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Comment on essd-2022-91

Anonymous Referee #1

Referee comment on "A database of radiogenic Sr–Nd isotopes at the “three poles”" by Zhiheng Du et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2022-91-RC1, 2022

Review of Du et al. A database of radiogenic Sr-Nd isotopes at the “three poles”

General comments

Du et al. present a dataset regarding the Sr and Nd isotope of various surface sediments to trace the source-to-sink process of dust in the three poles of the Earth. Such a data compilation is timely because there are emerging Sr-Nd isotopic data in past years. I list some concerns for improving this paper.

First, a major pitfall of this paper is that many previous studies regarding Sr-Nd isotopes of surface sediment are absent in this study. I am only familiar with those studies on Asian dust sources, and the suggestion can be found in specific comments below. The authors should check other regions, e.g., the Arctic and Antarctic.

Second, the present compilation of Asian dust sources only covers the Tibetan Plateau and Jungar Basin. The data in other regions of central and East Asia should not be omitted in this study because those data in North China and Mongolia could provide dust to the North Pacific and even Greenland (dust in the Arctic).

Third, because the Sr-Nd isotopic fingerprint in Asian dust sources was studied extensively, the paper should not only focus on the bulk sediment Sr-Nd isotopic but also leave a position for the different grain sizes (e.g., for Nd and Sr isotopes) and different

mineral phases (for Sr isotopes), those distinct grain size and phases will correspond to different dust dynamics.

Specific comments

First, lots of data regarding the surface sediment in the Asian dust source region are missing. Only the dust samples, mostly from snow/ice, are insufficient to track the regional dust transport. Because a substantial amount of those dust from snow/ice is not in situ and probably long-distance transported, the regional distribution of the Nd isotope dataset mostly from those snow/ice dust cannot reflect the dust transport dynamic. In this regard, the box plot in Figure 3 divided by regional distribution can be biased, especially for those sand/soil samples.

Yang et al. 2021 GCA (https://doi.org/10.1016/j.gca.2020.12.026) compiled a new Nd isotope distribution of surface sediment (desert, fluvial, moraine, loess, and soil samples) over east and central Asia from many previous studies and new data. Most of many previous studies are missing in the present manuscript, e.g., Blayney et al., 2019; Chang et al., 2000; Clift et al., 2017; Garzione et al., 2005; He et al., 2019; Li et al., 2009; Liu et al., 1994; Nakano et al., 2004; Rao et al., 2015; Wu et al., 2010; Zhao et al., 2014, 2015. In Yang et al. 2021. The authors can find those missing studies with detailed citation information and data in Yang et al.'s Table S1.

Second, many of those missing studies of Nd isotopes also reported Sr isotopes, which should be compiled in this study. Other studies for the Sr isotope of surface sediments should also be cited. e.g., Jacobson, 2004 (https://doi.org/10.1029/2004GC000750)

Third, there are many Sr isotopic data regarding different phases of sediments (e.g., water-soluble salts, acetic acid leachate, acid-residue, etc., Honda et al., 2004 (doi: 10.1046/j.1365-3091.2003.00618.x); Yokoo et al., 2004 (doi:10.1016/j.chemgeo.2003.11.004); Nakano et al., 2005 (doi:10.1016/j.atmosenv.2005.05.050) and many other studies. If available, different phases of Sr isotopic data could also be compared.

Fourth, we know that there are many different units in the Himalayas with particular Sr-Nd isotopes (for example, see Jonell et al. 2018 https://doi.org/10.1016/j.chemgeo.2018.03.036). Those Sr-Nd isotopes of surface sediment should also be cited. If the authors think that the much variable Sr-Nd isotopes of source rock are not related to the present snow/ice dust samples, the authors should state the limit of the current compilation and explain the reason why the Himalaya dust yields a limited range of Sr-Nd isotopes within a region consisting of such variable source rocks.

Technical corrections

Line 76-70, there is another paper regarding Sr isotope as an eolian tracer Yang et al., 2017 (http://dx.doi.org/10.1016/j.epsl.2017.02.009).

Sr-Nd correlation plot like figure 8 for the Antarctic could also be illustrated for those data in Asian dust sources and the Arctic.