# Title

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**Abstract**

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## 1 Model

For the strain rates estimated from the GPS data: $X_i = R_i + e_i$

for:

$X_i$: $i$th observed strain rate from GPS data

$\vec{R} \sim LN(\log(\vec{\eta}) - \text{diag}\,(\Sigma_R)\,/2, \Sigma_R)$: true state of present strain rate where the average strain rate is $\vec{\eta}$. Note that this is an exponentiated GP.

$\vec{e} \sim GP(\vec{0}, \rho(\cdot))$: measurement error with Matern correlation fit from the $\vec{X}$ observations. The estimated errors of the observations, $\vec{X}$, could be used for a simple nonstationary variance model to scale the correlation matrix by the standard errors at each location.

For the subsidence data:

$S_i = \Delta T \cdot \eta_i \xi_i$

$Y_i = g_i(\vec{S}) + \varepsilon_i$

for:

$\vec{S}$: earthquake slip values throughout the fault

$\Delta T$: time since previous earthquake

$\vec{\xi} \sim LN(-\text{diag}\,(\Sigma_\xi)\,/2, \Sigma_\xi)$: multiplicative deviation with unit expectation of slip during earthquake from slip accumulated since last earthquake. Multiplicative LN variable ensures positive slips. Note that this is the exponential of a GP.

$\vec{Y}$: observed subsidence levels

$g_i(\vec{s})$: $i$th subsidence level given earthquake slips, $\vec{s}$. Compute using Okada model

$\vec{\varepsilon} \sim N(\vec{0}, \text{diag}\,(\vec{\sigma}))$: independent measurement error of subsidence levels where $\vec{\sigma}$ is known.

The parameters being estimated are:

$$\vec{\theta} = ($$

From there it seems like it's possible to calculate likelihood of the strain rate data, $\vec{X}$, and the expected likelihood of the subsidence data, $\vec{Y}$, using Monte Carlo sampling. I can't think of another way to get the likelihood of $\vec{Y}$ aside from getting the expected likelihood using Monte Carlo sampling, since the $g(\cdot)$ function has an unknown affect on the distribution of $\vec{S}$.