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SPECIAL - The Savanna Patterns of Energy and Carbon Integrated Across the Landscape campaign

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We undertook a significant field campaign (SPECIAL) to examine spatial patterns and processes of land surface-atmosphere exchanges (radiation, heat, moisture, CO_2 and other trace gasses) across scales from leaf to landscape scales within Australian savannas. Such savanna ecosystems occur in over 20 countries and cover approximately 15% of the world's land surface. They consist of a mix of trees and grasses that coexist, but are spatially highly varied in their physical structure, species composition and physiological function. This spatial variation is driven by climate factors (rainfall gradients and seasonality) and disturbances (fire, grazing, herbivory, cyclones). Variations in savanna structure, composition and function (i.e. leaf area and function, stem density, albedo, roughness) interact with the overlying atmosphere directly through exchanges of heat and moisture, which alter the overlying boundary layer. Variability in ecosystem types across the landscape can alter regional to global circulation patterns. Equally, savannas are an important part of the global carbon cycle and can influence the climate through net uptake or release of CO_2. We utilized a combination of multiscale measurements including fixed flux towers, aircraft-based flux and regional budget measurements, and satellite remotely sensed quantities to quantify the spatial variability utilizing a continental scale rainfall gradient that resulted in a variety of savanna types. The ultimate goal of our research is to be able to produce robust estimates of regional carbon and water cycles to inform land management policy about how they may respond to future environmental changes.