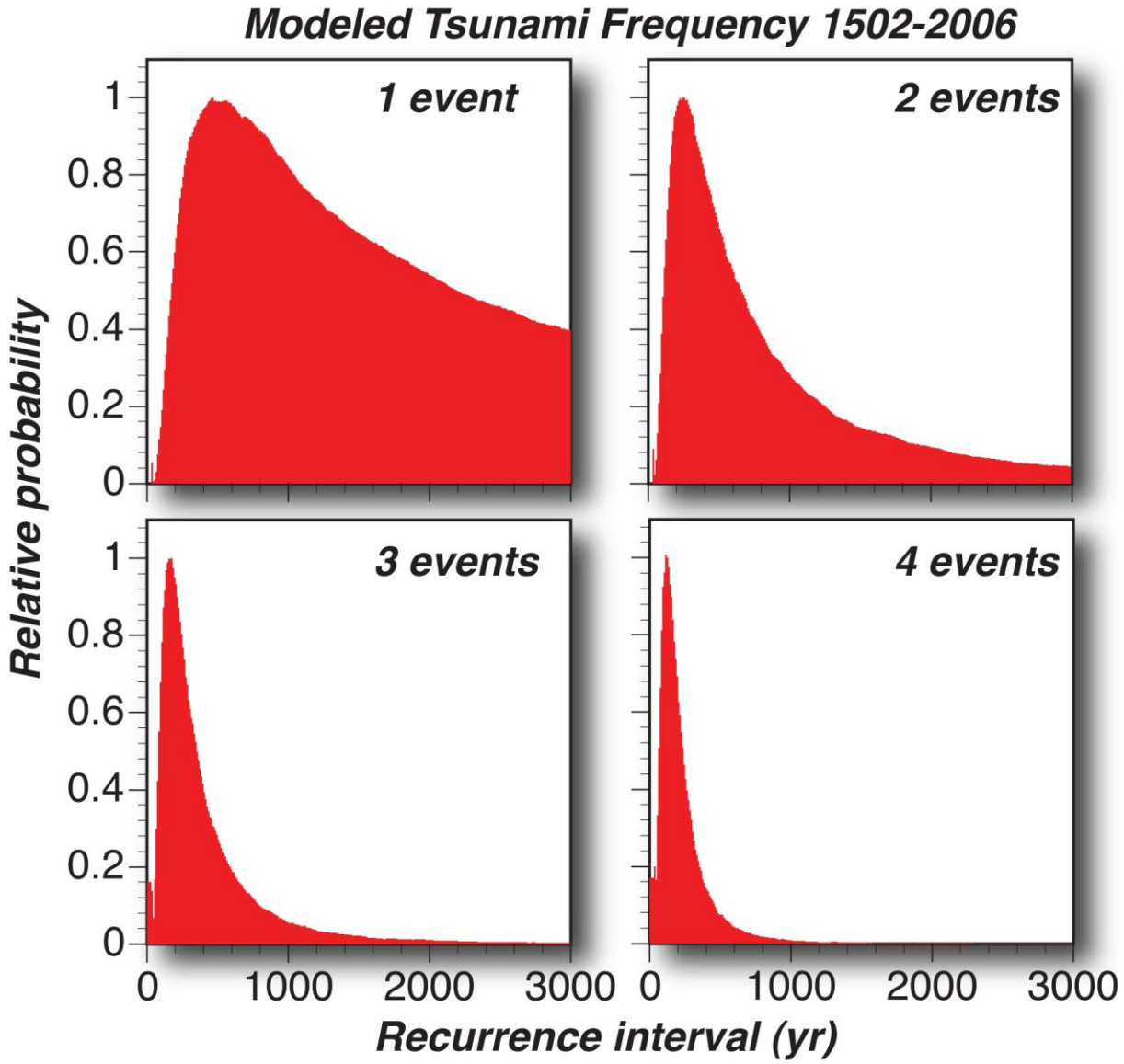
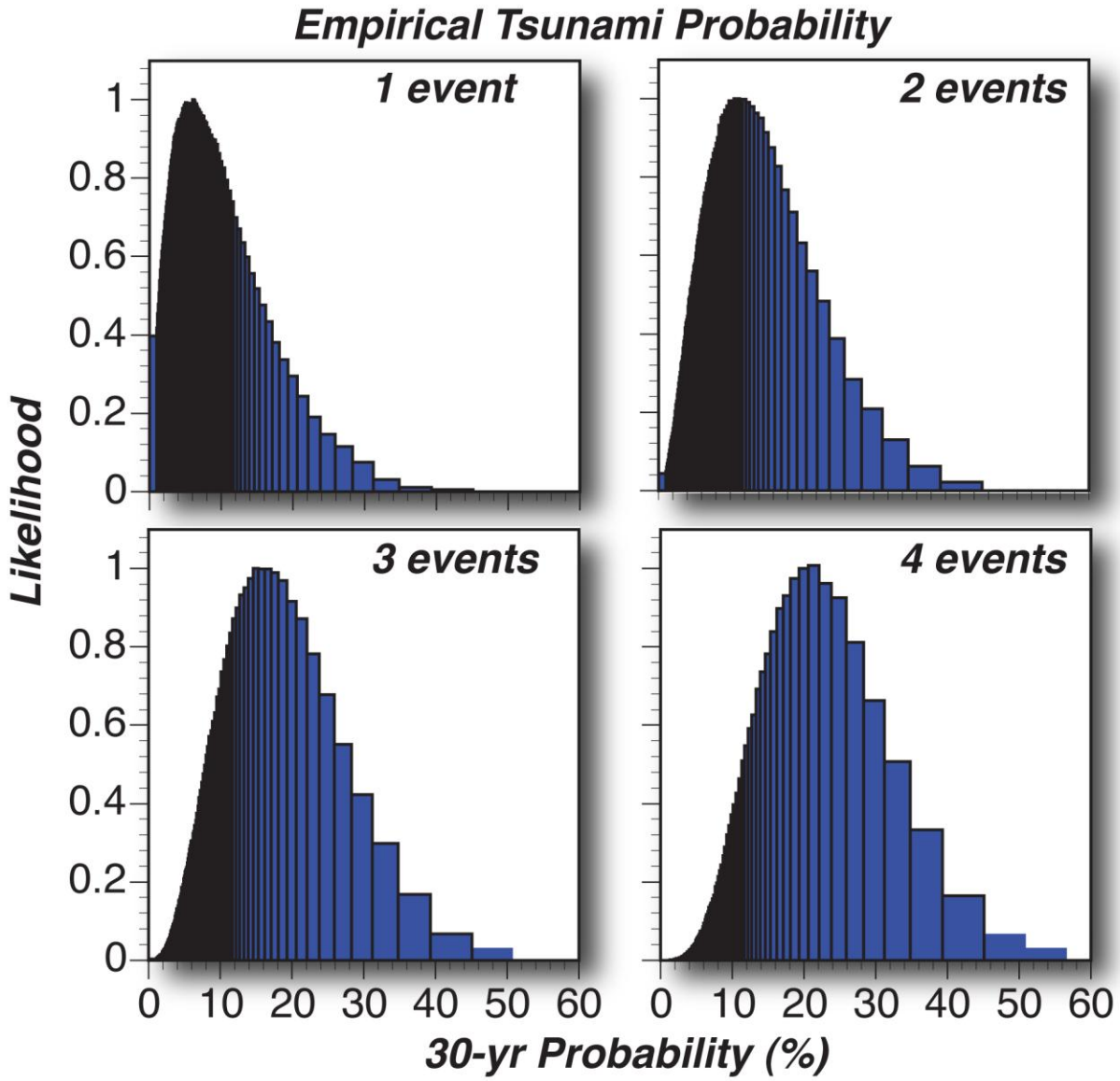
