**3.2 Carbonate and organic carbon δ13C**

The δ13C composition of 144 carbonate-rich samples was analysed (δ13Ccarb). Measurements on powdered samples weighing 120-150 μg were carried out on a ThermoScientific Delta V Plus mass spectrometer at the University of Münster. An in-house carbonate standard, Kabonat-1 (δ13C = 1.46‰, δ18O = -1.19‰), was used for calibration. The external standard NBS-19 (δ13C = 1.95‰, δ18O = -2.20‰) was used to monitor long-term performance. All δ13C values are reported relative to VPDB (Vienna Pee-Dee Belemnite). The in-house standard Karbonat-1 had a δ13C standard deviation (SD) of 0.04‰ (N=54). The external standard NBS-19 has an SD of 0.02‰ (N=10), and a mean offset of +0.04‰ relative to the accepted value. Duplicate δ13Ccarb measurements of 15 samples were consistent with the SD of 0.04‰ determined from the Karbonat-1 standard.

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In addition, a lower-resolution (N = 48) organic-matter carbon isotope series (δ13Corg) was constructed from measurements performed at the Archaeology, Environmental Changes and Geo-Chemistry Research Group (AMGC) of the Vrije Universiteit Brussel (Belgium). 35 of these samples had sufficient organic content to determine δ13Corg. The procedure described in Liu et al. (2021) was followed. Briefly, the samples were decarbonated with 10% HCl in two steps, rinsed with milliQ water, and dried in an oven at 50°C. Weighing before and after decarbonation resulted in a rough CaCO3 content estimate for each sample, assuming limited dissolution of other minerals. This content was compared to the CaCO3 estimate obtained through pXRF (section 3.3.2). Total organic carbon (TOC) contents and δ13Corg compositions were determined on a Euro EA Elemental Analyzer (CHNS) - Euro Vector HT-PyrOH combustion system coupled to a Nu-Instruments Horizon 2 isotope ratio mass spectrometer. The results were calibrated using two international standards, IAEA-C6 (sucrose: δ13C = -10.45‰) and IA-R068 (soy protein: δ13C = -25.22‰), together with reference material IVA33802151, which is calibrated against these international standards (organic-rich sediment: δ13C = -28.85‰). This calibration was verified with a further reference material, IVA33802153 (organic-poor soil: δ13C = -22.88‰). All δ13C values are reported relative to VPDB. Standard deviations for all standards were as follows: IAEA-C6 (sucrose) 0.095‰, IA-R068 (soy protein) 0.065‰, IVA33802151 (organic-rich sediment) 0.042‰, IVA33802153 (organic-poor soil) 0.201‰. The samples have a δ13C SD of 0.039‰ based on duplicate measurements of 5 samples.