OzFlux and OzEWEX: continental-scale monitoring of Australia's ecosystems, their ecohydrology, and the productivity of their unique flora

A. James Cleverly[a], B. Eva van Gorsel[b], C. Peter Isaac[c], D. Víctor de Dios[d], E. Robert Jordan[e], F. David Campbell[f], G. Elise Pendall[g]

[a] School of Life Sciences, University of Technology Sydney, Australia
[b] CSIRO Oceans and Atmosphere, Australia
[c] TERN OzFlux central node, Australia
[d] Universitat de Lleida, Spain
[e] San Diego State University, USA
[f] University of Waikato, New Zealand
[g] Western Sydney University, Australia
Email: james.cleverly@uts.edu.au

Abstract: OzFlux consistently measures ecosystem water, carbon and energy states and fluxes from across Australia and New Zealand. These measurements provide organisations like OzEWEX with continuous observations of the ecohydrology and meteorology over several key vegetation types and biomes, such as sclerophyllous woodland and forest, tropical savanna and rainforest, temperate rainforest, semi-arid woodland and savanna, grassland and meadow, crop and peat bog. Throughout this network, major findings have shown the vegetation to be uniquely suited to persevere through periods of stress (heat waves and drought), whilst finding opportunities to thrive during periods when vegetation in other locations, particularly those of the Northern Hemisphere, are dormant. For example, productivity is shifted toward the winter months in and the Eucalypt woodlands of western Sydney, which is potentially due to excessive vapour pressure deficit during the summer. In the peat bogs of New Zealand, summer stresses are not as severe, but productivity is still large in the winter when cold is less intense than in the northern counterparts. Likewise, the unique morphological features of vegetation across the semi-arid regions contribute to their strong photosynthetic responses to favourable moisture availability, contributing more than any other part of the world to global cycles of carbon uptake and emissions (e.g., during the 2011 global land C sink anomaly and the previous decade of drought, heat waves and enhanced emissions). As with our previous examples, these opportunities can often occur in the winter, when atmospheric stress is at a minimum. Likewise, photosynthesis in the woody component of the tropical savanna continues through the dry season, when cloud cover is minimal and moisture is supplied by storage of water in deep soil layers. The wealth of discovery across OzFlux can provide the wider scientific community with parameters, observations, calibration targets and prior knowledge of the drivers of ecosystem carbon, water and energy transport: water and light availability, meteorology, heat and drought stress responses, and the spatial distribution of land use/land cover.

Keywords: *Eddy covariance, carbon cycle, ecohydrology, environmental stress, observation network*