

Interactive comment on “Application of pore water stable isotope method to characterise a wetland system” by Katarina David et al.

Anonymous Referee #1

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General Comments

This paper contains a novel method for characterising the hydrology of wetlands and swamps and presents a scientifically robust model of temperate upland swamp hydrology that fits within the context of current research into similar ecosystems. It is a well written paper with high scientific significance. One issue is that the terminology for describing groundwater within the swamps and regional groundwater aquifers is not differentiated. A major part of the paper is concerned with connectivity of the swamp aquifers with regional groundwater yet the term groundwater is used to describe both aquifers. One way of differentiation may be to call swamp groundwaters 'swamp water' or 'swamp water table' and regional groundwater 'groundwater' or 'sandstone aquifer' or similar and use these terms consistently throughout. Another issue is that while the

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paper presents the application of the stable isotope direct vapour equilibration method to quantify water sources, it does not discuss this method in great detail. A paragraph (or two) to describe the data accuracy of the vapour method against the more conventional sampling method would be useful as would a more detailed discussion of the circumstances in which it could be used. Characterising flow paths within individual sedimentary units is one area where this method would be hugely advantageous. More detail is also required in describing methods and a description of the regional hydrogeology in the site description would be of use. See specific comments for detailed critique.

Specific Comments

Introduction: Page 3 Line 27: Change the term "hydrological balance". Swamp flora and fauna are dependent on the high water tables that are characteristic in THPSS. The term hydrological balance does not adequately describe this Page 3 Line 30: The term groundwater in this instance is confusing. Do you mean swamp groundwater or groundwater from the surrounding sandstone aquifer? Page 4 Line 1: Again groundwater terminology is confusing. Would suggest 'swamp water levels' or 'swamp groundwater' when referring to the swamp water table and 'regional groundwater' or 'sandstone aquifer' when referring to the bedrock aquifer.

Site Description: Need a description of regional hydrogeology to give a better picture of likely groundwater interactions. Page 6 Line 4: Does this mean the longwalls are located directly below the swamps?

Methods, Fieldwork and Sampling: More details of piezometers are required. Depth, installation method, construction materials etc Details of groundwater bore required including installation method, construction materials and depth Include a section on statistics and software used

Page 7 Line 5: Was a Russian D corer used to recover samples? If not how were samples recovered intact from a conventional auger? Page 7 Line 12: Swamp groundwater

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or regional groundwater? How were sandstone aquifer samples collected? Was the existing piezometer drilled within the bedrock?

Results: Page 10 Line 14-15: wouldn't this just be collected rainwater? Page 10 Line 20: This sentence would be better placed within the methods Page 11 Line 7: It also may be the result of lateral throughflow along the longitudinal gradient, particularly within the sandy units Page 15 Line 8: Or that the surface water sample points are located in the discharge zone for groundwater flow Page 15 Lines 10-14: Figure caption is confusing. Change groundwater terminology. Page 16 Line 28: Probably should be explained in the methods Page 17 Line 5: In that case it would be informative to relate enrichment to relative humidity to assess whether that has more influence on evaporation than temperature

Discussion: Page 18 Line 10: This sentence should be combined with line 11 below to strengthen this argument. As it is, the sentence hangs without supportive evidence Line 14: I'm not sure this statement holds up. Long water residence times within the swamp water table may be occurring to sustain this vegetation community Line 14- measurement of groundwater. Measurement of groundwater levels is not evidence of aquifer connectivity. Consistency of swamp water tables and lack of significant draw-downs in dry periods may however be linked to aquifer connectivity. See Cowley et al 2018 "The hydrological function of upland swamps in eastern Australia: The role of geomorphic condition in regulating water storage and discharge" Line 18: Again this statement does not represent evidence of groundwater interactions per se. It is speculation. Reword Line 20: Measurement of GW levels above & below sandstone is not an indication of connection. GW level comparison of both aquifers may be, as might be comparison of isotopic signatures. Reword. Line 22: Rapid infiltration and discharge of what? Swamp or sandstone aquifer? Line 22: Where are measurements of groundwater salinity? Line 23: "resulting from limited leaching of salts from the swamp". Not sure you have the evidence for this statement Line 23: "recharge of the groundwater table". Swamp or sandstone aquifer? Line 29: reference required for EC & pH results Page

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22: Line 4: groundwater from sandstone aquifer? swamp groundwater? Line 9: 'Isotopic signature' of precipitation? Line 14: A cross section of underlying hydrogeology would add to this conceptual model of swamp hydrology

Technical Corrections Abstract: Line 6: Add 'Endangered' before the word ecological and 'Under state and federal legislation' after communities Page 5 Figure 1: An Aerial photo or satellite base map would be better to define swamp boundaries than a topographic map. Page 7 line 13: Space needed between 'were' and 'described' Page 10 Figure 4: Where are the profiles and sediment logs for GGSWG swamp? Page 11 Figure 5: These charts may be better shown by putting the sampling periods together on one graph rather than separating the swamps. That would make it easier to flip between then and the rainfall charts. Putting sediment logs down the left hand side may make comparisons between sediment, moisture content and organic matter easier Page 15 Figure 7: Why are the surface water sample points low down in the depth profile in c and d but at the surface in a and b? Put them all at the surface Page 18 Line 21: THPSS Page 19 Figure 9: Change the colour of the Medium to fine grained sand/clayey sand unit. It appears at first glance to be indicating a water table Page 19 Line 14: Explain ETc Page 20 Line 7: space between day and is Page 21 Figure 10: This graphic does not effectively display the data in table 2. A simple column graph may be more effective. I don't understand why you used 2018 dates. Would it not be better to use sampling period dates? You need to explain why these dates were chosen Page 23 Line 9: Missing word after 'relatively' Line 15: Gorissen reference should go after the word 'ecosystem'. Insert 'this' before 'ecological' Page 32-33 Table 3: should be Table 1. It's difficult to determine which numbers pertain to which parameter. Either move the parameters or put borders around columns and rows. Move column 3 down so that the first 'peat' is in line with the first bulk density number Page 33: Table 4 should be table 2

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Gell, 2005, Middleton and Kleinebecker, 2012, Johnson, 2006, Valentin et al, 2005, Gatt, 1996, Dansgaard, 1964, Linacre et al, 1969, Mathieu and Bariac, 1996, dePaolo et al 2012.

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