

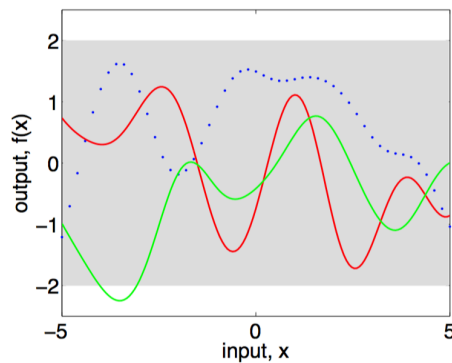
# Bayesian Statistical Modeling: Gaussian Process Regression Applied to Sea-Level Data

By Christina Williamson

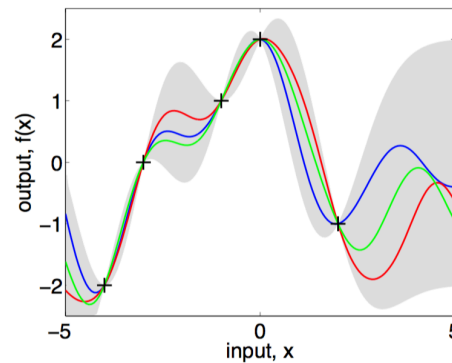
# Description

- We will use **Gaussian process regression** to model relative sea level

$$X \sim \text{GP}(x, K)$$



(a), prior



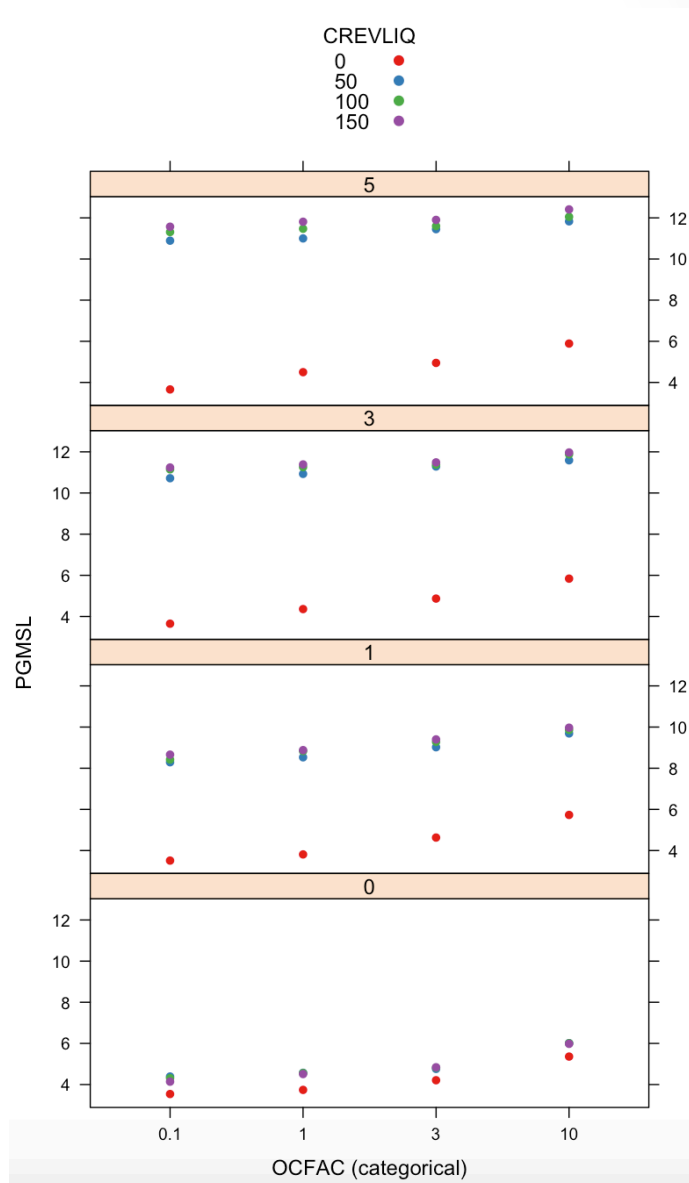
(b), posterior

- Robert DeConto and David Pollard modeled global mean sea level (GMSL) using measures which quantify different oceanic and atmospheric processes <sup>[1]</sup>

# Data

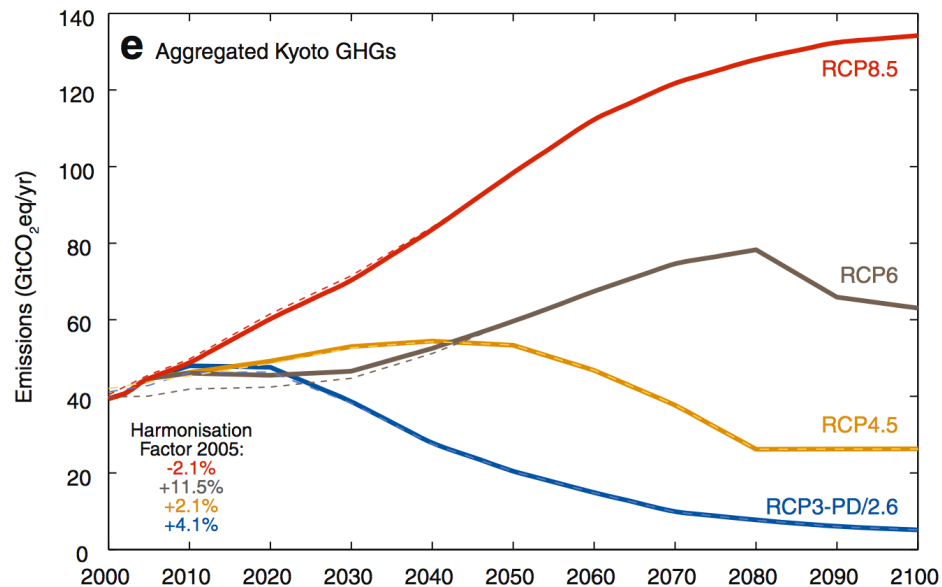
Parameter	Description
OCFAC	Sub-ice oceanic melt
CREVLIQ	Hydrofracturing due to surface liquid
VCLIF	Ice-cliff structural failure

Response	Description
PGMSL	Pliocene global mean sea level
LIGGMSL	Last Interglacial global mean sea level



# Future Predictions

- Representative Concentration Pathways (**RCPs**): “scenario-based projections of atmospheric composition” [2]



# Goals

- **Emulate** model from DeConto and Pollard
- Make **future predictions**

# Sources

- [1] DeConto, R.M. and D. Pollard. Contribution of Antarctica to past and future sea-level rise. *Nature* 531, 591-597 (2016).
- [2] Meinshausen, M. *et al.* The RCP greenhouse gas concentrations and their extensions from 1765 to 2300. *Climatic Change* 109, 213-241 (2011).
- [3] Rasmussen C.E. and C.K.I. Williams. Gaussian Processes for Machine Learning. MIT Press, 2006.

# Thank you!

Special thanks to:

- My mentors, Dr. Bob Kopp and Erica Ashe
- The NSF for funding my research experience with DIMACS