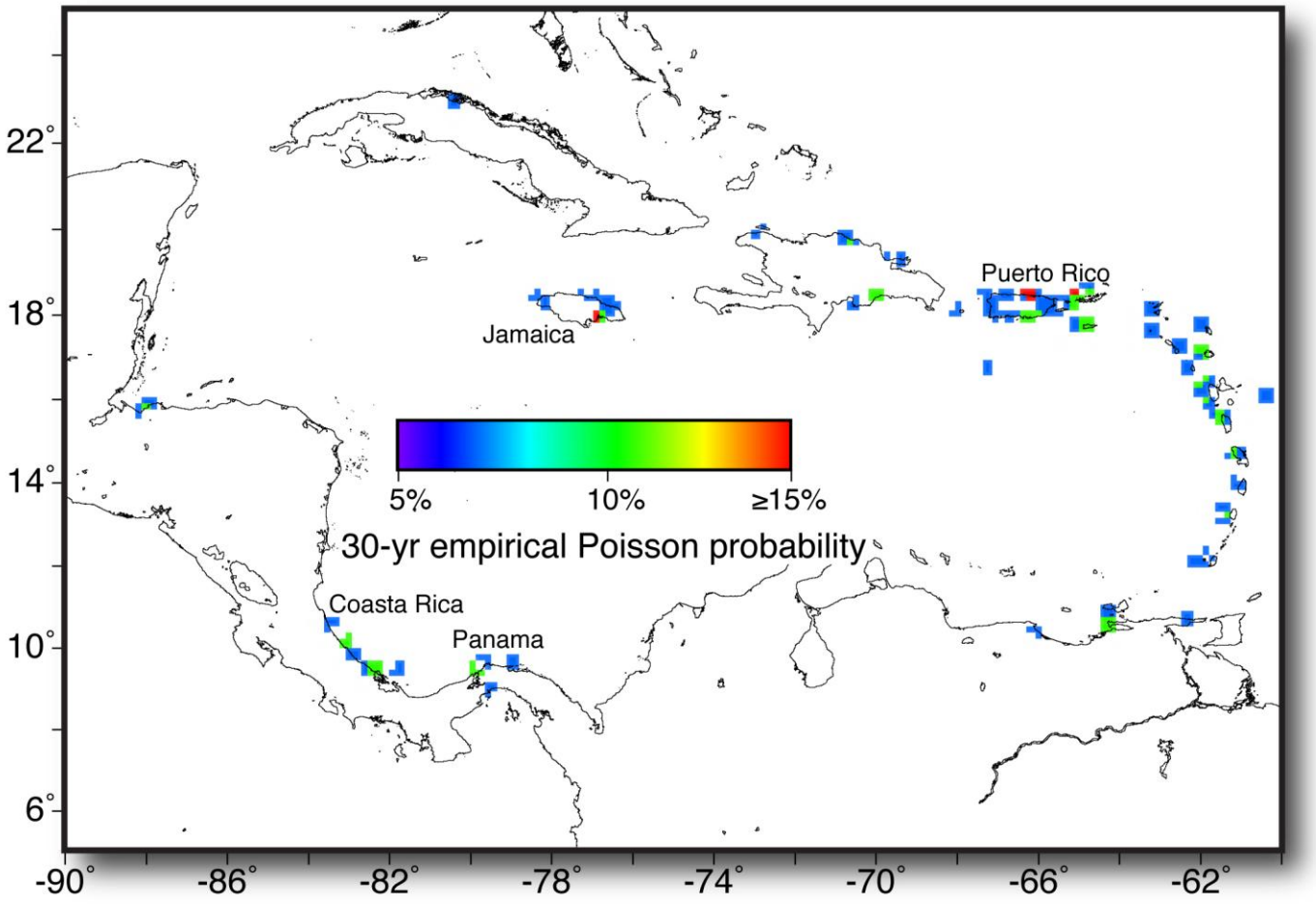
Empirical runup frequency on coastal grid



