

Quantification of Canopy Interception and Cloud Interception in the Elevated Forests of Norfolk Island

David McJannet¹, Jordan Marano², Cuan Petheram³, and Neil Tavener⁴

¹CSIRO Land and Water Dutton Park

²CSIRO Townsville Australian Tropical Sciences and Innovation Precinct

³CSIRO Land and Water Hobart

⁴Norfolk Island Government

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Abstract

The higher elevation forests of Norfolk Island are regularly immersed in the clouds and scientific and anecdotal evidence suggests that in addition to rainfall, water is likely to be collected as cloud droplets are intercepted by the forest canopy. This water is likely to be important for the local hydrology and ecology, yet it has never been quantified. To address this, a field measurement campaign was established to measure hydrological inputs to the forest floor at two elevated forest sites in the Norfolk Island National Park. Instrumentation included throughfall and stemflow systems and measurements of rainfall in the open in nearby clearings. Sites exhibited very high stem density and basal area by international standards and delivery of water to the forest floor was dominated by stemflow because of the funnelling characteristics of the dominant palm and pine trees. Both sites showed similar hydrological behaviour with stemflow and throughfall of around 48% and 32%, respectively. Stemflow contributions of 48% far exceed observations from the literature which are typically less than 10%. Rainfall rarely occurred in the absence of low-level cloud and some cloud immersion events lasted for many days with hydrologic inputs continuing for extended periods despite rainfall not being observed in the open. Cloud interception accounted for approximately 20% of total water input at both sites which is equivalent to 25% extra water on top of rainfall measured in the open. From an island-wide perspective the calculated extra hydrological input is only small due to the limited spatial extent of elevated forest, however, the additional water is likely to be very important to local hydrological processes and the unique plants, insects and animals which inhabit the higher elevation forests of Norfolk Island.

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