$$Y(\boldsymbol{x}, \omega) = \boldsymbol{r}(\boldsymbol{x}) \cdot \boldsymbol{\beta} + Z(\boldsymbol{x}, \omega)$$

Trend (deterministic)

Linear regression on a fixed basis

Random fluctuations

Gaussian process with zero mean and stationary

$$\mathbb{C}\mathrm{ov}_Z(\boldsymbol{x}, \boldsymbol{x'}) = \sigma^2 \rho(\|\boldsymbol{x} - \boldsymbol{x'}\|)$$