

Interactive comment on “The last interglacial sea-level record of New Zealand (Aotearoa)” by Deirdre D. Ryan et al.

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This paper presents a very useful new dataset of last interglacial relative sea level indicators for New Zealand (NZ) Aotearoa. The dataset appears to have been rigorously compiled to the WALIS global standard and it is useful, albeit humbling (in terms of the relatively few datapoints able to be compiled), to see these data in a global context. The paper is very well written and appropriately illustrated, bar the minor points I discuss below and on the annotated pdf. I have not checked the calculations, in part because I don't fully understand the methods (discussed below), but I suspect there are no major errors as the calculations are not complex.

The largest issue I have with the paper in its current form is the lack of detail on the

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methods (section 2 is notably brief). I appreciate that this paper is part of a special issue and the methods and parameter descriptions are described elsewhere, but nevertheless I do think there should be some brief additions to this paper to make it more stand-alone. This will be particularly useful to NZ readers. I have noted these on the annotated pdf, but the key methods are: 1) What criteria did you use to include datapoints? Can you provide more info (e.g., a list) on the publications reviewed but not included? 2) Explain the RSL indicators (marine-limiting, direct sea level, terrestrial-limiting). It would be particularly helpful to see these labelled on Figure 1, similar to Figure 2 of Rovere et al. (2016). 3) Explain the indicative meaning calculation. In particular the calculations in the IMCalc tool, and the calculation of uncertainties. For each of these I'm thinking of one or a two sentences of relatively high explanation and then referring to the other papers and links for more details. It would also be helpful (again, especially for a NZ audience) to work through an example for 2 and 3.

To expand upon the criteria method a bit further, having done similar compilations in the past (e.g., Beavan and Litchfield, 2012), I am aware of a number of other data sources such as geological maps, student theses and groundwater reports that have some LIG SL information in them. I suspect many of them were examined and were unable to be used because they didn't contain specific locations, elevations, or ages, or perhaps there was a preference for peer-reviewed papers or publicly available reports? For example I was also going to raise the Ninis (2018) thesis raised by reviewer Tim Naish, and I see from the response that the authors were aware of it but chose not to include it so as not to scoop the publication (thanks for that and yes, it is in progress and can be provided later). Some that I thought would have provided useful information are the Ota et al. (1981) Late Quaternary tectonic map of NZ, the Dravid and Brown (1987) Heretaunga Plains Groundwater report (references are contained in Beavan and Litchfield 2012) and the paper by Schermer et al. (2009) *Tectonics*, 28: TC6008; doi: 10.1029/2008TC002426.

Another surprising omission is any discussion of the relative sea levels that have been

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compiled. While I appreciate this is primarily a data paper, I was surprised to not see any discussion of the graphs in the lower parts of Figures 3 and 4. While I am biased in that I am a tectonic geomorphologist, and the patterns that are obtained are almost entirely likely the result of tectonics, I still find it odd not to discuss the results. The total range of RSLs are also mentioned in the abstract, but not elsewhere. Again, I'm only suggesting a few sentences should be added, probably to section 4.3.

In several places there are references to the Otago coastline previously being considered to be tectonically stable. While this was certainly a key assumption for construction of the NZ Holocene sea level curve (Gibb, 1986) I think the deformation of the coast south of Dunedin has been long known. Personally (and I acknowledge I'm biased and sensitive to this since it was my PhD area) I've always considered the stable part of the South Island to be farther south, in southeast Southland (including Rakiaura/Stewart Island). So I'd recommend changing the references to Otago being stable to be "parts of Otago/SE Southland", or if this is too much of a mouthful, just say "the SE South Island" rather than singling out Otago. You may even like to reiterate the concerns about the impact on the Holocene NZ sea level curve from the deformation of the LIG terrace at Blueskin Bay, as I don't think this point has really been made strongly enough previously.

I applaud the use and updating of the Pillans (1990) figure in Figure 1, but I do have an issue with the depiction of the modern beach and platform. There is a significant body of research on processes of formation of rock shore platforms in NZ (none of which I note is referenced) and my understanding of it and my own personal observations is that where there is a well developed shore platform, it generally forms between high tide and low tide. I appreciate that discussion of much of this is beyond the scope of this paper, but I would like to see this part of Figure 1 updated to reflect this and at least some reference to the shore platform literature. A good starting place would be review paper by Dickson and Stephenson (2014) – The rock coast of NZ, Chapter 13, in: Kennedy, D. M., Stephenson, W. J. & Naylor, L. A. (eds) 2014. Rock Coast

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Geomorphology: A Global Synthesis. Geological Society, London, Memoirs, 40, 225–234. <http://dx.doi.org/10.1144/M40.13>.

There are quite a few references missing from the reference list, which I've listed below. Some may be typos that I wasn't confident enough to correct on the pdf, but in particular most of the references in Table 2 are missing. Bowen et al. (1988) Bowen et al. (1998) Brown (1988) Bull (1985) Chappell et al. (1996) Cowie (1961) Cowie (1981) Goodfriend et al. (1995) Hammon et al. (1983) Lambeck and Chappell (2001) Lowe (2019) Ludwig et al. (1996) McGlone et al. (2004) Muhs (2000) Palmer (1988) Pillans (1985) Pillans (1986) Pillans (1991) Pillans et al. (1994) Pillans et al. (1998) Siddall et al. (2007) Veeh and Chappell (1970) Vucetich and Pullar (1982) Ward (1967) Worth and Grant-Mackie (2003)

Please also note the supplement to this comment:

<https://essd.copernicus.org/preprints/essd-2020-288/essd-2020-288-RC2-supplement.pdf>

Interactive comment on Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2020-288>, 2020.

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