Empirical runup frequency on coastal grid

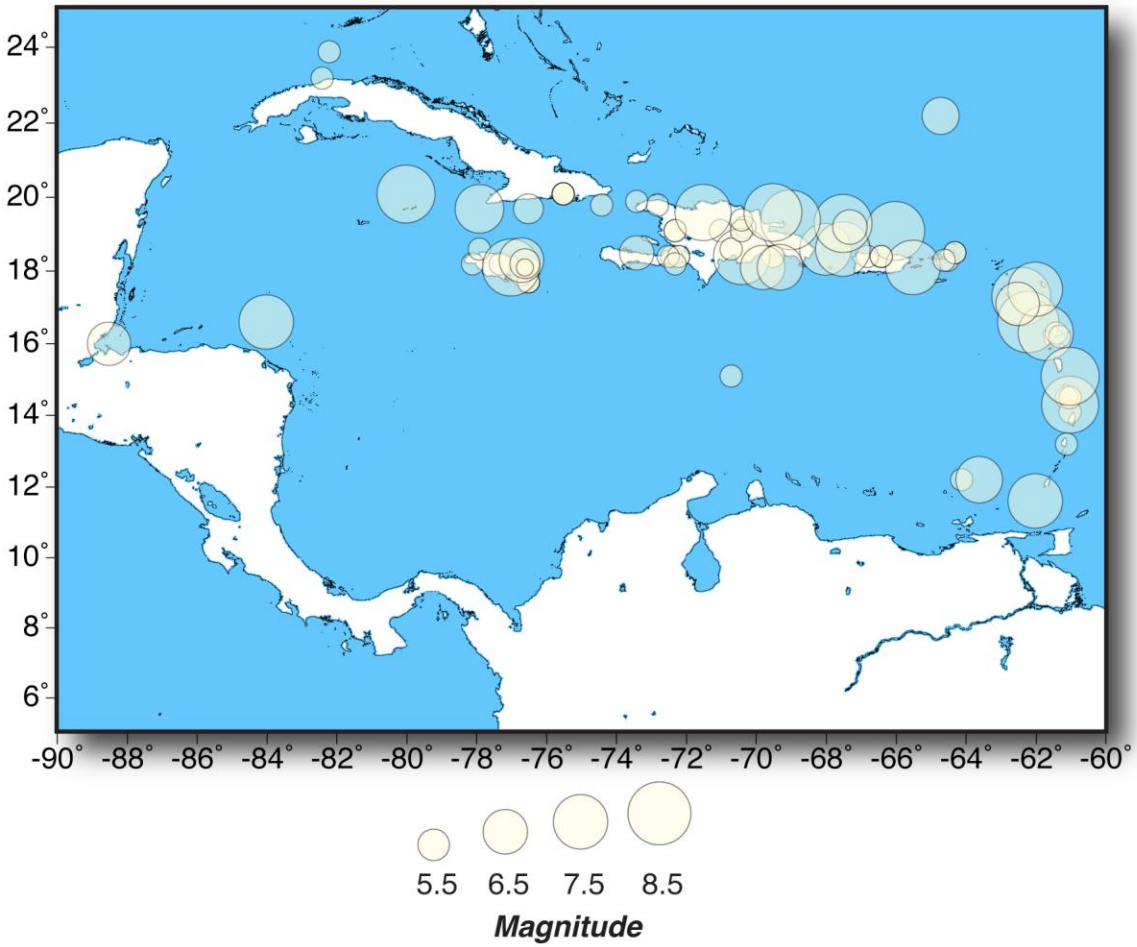


Tsunami probability calculated from empirical data

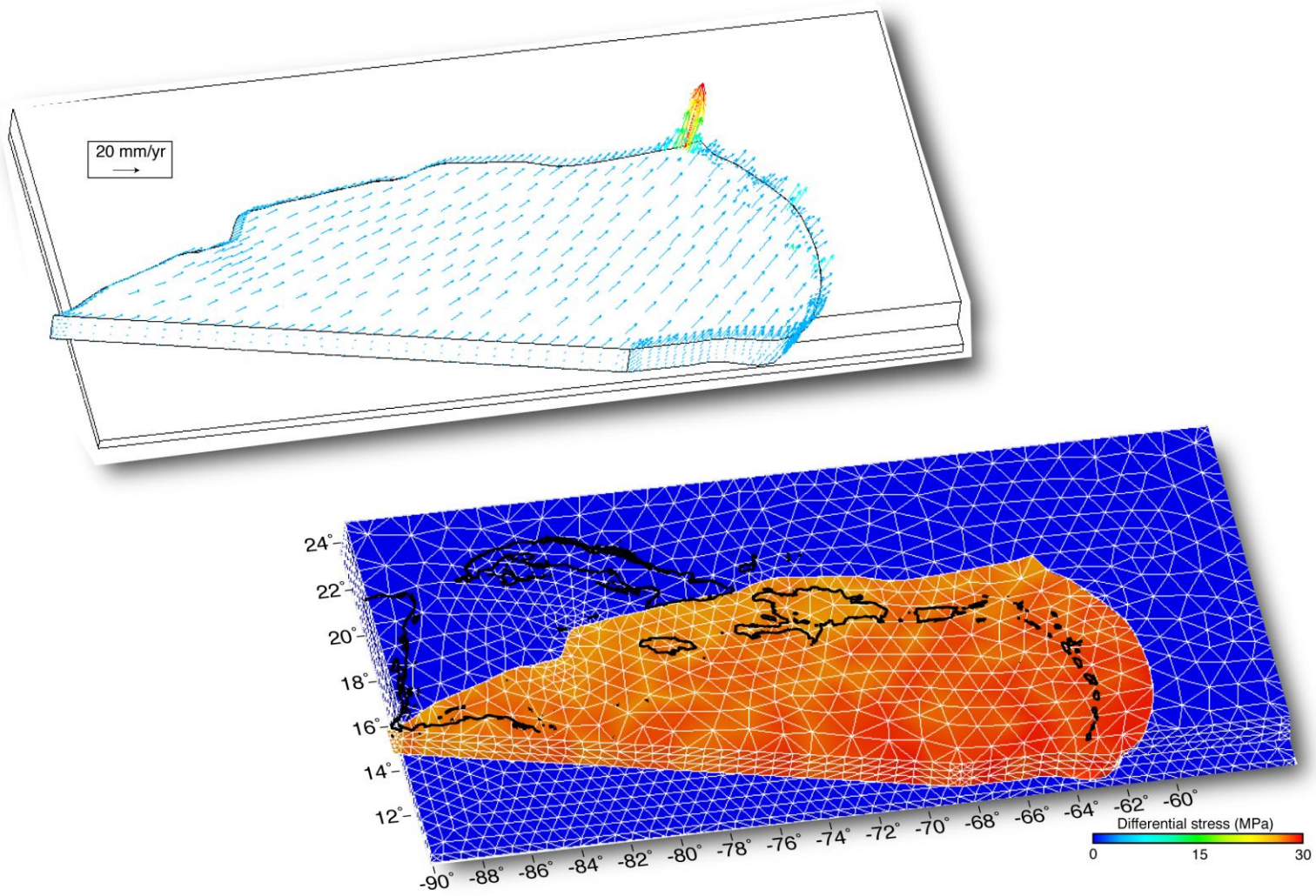


GPS-driven 3D finite element model used for moment rate calculations

