



Amplification and dampening of soil respiration by changes in temperature variability

Sierra Carlos (1,2), Harmon Mark (2), Thomann Enrique (2), Steven Perakis (3), and Henry Loescher (4)

(1) Max-Planck Institute for Biogeochemistry, Jena, Germany (casierra@bgc-jena.mpg.de), (2) Oregon State University, Corvallis, USA, (3) USGS, Corvallis, USA, (4) NEON, Boulder, USA

Accelerated release of carbon from soils is one of the most important possible feedbacks related to anthropogenically induced climate change. Studies addressing the mechanisms for soil carbon release through organic matter decomposition have focused on the effect of changes in the average temperature, with little attention to changes in temperature variability. Anthropogenic activities are likely to modify both the average state and the variability of the climatic system; therefore, the effects of future warming on decomposition should not only focus on trends in the average temperature, but also variability expressed as a change of the probability distribution of temperature. Using analytical and numerical analyses we tested common relationships between temperature and respiration and found that the variability of temperature plays an important role determining respiration rates of soil organic matter. Changes in temperature variability, without changes in the average temperature, can either increase or decrease the amount of carbon released through respiration over the long-term. Furthermore, simultaneous changes in the average and variance of temperature can either amplify or dampen the sensitivity of soil organic matter to temperature. A potential consequence of this effect of variability would be lower respiration in places where the average temperature is expected to increase but its variance decreases.