Palaeogeography, Palaeoclimatology, Palaeoecology 537 (2020) 109421

Contents lists available at ScienceDirect

Palaeogeography, Palaeoclimatology, Palaeoecology

journal homepage: www.elsevier.com/locate/palaeo

Reply to Comment on "Uranium series dating of Great Artesian Basin travertine deposits: Implications for palaeohydrogeology and palaeoclimate" by Uysal et al. (2019).

Stacey C. Priestley[a,c,*], Karl E. Karlstrom[b], Andrew J. Love[c], Laura J. Crossey[b], Victor J. Polyak[b], Yemane Asmerom[b], Karina T. Meredith[a], Ryan Crow[d], Mark N. Keppel[e], Marie A. Habermehl[f]

[a] *ANSTO, New Illawarra Road, Lucas Heights, NSW, 2234, Australia*
[b] *Department of Earth and Planetary Sciences, University of New Mexico, NM, 87131, USA*
[c] *Collage of Science and Engineering, Flinders University, Adelaide, SA, 5042, Australia*
[d] *US Geological Survey, Flagstaff, AZ, 86001, USA*
[e] *Department of Environment and Water, Government of South Australia, Adelaide, SA, 5000, Australia*
[f] *Geoscience Australia, Canberra, ACT, 2609, Australia*

1. Reply

Tonguc Uysal and co-authors (this issue) propose that at least some of the U-series ages reported by Priestley et al. (2018) and Ring et al. (2016) provide minimum ages of movement at the Norwest Fault Zone in central Australia resulting from significant CO_2 production due to mantle degassing related to active tectonics. We thank Tonguc Uysal and co-authors for their discussion on the role of tectonics and CO_2 degassing in travertine precipitation and note that we had previously published (and agree with) the importance of mantle degassing as a source of CO_2 that closely interacts with palaeohydrogeologic and palaeoclimatic forcings in explaining the rate and distribution of travertine deposition in the southwestern Great Artesian Basin (GAB) of central Australia. Based in part on western U.S. analogues (Crossey et al., 2016; Karlstrom et al., 2013a), we proposed and explored a model for these processes and their implications for the GAB in previous publications (Crossey et al., 2013; Karlstrom et al., 2013b) whereas Priestley et al. (2018) focused more specifically on palaeoclimate implications.

There has been an ongoing discussion linking GAB springs with tectonics and CO_2 degassing, with Sprigg (1957) being one of the first to notice the link between GAB springs and seismicity. Tectonics is likely to be the primary control on spring vent locations along the mound springs line and likely influences spacing of vents at fault intersections that provide spring pipes for upward flow of CO_2 and mixing to create carbonic fluids (Hancock et al., 1999; Keppel, 2013). Mantle degassing and tectonic conduits are needed to explain why GAB groundwater contains high $^3He/^4He$ ratios measured in the mound springs and is saturated with respect to CO_2 (Karlstrom et al., 2013b; Uysal et al., 2019). Internationally, there have been numerous studies examining the relationships between travertine depositing springs and mantle CO_2 flux with many examples using spring travertines to study past neotectonic activity (e.g. Minissale, 1991; Crossey et al., 2009), changes in spring flow (e.g. Clark and Fontes, 1990; Miner et al., 2007; Priewisch et al., 2014), or hydrochemistry to predict earthquake activity (e.g. Mogi et al., 1989; Manga and Rowland, 2009). We agree with Uysal et al. (2019) that there is a link between tectonics and GAB spring travertine deposition. However, Priestley et al. (2018) focused on the important role of climatic influences on travertine accumulation that are superimposed on the longer-term and persistent tectonic influences as discussed further below.

Uysal et al. (2019) suggest that the GAB groundwater system cannot easily be periodically affected by palaeoclimatic conditions because the GAB is entirely under confined conditions, flow rates are slow (1–5 m/yr; Habermehl, 1980) and there is no evidence of palaeoclimatic variations within GAB groundwater. However, groundwater systems, especially confined groundwater systems, have piston flow conditions that respond quickly to changes in climate (for example, Haldorsen et al., 2016; Jasechko et al., 2015; Darling, 2011; Edmunds, 2009). Despite the fact that groundwater flow rates in the GAB are slow, the actual transmission of artesian pressure (hydraulic head) and resulting increased spring discharge is rapid, with pressure transmission times between 0.1 and 1 kyr estimated in Priestley et al. (2018) using the Error function (Kresic, 2007). We disagree there is no evidence of palaeoclimate variations within GAB groundwater. Love et al. (2000) used Cl concentrations and $\delta^{18}O$ values to show that recharge rates to the main aquifer of the western GAB, where the majority of spring deposits are located, have responded to climatic changes with recharge rates being three times higher 30 kyr ago. Also while Radke et al. (2000) did not discern the expected palaeoclimate $\delta^{18}O$ signals in GAB

