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Progress in Palaeosalinity

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As yet, proxies for palaeosalinity are poorly developed. This contrasts with a diverse variety of palaeotemperature proxies, which in favourable conditions can achieve a realistic uncertainty of $\pm 1^{\circ}$C (about 3% of the total sea-water temperature range of about -2 to +35°C). In terms of geochemical measurements to approach the palaeosalinity problem, the focus is especially on the stable isotopes of Oxygen and Hydrogen, as these record fractionation processes due to the freshwater budget. Of these, δ18O is the most established measurement to have been applied in previous palaeosalinity studies, but the use of dD is gaining increasing attention. I will start with an overview of the potential and limitations of these existing methods for palaeosalinity characterisation. Next, I will propose a new theoretical framework for the combined use of δ18O and dD to constrain the impact of the hydrological cycle on the surface waters, and to thus characterise surface water palaeosalinity /change/, both in a spatial sense and in a temporal sense. I will show that, with realistic numbers of replicate analyses, palaeosalinity change can be estimated with an uncertainty margin of about ± 1 psu, which is about 3% of the total sea-water range of 0 to 40 psu (i.e., similar to the resolution of palaeotemperature).