Comparision between historical seismic strain release and modeled strain

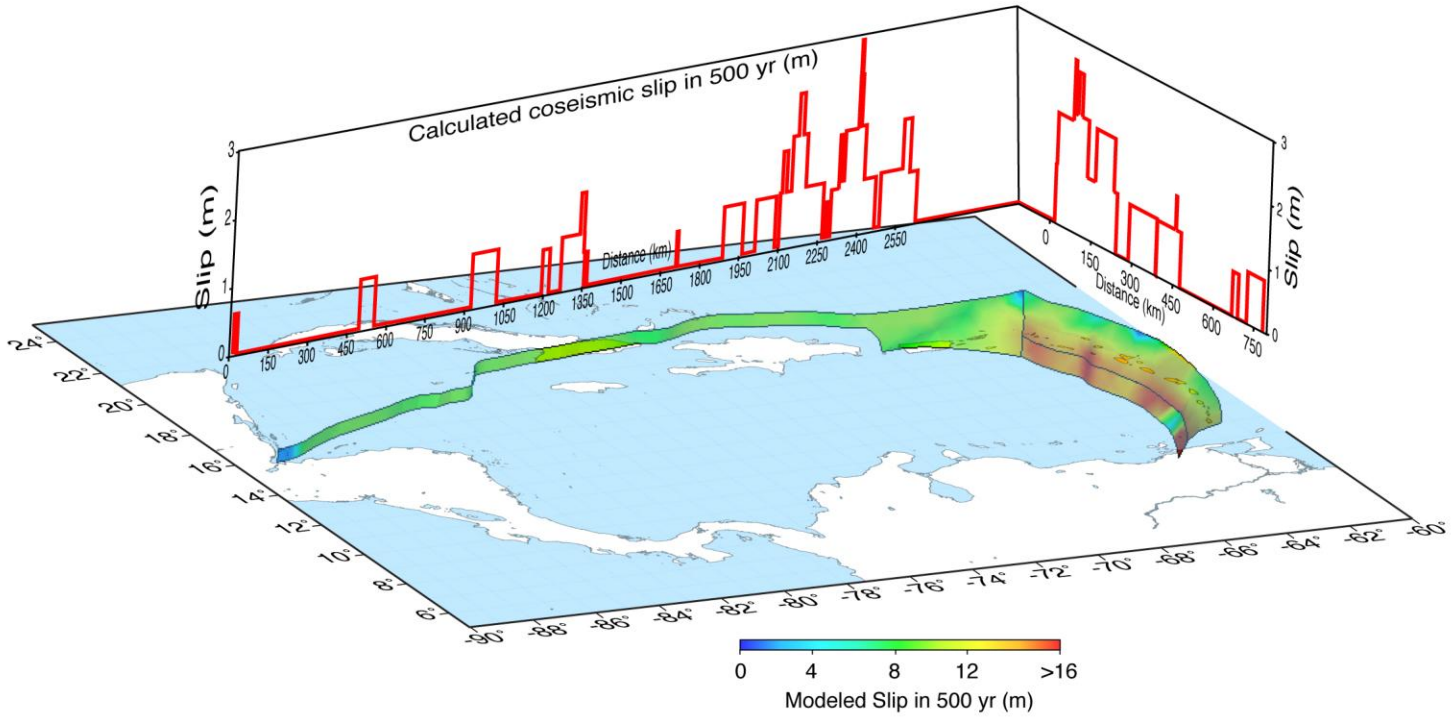


GPS-driven 3D finite element model used for moment rate calculations