DOI of original article: https://doi.org/10.1016/j.palaeo.2019.109420

* Corresponding author.
E-mail address: stacey.priestley@ansto.gov.au (S.C. Priestley).

https://doi.org/10.1016/j.palaeo.2019.109421
Received 10 September 2019; Received in revised form 20 October 2019; Accepted 22 October 2019

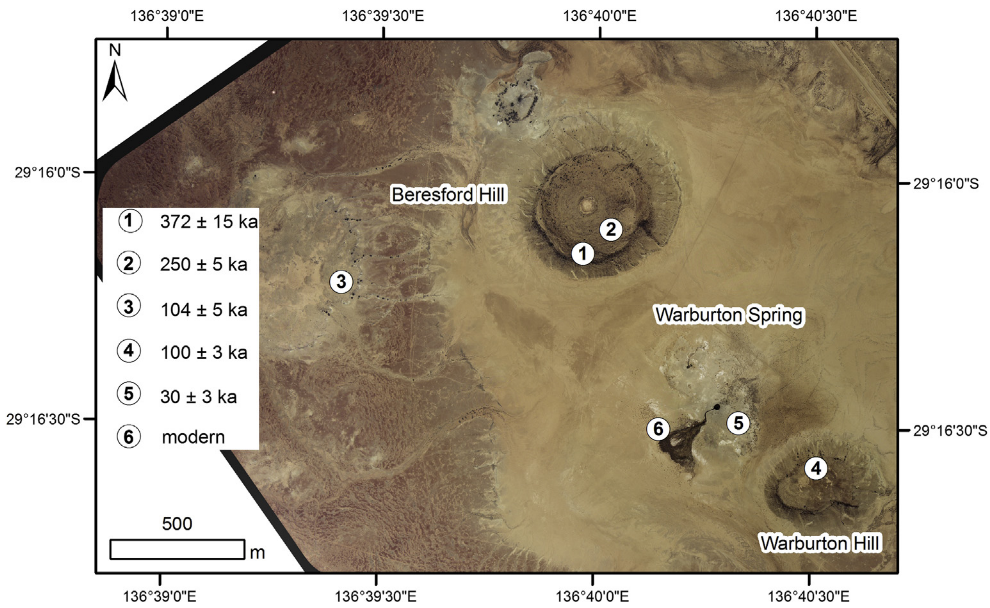

Fig. 1. Adapted from Keppel, 2013 Beresford Hill Spring system aerial photograph with locations of age samples and results listed in table in bottom left hand corner.

Tables 1
^{234}U–^{238}U disequilibrium dating results. $\delta^{234}U$ measured is the ICP result from U and Th analysis, $^{234}U/^{238}U$ is calculated using the ICP raw results and $\delta^{234}U_{initial}$ was estimated by averaging the ICP results for the different areas; Beresford and Warburton group; Dalhousie group and Elizabeth, Jersey and Kewson Hill group.

Ref # for paper	Sample area	$\delta^{234}U$	$^{234}U/^{238}U$	$\delta^{234}U_{initial}$	^{234}U–^{238}U disequilibrium age range
		measured	calculated	estimated	ka
63	Beresford Hill	132 (64)	62.2 (1.1)	1532 (459)	743–961
64	Warburton Hill	32 (6)	56.6 (1.0)	1532 (459)	1258–1476
66	Beresford Hill	88 (15)	59.7 (1.1)	1532 (459)	890–1109
69	Warburton Hill	77 (3)	59.1 (1.1)	1532 (459)	935–1154
71	Dalhousie Springs	165 (4)	63.9 (1.2)	1039 (255)	553–731
72	Kewson Hill	138 (3)	62.5 (1.1)	1806 (1193)	529–1092
73	Beresford Hill	206 (1)	66.2 (1.2)	1532 (459)	586–805

groundwater, they attributed hydrochemical anomalies in the Eulo-Nebine Ridge area to periods of aridity during the Pleistocene. Given this evidence for a response to palaeoclimate variability, and the fact that travertine deposits are known to record palaeoclimate conditions globally (e.g. Sierralta et al., 2010; Zentmyer et al., 2008), it would seem plausible to look for evidence of palaeoclimate variability in GAB spring deposits as an explanation for observed travertine episodicity.

