Responses of two nonlinear microbial models to warming and increased carbon input

Objective:

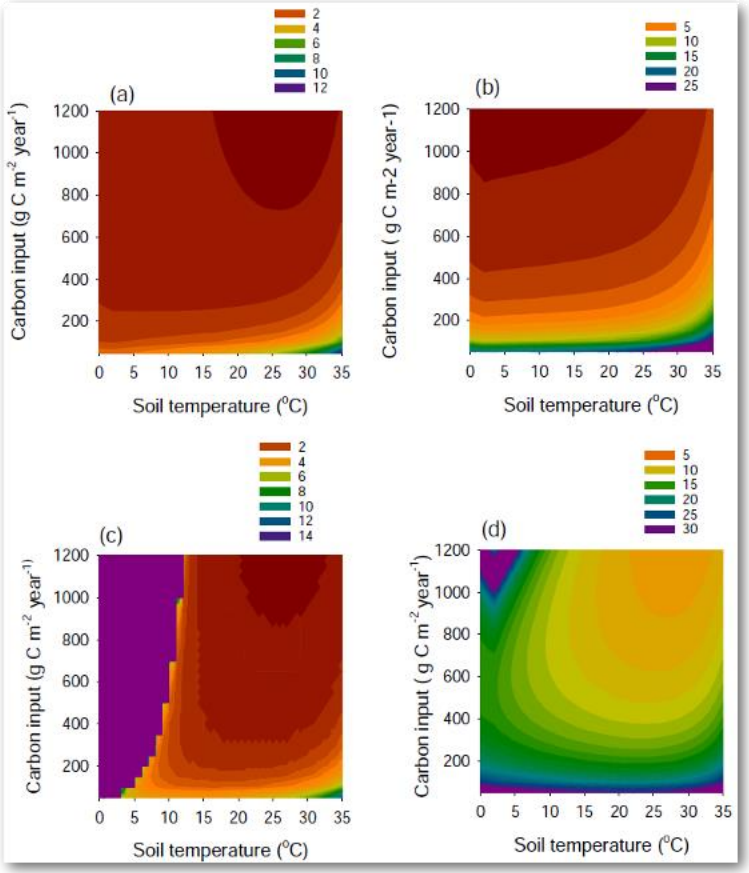
Improve understanding of significance of soil microbial processes in soil carbon responses to climate change.

Approach:

- Compared two nonlinear microbial models: one based on reverse Michaelis–Menton kinetics (model A) and the other on regular Michaelis–Menton kinetics (model B).
- Used analytic approximations and numerical solutions to test CO_2 efflux of both models.

Results/Impacts:

- We found oscillatory responses of C pools to small perturbations in initial pool sizes, which dampened faster in model A than in model B.
- Soil warming always decreased C storage in model A, but in model B it predominantly decreased C storage in cool regions and increased C in warm regions.
- Sensitivity of maximum CO_2 efflux to increased C input increased with soil temperature in model A but decreased with increased soil temperature in model B.



Half-life (a, b) and period (c, d) in units of year for model A (a, c) and B (b, d). The purple region represents non-oscillatory region for model A in (c), and a period greater than 30 years for model B in (d).

Wang, Y. P., J. Jiang, B. Chen-Charpentier, F. B. Agusto, A. Hastings, **Forrest M. Hoffman**, M. Rasmussen, M. J. Smith, K. Todd-Brown, Y. Wang, X. Xu, and Y. Q. Luo (2016), Responses of two nonlinear microbial models to warming and increased carbon input, *Biogeosci.*, 13(4):887–902. doi:10.5194/bg-13-887-2016.