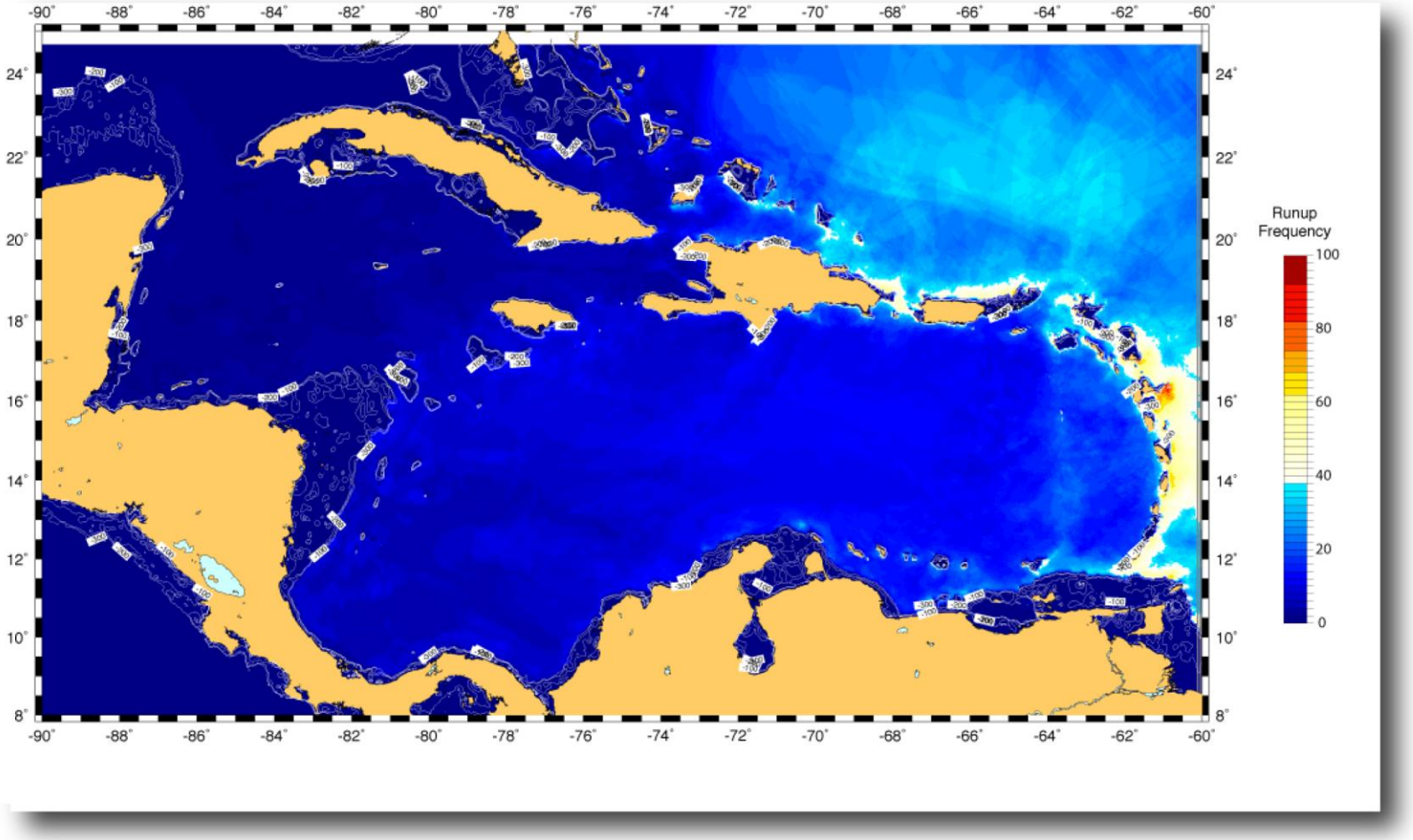
GPS-driven 3D finite element model used for moment rate calculations

Comparision between historical seismic strain release and modeled strain suggests a ~0.3 coupling coefficient