Factors important to the formation of GAB spring travertine mounds have been extensively investigated by Keppel et al. (2011) and Keppel et al. (2012) using GAB spring water hydrochemistry, a microcosm experiment, as well as petrological and Scanning Electron Microscopy techniques. While the carbonate hydrochemistry of spring water and by extension the rate-limited degassing of CO_2 upon groundwater emergence from a spring is the primary control on gross mound morphology, the flow rate of the spring also has an important relationship to the resultant spring wetland depth, which does appear to be relevant to controlling the size of the mound footprint (Keppel et al., 2018). In other words, water volume (discharge) is a major control on spring mound travertine volume as long as CO_2 oversaturation at a given location remains the same. Travertine deposition in central Australia occurs in the current arid climate; however, modern travertine precipitation is generally downstream of spring orifaces, with precipitation concentrated in spring tail delta environments rather than the spring mound (where channels form today), and may be much younger than the mound immediately around the vent (Keppel et al., 2011, 2012).

In contrast, CO_2 flux from the mantle is a consequence of longer-term processes of mantle flow and degassing (Crossey et al., 2016; Karlstrom et al., 2013a). The conduit system is complex, but involves magmatic processes at deep levels and seismic processes above the brittle ductile transition (Crossey et al., 2016) and results in exceptionally high alkalinity that is extensive within the GAB aquifer (Crossey et al., 2013; Italiano et al., 2014; Shand et al., 2016). We agree that CO_2 – rich fluids both promote and respond to upper crustal seismicity and that there is an association of CO_2 flux to microseismicity within the overall system. However, without large water discharge volumes, the CO_2 flux alone cannot precipitate large volumes of travertine. Thus, travertine **volumes** are likely dominantly controlled by water volumes (water limited) rather than being CO_2 limited. And the volume of travertine being deposited is likely to increase with high spring water discharge rates (i.e. high volume flow = high volume travertine deposition).

An increase in past spring water discharge rates, relatively to today's, is suggested by the size of older preserved travertine mounds and platforms within the landscape. For example, at Beresford the larger spring travertine mounds preserved at higher elevations in the landscape are > 100 ka, whereas the smaller currently active spring mound preserved at ground level is < 30 ka, with modern travertine precipitation restricted to the spring tail environment (Fig. 1). This reduction in the size of travertine deposits is consistent with a pronounced increase in aridity from ~130 ka (Ayliffe et al., 1998; Magee et al., 2004; Radke et al., 2000).

Uysal et al. (2019) queried why older travertine deposits are not more widely preserved if travertine deposition is related to wetter climates. However, our data do show large travertine deposits preserved

