Learnings and lessons from long-term flux monitoring of cropping systems across two continents. (or in the Midwest United States and southwestern Australia)

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Long-term flux monitoring sites play a vital role in understanding how climate, biophysical and management processes influence inter-annual variability in the carbon balance of agricultural systems. Annual maize-soybean crop rotations with occasional perennial bioenergy crops are the dominant land use in the Midwest region of the United States, while cereals, pulses, pastures and oilseed crops are found throughout the southwestern Australian agricultural region. The Midwest US occupies a warm summer high rainfall temperate climate on rich fertile soils, while the southwestern Australian region occupies a cool winter moderate rainfall Mediterranean climate on sandy low nutrient soils. This talk will present learnings and lessons from long-term flux monitoring across these two contrasting agricultural zones, both of which have experienced drought and flooding rain events since greenhouse gas flux monitoring commenced. Using the eddy covariance technique, we show **1)** how the carbon and nitrogen cycle is altered when reverting from a perennial switchgrass to annual maize crop rotation, **2)** how a mix of climate and management can lead to substantial carbon losses from an annual maize-soybean rotation, and **3)** how the carbon balance of a mixed farming system (cropping/grazing) compares to a woodland ecosystem remnant of pre-cleared land use. Our results highlight the impact that climate extremes and management can have on the greenhouse gas budget from agricultural regions of the Midwest United States and southwestern Australia.

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