The long and the short of it: how distinct climate drivers are affecting different components of drylands over varied timescales

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Like all ecosystems, drylands are made up of multiple classes of biota with varied physiologies, survival strategies, and life history traits. A factor that binds dryland organisms together is the harshness of their environment, and that the ecosystems known for high temperatures and aridity are predicted to become hotter and drier still. We will present data from a variety of timescales that show how different climate drivers (e.g., increased temperature and multiple altered precipitation treatments) affect the community composition, carbon cycling, and energy balance of drylands. Of particular interest are the results showing dramatic negative responses to altered climate – with shifts in communities and function as large or larger than those observed with physical disturbance (e.g., grazing, 4x4 vehicle use). We will discuss climate-induced changes to net CO_2 efflux and energy balance for both plants and soils, as well as highlight data showing the unexpected importance of under-snow carbon cycling. Finally, we will show the strong coupling between above- and belowground CO_2 fluxes in their response to increased temperature, but a decoupling in response to altered growing season precipitation, as well as discuss the significant variability in response among functional groups. Taken together, these data represent a significant step forward in our understanding of how different dryland organisms, biogeochemical cycles, and energy fluxes will respond to a range of future climates.