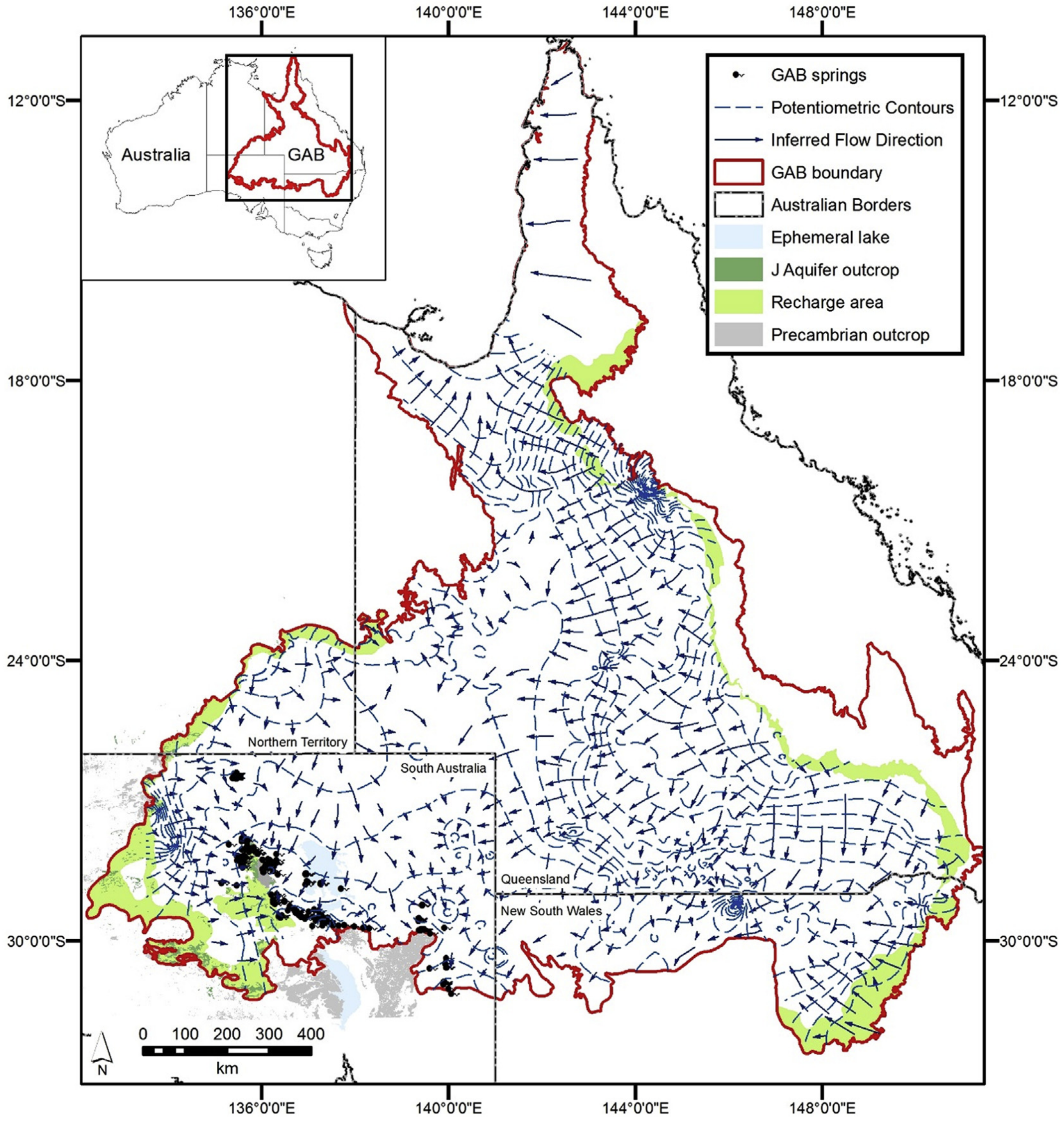

Fig. 2. Great Artesian Basin extent, potentiometric surface and potential recharge areas adapted from Love et al. (2013) and Ransley et al. (2015).

in the landscape, such as Beresford Hill and Hamilton Hill as examples (Priestley et al., 2018). Our sampling emphasized stratigraphic bracketing with, at best, three ages from an individual mound location. For the larger palaeo-mounds, all we know is that they are outside of U-series range (Priestley et al., 2018) with ^{234}U–^{238}U disequilibrium model ages suggesting that travertine may have been deposited in these locations episodically since approximately 1 Ma (Table 1).

The travertine samples presented in Ring et al. (2016) are vein carbonates at the surface of young travertine platforms and we agree with Ring et al. (2016) and Uysal et al. (2019) that these most likely represent periods of tectonic activity. For some of these vein dates, it may be permissible to use U-series travertine dates to constrain individual fault slip or crack-seal events as vein carbonates often record cycles of fluid overpressure and stress release (Ricketts et al., 2014). But much more systematic dating of veins, combined with kinematic studies, would be needed to infer any seismic episodicity and fault slip history. The majority of U-series dated samples presented in Priestley et al. (2018) are from the 'tufa' deposition environment (Keppel et al., 2011). Further work is certainly needed to date multiple travertine samples from all facies: spring mounds, platforms, and veins to gain a better understanding of the individual or combined controls and drivers of spring travertine deposition. Nevertheless, the U-series dated spring mound travertine samples presented in Priestley et al. (2018) suggest synchronous deposition of travertine across the region with some clear groupings of the ages that suggest more regional control than slip on individual faults.

