

# ***Interactive comment on “An ice core derived 1013-year catchment scale annual rainfall reconstruction in subtropical eastern Australia” by C. R. Tozer et al.***

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Tozer’s et al. paper ‘An ice core derived 1013-year catchment scale annual rainfall reconstruction in subtropical Australia eastern Australia’, provides a high resolution proxy record of rainfall in eastern Australia based on a teleconnection between summer sea salt deposition from east Antarctica and eastern Australia. Overall the paper is very well written/presented and provides a concise overview of the development of linkages (in terms of the climatology and modelling approaches) between the Law Dome ice core record and eastern Australia rainfall (with a focus on the Williams River catchment). The addition of a high resolution 1000 year proxy record for eastern Australia

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makes a significant contribution to understanding hydroclimatological variability within Australia and beyond, as there are very few annually derived records from the Southern Hemisphere in general and eastern Australia in particular. In addition, the authors should be commended for highlighting the water resource management implications of this research, particularly when most catchment planning and infrastructure design is based on instrumental records that extend back 100 years, potentially missing much larger fluctuations that may have occurred in the past (and which the authors have identified for the Williams River catchment from their reconstruction).

Overall I feel that the paper clearly defines how the teleconnection between the Law Dome site in eastern Antarctica and the Williams River catchment operate through modulations of ENSO and IPO. Correlations in the instrumental and ice core data are then used to explore the relationship between Summer Sea Salt deposition (LDSSS) in East Antarctica and rainfall in eastern Australia, which is then used to provide a 1000 year rainfall record for the Williams River catchment. My only comment is the role of ECLs impacting the relationship between rainfall and the ice core record (i.e. high occurrence in the 1950s breaking down the relationship between LDSSS and rainfall) and resulting in different results from southeast Queensland and northeast New South Wales. ECLs have been also shown to impact the southeast Queensland and northeast New South Wales region, particularly in winter and I am wondering if additional factors could be at play, i.e. the orographic influence and coastal location of the Williams River catchment (and which the authors have discussed but could possibly expand on). Furthermore, southeast Queensland and northeast New South Wales experiences a summer dominant, southeast Trade Wind rainfall pattern (with a greater influence from the tropics), which is different from the generally even and more westerly dominated rainfall pattern (with a greater influence from temperate weather systems) of the Williams River catchment and I am wondering if this is a factor that may warrant some further discussion in the paper (but agree with the authors that the relationship between LDSSS and rainfall is still valid).

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In terms of more specific suggestions there are some minor corrections required in the paper (mainly spelling and referencing issue) and I have listed them below. Page 12486, line 5 (and throughout the paper) – ‘Kiem et al., 2003’ is not cited in the references and this needs to be added. Page 12488, line 22 – I think ‘WR’ could be deleted here – reads ‘. . .average monthly rainfall totals for the catchment.’ Page 12489, line 14 – not sure what is meant by ‘(e.g. blocking. . .’ need to rewrite or delete to improve the sentence structure. Page 12495, lines 15 to 16 – delete brackets around e.g. the World War II drought. Page 12496, line 3 – should read 20th century.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 12483, 2015.

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