NAME: Scott Bridgham
ORGANIZATION: University of Oregon
PROGRAM AFFILIATION: TES
ABSTRACT TITLE: Response of soil efflux to experimental warming and precipitation intensity depends upon latitudinal climate gradient in Pacific Northwest grasslands

ABSTRACT: Soil respiration is expected to increase as global temperatures rise, amplifying climate forcing. Most studies have been conducted at single sites, making it difficult to generalize results. Additionally, acclimation to warming has been observed repeatedly in experimental studies, although the mechanism remains unclear and this response does not occur in Earth system models. To deconvolve local versus regional climatic controls, we examined soil respiration along a 520-km latitudinal climate gradient in three Pacific Northwest grasslands, with increasingly Mediterranean-like climates from north to south. Beginning Fall 2010, we implemented a fully-factorial treatment combination of 2.5-3°C warming and 20% added precipitation intensity at each site. We are also sampling labile soil carbon pools seasonally to determine if there is a relationship with any observed acclimation response. The response of soil respiration varied seasonally among sites, consistent with soil temperature and moisture trends imposed by the regional climate gradient. Soil respiration was highest in the wettest/warmest conditions (Spring), lower in cool/wet conditions (Fall and Winter), and lowest when dry (Summer). The gradient also influenced seasonal transition rates, with the switch between a stimulatory to an inhibitory effect of experimental warming moving progressively later in the spring from the southern to the northern site due to accelerated moisture limitation. Precipitation stimulated respiration in the most southern site during May and July, consistent with respiration being primarily moisture limited. Treatment effects diminished after July 2011, which may indicate soil acclimation although there is no evidence to date of decreased labile soil carbon. Seasonal shifts in the primary physical limitations on respiration varied predictably along the climate gradient, emphasizing the importance of regional responses to climate change within an ecosystem type. Potentially most importantly, our results indicate that soil respiration may be minimally responsive to warmer temperatures during periods of drought, which may become more pervasive in many ecosystems in the future.