Ideally spring travertine deposition ages should be compared with palaeoclimate proxies from the groundwater source recharge area. However, GAB recharge areas extend over three major climatic regions of Australia (Keywood, 1995; Radke et al., 2000), and these can experience wetter or drier conditions somewhat independently (Reeves et al., 2013). Water discharging from the GAB springs are predominantly sourced from within the western GAB with complex flow paths due to some localised recharge locations (e.g. Finke River, Marla; Love et al., 2013) and unconfined areas, with short flow paths compared to the eastern GAB (Fig. 2). Comparison of the travertine deposition episodes with published independent palaeoclimate records are presented in Priestley et al., (2018) suggesting a correlation between the times of regional travertine deposition and wetter periods consistent with an important palaeohydrogeology/palaeoclimate control on spring mound travertine deposition.

Uysal et al. (2019) argue that while there is good correlation with a number of central Australian records there is no unique climate control on travertine deposition because some travertine deposition times are not related to wet periods. They point specifically to the 285–240 ka, the 160–150 ka, and the < 30 ka intervals and highlight palaeoclimate proxies that have not recorded wet periods during these intervals. But, whereas no speleothem growth has been recorded in southern Australia for the 280–200 ka period (Ayliffe et al., 1998; Uysal et al., 2019), there is evidence of increased fluvial activity in northern Australia during this time (Jansen et al., 2013; Nanson et al., 2008). Thus it is possible that precipitation within northern Australia, where several recharge areas are located, caused groundwater recharge and spring deposition at this time. Secondly, although Magee et al. (2004) did find pronounced aridity in the latter half of MIS 6 (i.e. 150–130 ka), this was likely preceded by a wetter period as there is also evidence of fluvial activity throughout central Australia between 150 and 140 ka (Herczeg and Chapman, 1991; Nanson et al., 2008), as well as a period of effective precipitation up to 155 ka in southern Australia (Ayliffe et al., 1998), which potentially drove travertine precipitation during the 160–150 ka period. Thirdly, the absence of a travertine age in our study that correlates with a wetter period before 26 ka (Uysal et al., 2019), does not mean there was no travertine deposition during that period. Although ours was the first extensive regional sampling (n = 21 samples), it was not comprehensive and we don't attempt to interpret periods of aridity from a lack of ages (Priestley et al., 2018). Magee et al. (2004) did not find evidence of wet episodes between 34–12 ka; however, other proxies throughout Australia (e.g. Bowler et al., 1986; Fitzsimmons et al., 2013; Gliganic et al., 2015) and nearby Lake Mega-Frome (Cohen et al., 2011) do show evidence of high lake levels at this time highlighting that there were localised wetter areas during this period.

In our view, travertine formation has both tectonic controls for CO_2 flux and palaeohydrologic controls on water volumes (e.g. Priewisch et al., 2014). The mound springs lineaments, and the resulting locations of the main discharge areas of the GAB are seen as a product of different interacting scales of active tectonism in central Australia (Karlstrom et al., 2013b) with important climatic influences, due to complex recharge timing and processes, superimposed on travertine deposition (the focus in Priestley et al., 2018). This conclusion is similar to the observation of regionally synchronous times of spring discharge that appear to be linked to palaeoclimate (De Filippis et al., 2013, referenced by Uysal et al., 2019; Minissale et al., 2002). In fact, it is possible that increased artesian pressure during wetter periods may also lead to an increase in tectonic activity (Faccenna et al., 2008). Thus, climate, tectonics, mantle CO_2 flux, and travertine deposition may all be interconnected in a circular feedback system. More dating of travertine deposits is certainly needed to test multiple forcings, both at regional and local scales.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors wish to thank Dr. Andrea Billi and an anonymous reviewer for their constructive corrections and comments. We would also like to thank Dr. Pauline Treble for her comments and suggestions on this manuscript.

References

Ayliffe, L.K., Marianelli, P.C., Moriarty, K.C., Wells, R.T., McCulloch, M.T., Mortimer, G.E., Hellstrom, J.C., 1998. 500 ka precipitation record from southeastern Australia: Evidence for interglacial relative aridity. Geology 26, 147–150.

Bowler, J.M., Huang, Q.J., Kezao, C., Head, M.J., Baoyin, Y., 1986. Radiocarbon dating of playa-lake hydrologic changes: Examples from Northwestern China and Central Australia. Palaeogeogr. Palaeoclimatol. Palaeoecol. 54, 241–260.

Clark, I.D., Fontes, J.C., 1990. Paleoclimatic reconstruction in northern Oman based on carbonates from hyperalkaline groundwaters. Quat. Res. 33, 320–336.

Cohen, T.J., Nanson, G.C., Jansen, J.D., Jones, B.G., Jacobs, Z., Treble, P., Price, D.M., May, J.-H., Smith, A.M., Ayliffe, L.K., Hellstrom, J.C., 2011. Continental aridification and the vanishing of Australia's megalakes. Geology 39, 167–170.