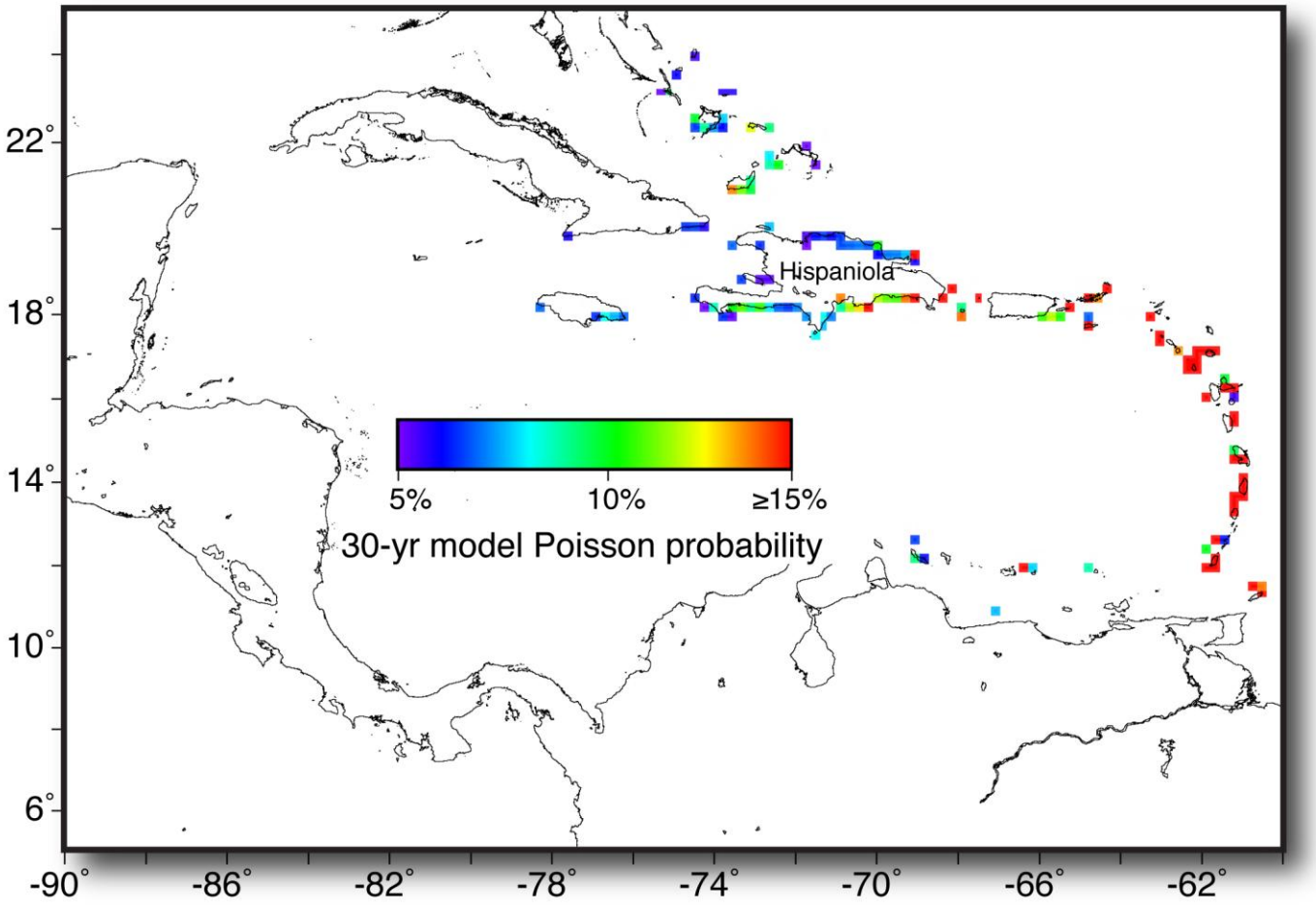


Moment rate model is used to generate Gutenberg-Richter event distributions and to simulate