Gains and pitfalls of proxies for the reconstruction of ocean-continent water transfer - testing aquifer eustasy

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One of the most intriguing factors of the global water cycle is the balance of polar ice and continental water storage in managing global sea-level fluctuations. It was shown that greenhouse climates, e.g. during certain times in the Cretaceous, were probably dominated by aquifer eustasy (WENDLER & WENDLER, 2016), and on the contrary icehouse climates seem to be dominated by glacio eustasy. But it is the balance between both factors which is particularly interesting for a holistic understanding of sea-level change by involving observational data available today. Namely the human influence on the water cycle is a major factor in shaping the Anthropocene because we humans screw up both the households of aquifers and polar ice at the same time. 21 of the 37 largest aquifers have been significantly depleted contributing to sea-level rise (RICHEY et al., 2015). On the other hand rainfall increases related to the ENSO phenomenon La Nina in certain regions around the globe move water back on land causing notable sea-level fall (REAGER et al., 2016). Through these processes the spatial expand of vegetation changes and influences amounts of biological CO_2-uptake and thus the global carbon cycle as well as global temperatures. That way, global vegetation coverage represents the third regulation factor of a system whose impact on sea level we can actually observe and measure today, a system which needs to be understood when reconstructing sea-level in the geological past, and also when forecasting future sea-level. Proxies for a faithful reconstruction of precipitation appear to be a crucial prerequisite for such tasks. This talk introduces the idea of an ice-aquifer-biosphere water balance and addresses gains and pitfalls of proxies for continental precipitation.

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