Crossey, L., Karlstrom K, E., Springer A, E., Newell, D., Hilton, D., Fischer, T., 2009. Degassing of mantle-derived CO_2 and He from springs in the southern Colorado Plateau region-Neotectonic connections and implications for groundwater systems. Geol. Soc. Am. Bull. 121, 1034–1053.

Crossey, L.J., Karlstrom, K.E., Schmandt, B., Crow, R.R., Colman, D.R., Cron, B., Takacs-Vesbach, C.D., Dahm, C.N., Northup, D.E., Hilton, D.R., Ricketts, J.W., Lowry, A.R., 2016. Continental smokers couple mantle degassing and distinctive microbiology within continents. Earth Planet. Sci. Lett. 435, 22–30.

Crossey, L.J., Priestley, S.C., Shand, P., Karlstrom, K.E., Love, A.J., Keppel, M., 2013. Source and origin of western GAB spring water. In: Love, A.J., Shand, P., Crossey, L., Harrington, G.A., Rousseau-Gueutin, P. (Eds.), Allocating Water and Maintaining Springs in the Great Artesian Basin, Volume III: Groundwater Discharge of the Western Great Artesian Basin. National Water Commission, Canberra.

Darling, W.G., 2011. The isotope hydrology of quaternary climate change. J. Hum. Evol. 60, 417–427.

De Filippis, L., Faccenna, C., Billi, A., Anzalone, E., Brilli, M., Soligo, M., Tuccimei, P., 2013. Plateau versus fissure ridge travertines from Quaternary geothermal springs of Italy and Turkey: Interactions and feedbacks between fluid discharge, paleoclimate, and tectonics. Earth Sci. Rev. 123, 35–52.

Edmunds, W.M., 2009. Palaeoclimate and groundwater evolution in Africa - implications for adaptation and management. Hydrol. Sci. J. 54, 781–792.

Faccenna, C., Soligo, M., Billi, A., De Filippis, L., Funiciello, R., Rossetti, C., Tuccimei, P., 2008. Late Pleistocene depositional cycles of the Lapis Tiburtinus travertine (Tivoli, Central Italy): Possible influence of climate and fault activity. Glob. Planet. Chang. 63, 299–308.

Fitzsimmons, K.E., Cohen, T.J., Hesse, P.P., Jansen, J., Nanson, G.C., May, J.H., Barrows, T.T., Haberlah, D., Hilgers, A., Kelly, T., Larsen, J., Lomax, J., Treble, P., 2013. Late Quaternary palaeoenvironmental change in the Australian drylands. Quat. Sci. Rev. 74, 78–96.

Gliganic, L.A., May, J.H., Cohen, T.J., 2015. All mixed up: Using single-grain equivalent dose distributions to identify phases of pedogenic mixing on a dryland alluvial fan. Quat. Int. 362, 23–33.

Habermehl, M.A., 1980. The Great Artesian Basin. BMR Journal of Australian Geology & Geophysics, Australia, pp. 9–38.

Haldorsen, S., Van Der Ploeg, M.J., Cendón, D.I., Chen, J., Jemâa, N.C.B., Gurdak, J.J., Purtschert, R., Tujchneider, O., Vaikmäe, R., Perez, M., Zouari, K., 2016. Groundwater and global palaeoclimate signals (G@GPS). Episodes 39, 556–567.

Hancock, P.L., Chalmers, R.M.L., Altunel, E., Çakir, Z., 1999. Travitonics: Using travertines in active fault studies. J. Struct. Geol. 21, 903–916.

Herczeg, A.L., Chapman, A., 1991. Uranium-series dating of lake and dune deposits in southeastern Australia: A reconnaissance. Palaeogeogr. Palaeoclimatol. Palaeoecol. 84, 285–298.

Italiano, F., Yuce, G., Uysal, I.T., Gasparon, M., Morelli, G., 2014. Insights into mantle-type volatiles contribution from dissolved gases in artesian waters of the Great Artesian Basin, Australia. Chem. Geol. 378–379, 75–88.

Jansen, J.D., Nanson, G.C., Cohen, T.J., Fujioka, T., Fabel, D., Larsen, J.R., Codilean, A.T., Price, D.M., Bowman, H.H., May, J.H., Gliganic, L.A., 2013. Lowland river responses to intraplate tectonism and climate forcing quantified with luminescence and cosmogenic ^{10}Be. Earth Planet. Sci. Lett. 366, 49–58.

