Title: **Experimental Warming and Drying Increase the Age of Soil Respired Carbon and Alter Respiration Flux Rates in Lowland Tropical Forests in Panama**

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BER Program: ESS

Project: Early Career Project

Project Website:

Project Abstract: Tropical forests account for over 50% of the global terrestrial carbon sink and roughly one-third of global soil carbon, but the stability of carbon in these ecosystems under a changing climate is unknown. We assessed how a changing climate affects soil carbon stability in tropical forests, by using ^{14}C to determine the average age of soil respired carbon following experimental warming and drying. For two different *in situ* experiments - soil warming (via whole-profile heating by 4ºC) and soil drying (via partial throughfall exclusion) - we measured soil respired $^{14}CO_2$ for one year during the dry, dry-to-wet transition, and wet seasons. The background $\Delta^{14}C$ of soil respiration in these forests (16 ± 8 ‰ for control plots) reflected modern sources (<4 yr on average) and was 6 ‰ higher (one year older on average) during the dry-to-wet transition than later in the wet season. Experimental warming increased respiration rates and, during the wet season, increased the age of respired soil carbon by roughly 2–3 years ($\Delta^{14}C$ increased by 12 ‰ relative to controls). In contrast, experimental drying decreased respiration rates and increased the age of respired soil carbon by about 2 years ($\Delta^{14}C$ increased by 8 ‰ relative to controls). Together, these results indicate a relative shift in microbial carbon use towards older sources: warming by depleting the pool of rapidly cycling carbon and stimulating the decomposition of old carbon; drying by reducing the accessibility and subsequent decomposition of new carbon inputs. These findings imply a destabilization of old soil carbon under warming and a suppression of new carbon turnover under drying, which will have major implications for the tropical forest carbon cycle under climate change.