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Continental Scale research of the coupled carbon and water cycles in Australia

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It is essential to understand the drivers and processes that regulate uptake and release of carbon and water by the terrestrial biosphere to quantify the sink and source strengths under current climatic conditions. In addition, understanding the consequences of a changing climate on the capacity of the biosphere to sequester carbon by using a certain amount of water and the impacts of disturbances on resilience and thresholds of the terrestrial biosphere is critical. Recently there has been increasing general interest in how human activities may be affecting Australia's natural carbon cycles.

Quantification of carbon and water exchanges requires process understanding over long temporal and large spatial scales, but at fine levels of detail. This requires integration of long term, high frequency observations, models and information from process studies and can only be achieved through research infrastructure that can provide easy access to meta-data and data that have been collected in a systematic and standardized way. The Australian Terrestrial Ecosystem Research Network (TERN) provides such nationally networked infrastructure, along with multi-disciplinary capabilities and end-user-focused products to deliver better ways of measuring and estimating Australia's current and future environmental carbon stocks and flows.

Multiple Facilities in TERN are studying carbon and water dynamics across a range of distance and time scales. OzFlux, the Australasian arm of the global initiative Fluxnet, is the most obvious deployment of field hardware in TERN with close to 30 flux towers and their associated micrometeorological instrumentation in place around the country, from Central Australia to the Alps, covering ecosystems ranging from rainforest to alpine grasslands to mulga. Intensive monitoring is carried out at the 10 TERN Supersites which carry a suite of environmental instrumentation and perform standardised vegetation, faunal, soil and water monitoring.TERN AusCover provides a national expert network and data delivery service for provision of Australian biophysical remote sensing time-series data, continental-scale map products, and select high-resolution datasets over TERN OzFlux and Supersites. Integration of data streams and modeling is carried out through the TERN eMAST Facility.

This presentation will give an overview of the infrastructure related to research in biogeochemistry through TERN. We will show how the deployment of large-scale infrastructure, observations, the curation of data and assimilation and integration of data into modelling is enhancing our process understanding of carbon uptake and water use in a large range of ecosystems.