Jasechko, S., Lechler, A., Pausata, F.S.R., Fawcett, P.J., Gleeson, T., Cendón, D.I., Galewsky, J., LeGrande, A.N., Risi, C., Sharp, Z.D., Welker, J.M., Werner, M., Yoshimura, K., 2015. Late-glacial to late-Holocene shifts in global precipitation δ^{18}O. Clim. Past 11, 1375–1393.

Karlstrom, K.E., Crossey, L.J., Hilton, D.R., Barry, P.H., 2013a. Mantle He-3 and CO_2 degassing in carbonic and geothermal springs of Colorado and implications for neotectonics of the Rocky Mountains. Geology 41, 495–498.

Karlstrom, K.E., Keppel, M., Crossey, L.J., Love, A.J., Boreham, C., 2013b. Structural and tectonic history. In: Keppel, M., Karlstrom, K.E., Love, A.J., Priestley, S.C., Wohling, D., De Ritter, S. (Eds.), Allocating Water and Maintaining Springs in the Great Artesian Basin, Volume I: Hydrogeological Framework of the Western Great Artesian Basin. National Water Commission, Canberra.

Keppel, M.N., 2013. The geology and hydrochemistry of calcareous mound spring wetland environments in the Lake Eyre South region, Great Artesian Basin, South Australia. School of the Environment, Flinders University, Adelaide South Australia.

Keppel, M.N., Clarke, J.D.A., Halihan, T., Love, A.J., Werner, A.D., 2011. Mound springs in the arid lake Eyre South region of South Australia: A new depositional tufa model and its controls. Sediment. Geol. 240, 55–70.

Keppel, M.N., Post, V.E.A., Love, A.J., Clarke, J.D.A., Werner, A.D., 2012. Influences on the carbonate hydrochemistry of mound spring environments, Lake Eyre South region, South Australia. Chem. Geol. 296, 50–65.

Keppel, M.N., Post, V.E.A., Love, A.J., Werner, A.D., Clarke, J.D.A., Halihan, T., 2018. Modelling size constraints on carbonate platform formation in groundwater upwelling zones. Sci. Rep. 8, 17460.

Keywood, M., 1995. Origins and Sources of Atmospheric Precipitation from Australia: Chlorine-36 and Major-Element Chemistry. School of Earth Sciences. Australian National University, Canberra.

Kresic, N., 2007. Hydrogeology and Groundwater Modeling. CRC Press, Taylor & Francis Group, London.

Love, A.J., Herczeg, A.L., Sampson, L., Cresswell, R.G., Fifield, L.K., 2000. Sources of chloride and implications for Cl-36 dating of old groundwater, southwestern Great Artesian Basin, Australia. Water Resour. Res. 36, 1561–1574.

Love, A.J., Wohling, D., Fulton, S., Rousseau-Gueutin, P., De Ritter, S., 2013. Allocating

Water and Maintaining Springs in the Great Artesian Basin, Volume II: Groundwater Recharge, Hydrodynamics and Hydrochemistry of the Western Great Artesian Basin. National Water Commission, Canberra.

Magee, J.W., Miller, G.H., Spooner, N.A., Questiaux, D., 2004. Continuous 150 k.y. monsoon record from Lake Eyre, Australia: Insolation-forcing implications and unexpected Holocene failure. Geology 32, 885–888.

Manga, M., Rowland, J.C., 2009. Response of Alum Rock springs to the October 30, 2007 Alum Rock earthquake and implications for the origin of increased discharge after earthquakes. Geofluids 9, 237–250.

Miner, R.E., Nelson, S.T., Tingey, D.G., Murrell, M.T., 2007. Using fossil spring deposits in the Death Valley region, USA to evaluate palaeoflowpaths. J. Quat. Sci. 22, 373–386.

Minissale, A., 1991. Thermal springs in Italy: Their relation to recent tectonics. Applied Geochemistry 6, 201–212. https://doi.org/10.1016/0883-2927(91)90030-S.

Minissale, A., Kerrick, D.M., Magro, G., Murrell, M.T., Paladini, M., Rihs, S., Sturchio, N.C., Tassi, F., Vaselli, O., 2002. Geochemistry of Quaternary travertines in the region north of Rome (Italy): Structural, hydrologic and paleoclimatic implications. Earth Planet. Sci. Lett. 203, 709–728.