tsunami run-ups in the Caribbean basin

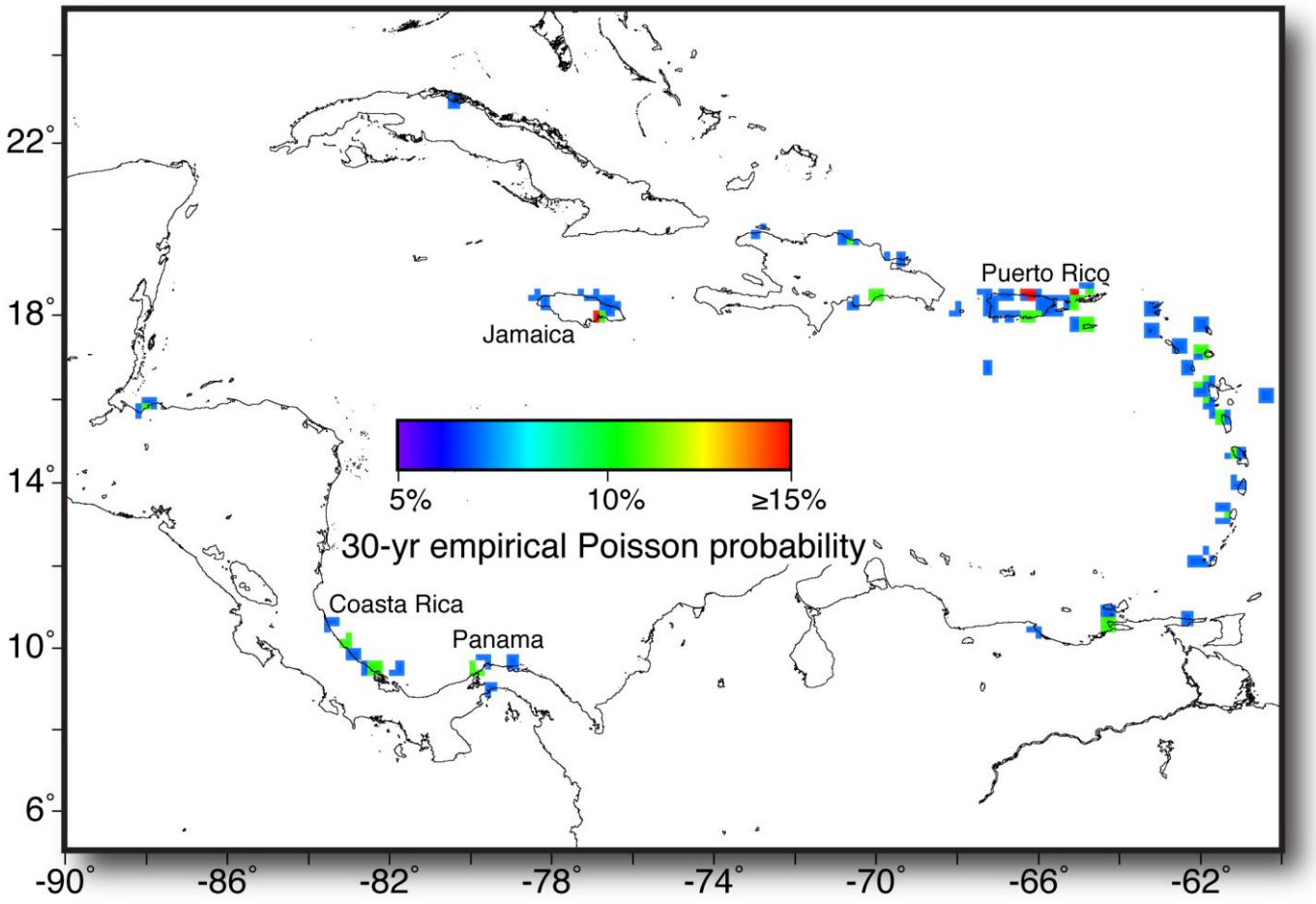
Example runup frequency plot from 50 simulations



