Manuscript ID: ESSD-2022-34
„The CISE-LOCEAN sea water isotopic database (1998-2021)"

Comments to the authors

General remarks

The manuscript describes the methods and analytical techniques including adjustments and correction applied to seawater stable isotope data ($\delta^{18}O$, $\delta^{2}H$) in the LOCEAN data base, which hold more than 20 years of measurements from various cruises. The authors discuss the different sources of error and uncertainty. Overall, for $\delta^{2}H$ the authors are bit too optimistic for the precision of the data. Especially IRMS measurements in the past have not reached the precision of the latest CRDS generation. So, the claimed standard deviation of 0.15 (line 8) is most probably far to optimistic. The data set itself is of high value for various research disciplines and the authors did their best to describe the quality and limitations of the data. I made some more specific comments to some sections below.

Technically, the manuscript is adequality organized and language does not need any revision. With some minor revisions, the manuscript should be publishable in ESSD.

Specific comments

L51   Please give the full meaning of the acronym as footnote

Section 2.1   Does the potentially evaporated samples show a deviation similar to an 'evaporation line' in terrestrial surface water, aka the samples plot on a regression with lower slope assuming that the starting value is roughly comparable for a set of samples?

L178-180   From personal experience, I doubt that in-vial evaporation causes drift in the instrument. In such a case, the effect would also be visible in the same manner also by IRMS analysis that uses for example 12mL Exetainers. This is definitely not the case. Thus, possible but very unlikely.

L268-290   According to Table 1 the most negative internal standard has a $\delta^{18}O$ value of -6.61permil, the highest +1.22permil. With respect to the VSMOW-SLAP scale, this is a rather small coverage of the range ($\Delta\delta_{VSMOW-SLAP}$ = 55 permil). Yes, seawater has a rather narrow range of isotope values compared to continental freshwaters or precipitation, however, using reference materials so close to each other will not improve the overall precision of the measurement. For scale normalization you calculate a regression line through 2 or 3 of your standards and if isotope values are rather close any scatter in the 2 to 8 values used for the average calculation will already shift your slope and intercept of the line. This effect should be less problematic for reference materials that show a wider separation in isotope values. Also, the other laboratories might have used a different range of reference materials. Seawater isotope analysis is somewhat different to groundwater or precipitation, which covers a far wider range of isotope values (and the respective standards).

L312   The "salt isotope effect" might need a deeper discussion here. First, this effect only influences IRMS measurements done by equilibration (CO_2 and H_2) but does not apply to LAS (Picarro, Los Gatos). So, theoretically laser measurements should not be corrected in any manner. This not so clear from the text. You apply a correction approach by Benetti et al (2017) who claim

that also LAS $\delta^{18}O$ data (at least Picarro) should be corrected by 0.09‰ due to incomplete evaporation in the vaporizer.

Second, the effect of seawater salinity to the chemical equilibrium (activity vs concentration scale) has been tested and discussed in quite a few publications. However, studies were never 100% conclusive. This correction is reported to be –0.15‰ for $\delta^{18}O$ (Lécuyer et al, 2009) and -2‰ for δD (Martineau et al. 2012) between the fresh water reference materials and the saline samples. However, other studies did not observe such an effect for seawater salt concentrations (Horita et al., 1993a,b; Bourg et al., 2001). Consequently, it is mainly unclear for most datasets if or if not a correction has been applied to the final measured value. Is this stated for the LOCEAN data in the database what correction have been applied to older IRMS data? This is also not really clear from the text.

Bourg, C., Stievenard, M. and Jouzel, J. (2000), Hydrogen and oxygen isotopic composition of aqueous salt solutions by gas–water equilibration method. - *Chemical Geology*, 173, 331-337.

Horita J., Cole D. R., and Wesolowski D. J. (1993a) The activity-composition relationship of oxygen and hydrogen isotopes in aqueous salt solutions: I. I. Vapor-liquid water equilibration of single salt solutions from 50 to 100°. - *Geochimica Cosmochimica Acta,* 57(19), 2797-2817

Horita J., Cole D. R., and Wesolowski D. J. (1993b) The activity-composition relationship of oxygen and hydrogen isotopes in aqueous salt solutions: II. Vapor-liquid water equilibration of mixed salt solutions from 50 to 100°C and geochemical implications. - *Geochimica Cosmochimica Acta* 57(19), 4703-4711

Lécuyer, C., Gardien, V., Rigaudier, T., Fourel, F., Martineau, F. and Cros, A. (2009): Oxygen isotope fractionation and equilibration kinetics between CO2 and H2O as a function of salinity of aqueous solutions. - *Chemical Geology*, 264, 122-126.

Martineau et al. (2012). D/H equilibrium fractionation between H2O and H2 as a function of the salinity of aqueous solutions. Chemical Geology 291 (2012) 236–240

L340   Has the correction been applied also to the samples with suspected larger evaporation?

L347-362   If the samples were identical, both measurement techniques (LAS and IRMS) should result in the same values as samples has undergone evaporation and were split into aliquots later? I cannot directly see how this then helps to test the evaporation correction approach based on the relation between S, d-excess and δ-values. Or does this paragraph refer to the salt isotope effect above?

Technical comments

L312   found

L337   space character between delta and D