Mogi, K., Mochizuki, H., Kurokawa, Y., 1989. Temperature changes in an artesian spring at Usami in the Izu Peninsula (Japan) and their relation to earthquakes. Tectonophysics 159, 95–108.

Nanson, G.C., Price, D.M., Jones, B.G., Maroulis, J.C., Coleman, M., Bowman, H., Cohen, T.J., Pietsch, T.J., Larsen, J.R., 2008. Alluvial evidence for major climate and flow regime changes during the middle and late Quaternary in eastern central Australia. Geomorphology 101, 109–129.

Priestley, S.C., Karlstrom, K.E., Love, A.J., Crossey, L.J., Polyak, V.J., Asmerom, Y., Meredith, K.T., Crow, R., Keppel, M.N., Habermehl, M.A., 2018. Uranium series dating of Great Artesian Basin travertine deposits: Implications for palaeohydrogeology and palaeoclimate. Palaeogeogr. Palaeoclimatol. Palaeoecol. 490, 163–177.

Priewisch, A., Crossey, L.J., Karlstrom, K.E., Polyak, V.J., Asmerom, Y., Nereson, A., Ricketts, J.W., 2014. U-series geochronology of large-volume quaternary travertine deposits of the southeastern Colorado plateau: Evaluating episodicity and tectonic and paleohydrologic controls. Geosphere 10, 401–423.

Radke, B.M., Ferguson, J., Cresswell, R.G., Ransley, T.R., Habermehl, M.A., 2000. Hydrochemistry and Implied Hydrodynamics of the Cadna-Owie - Hooray Aquifer, Great Artesian Basin, Australia. Bureau of Rural Sciences, Canberra.

Ransley, T.R., Radke, B.M., Feitz, A.J., Kellett, J.R., Owens, R., Bell, J., Stewart, G., Carey, H., 2015. Hydrogeological Atlas of the Great Artesian Basin. Geoscience Australia, Canberra.

Reeves, J.M., Barrows, T.T., Cohen, T.J., Kiem, A.S., Bostock, H.C., Fitzsimmons, K.E., Jansen, J.D., Kemp, J., Krause, C., Petherick, L., Phipps, S.J., 2013. Climate variability over the last 35,000 years recorded in marine and terrestrial archives in the Australian region: An OZ-INTIMATE compilation. Quat. Sci. Rev. 74, 21–34.

Ricketts W., J., Karlstrom E., K., Priewisch, A., Crossey J., L., Polyak J., V., Asmerom, Y., 2014. Quaternary extension in the Rio Grande rift at elevated strain rates recorded in travertine deposits, central New Mexico. Lithosphere 6 (1), 3–16. https://doi.org/10.1130/L278.1.

Ring, U., Tonguç Uysal, I., Yüce, G., Ünal-İmer, E., Italiano, F., İmer, A., Zhao, J.-x., 2016. Recent mantle degassing recorded by carbonic spring deposits along sinistral strike-slip faults, south-central Australia. Earth Planet. Sci. Lett. 454, 304–318.

Shand, P., Gotch, T., Love, A., Raven, M., Priestley, S., Grocke, S., 2016. Extreme environments in the critical zone: Linking acidification hazard of acid sulfate soils in mound spring discharge zones to groundwater evolution and mantle degassing. Sci. Total Environ. 568, 1238–1252.

Sierralta, M., Kele, S., Melcher, F., Hambach, U., Reinders, J., van Geldern, R., Frechen, M., 2010. Uranium-series dating of travertine from Sütto: Implications for reconstruction of environmental change in Hungary. Quat. Int. 222, 178–193.

Sprigg, R.C., 1957. The Great Artesian Basin in south Australia. J. Geol. Soc. Aust. 5, 88–101.

Uysal, I.T., Ring, U., Ünal-İmer, E., Yüce, G., Shulmeister, J., İmer, A., Italiano, F., Zhao, J., 2019. Comment on “Uranium series dating of Great Artesian Basin travertine deposits: Implications for palaeohydrogeology and palaeoclimate” by Priestley et al. Palaeogeogr. Palaeoclimatol. Palaeoecol 2018.

Zentmyer, R., Myrow, P.M., Newell, D.L., 2008. Travertine deposits from along the South Tibetan fault system near Nyalam, Tibet. Geol. Mag. 145, 753–765.