Tsunami probability calculated from numerical model



Tsunami probability calculated from empirical data



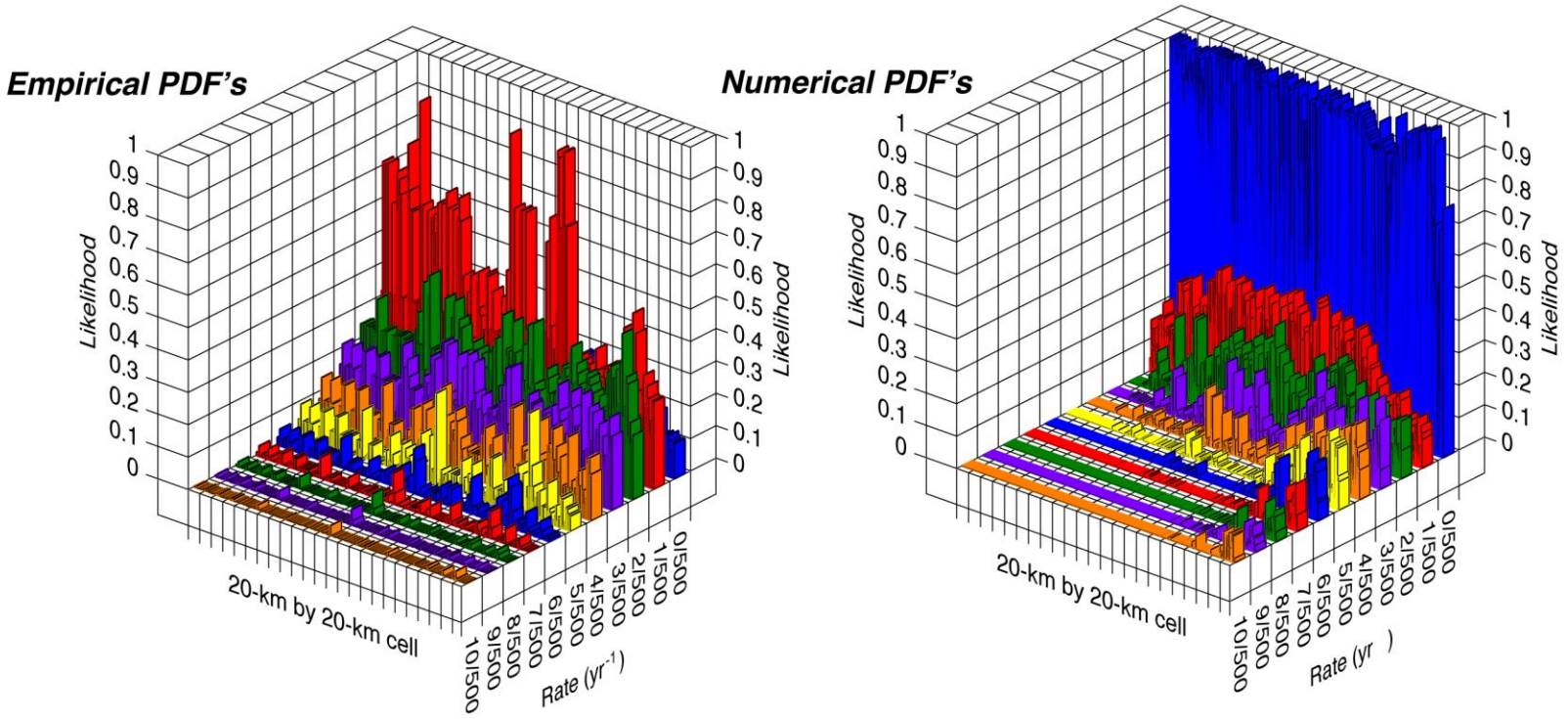
Combination of empirical and numerical rates with likelihood functions

The likelihood of a given rate λ where there are empirical estimates (*e1*) and numerical-modeled estimates (*e2*) is

$$L(\lambda \mid e1,e2) = k\left[p_1(e1 \mid \lambda)\right]\left[p_2(e2 \mid \lambda)\right],$$

where $p(e1|\lambda)$ is the probability of rate λ based on the Monte Carlo fits, and $p(e2|\lambda)$ is the probability of rate λ from the 50 numerical model runs. The constant k is used for normalizing the weights so that they add to 1.

Combination of empirical and numerical rates with likelihood functions



Best estimate tsunami probability from weighted combination of empirical and numerical rates