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Evidence from ^{182}W for an ancient mantle source in the flood basalts of the Deccan Large Igneous Province

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The $^{182}Hf - ^{182}W$ system ($t_{1/2}$ = 8.9 Ma) is a useful tool to trace the presence of ancient, primordial components in terrestrial rocks. In particular, the predominance of negative $\mu^{182}W$ isotope anomalies in modern ocean island basalts (OIBs) attracted attention [1, 2] and caused a new controversy on their origin [2, 3]. While many studies reported ^{182}W isotope compositions for OIBs [e.g. 1, 2, 4, 6], only a handful of data exist for their respective plume heads. Therefore, the investigation of Large Igneous Provinces (LIP) can contribute to a more comprehensive understanding of ^{182}W isotope systematics in the petro-magmatic history of mantle plumes and can reveal if plume heads tap different mantle reservoirs compared to their respective tails [5]. Here, we present new high-precision ^{182}W data for a comprehensive set of samples from the Deccan Large Igneous Province (DLIP) that is well-characterized in its trace element and Sr-Nd-Hf-Pb isotope inventory. The DLIP is linked to the intensively studied Réunion plume [e.g. 1, 4, 6], making the Deccan-Réunion hot-spot track an excellent case study to investigate the temporal evolution of ^{182}W compositions in deep-rooted mantle plume systems. Our preliminary $\mu^{182}W$ values for the DLIP main sequence show a wide range from -0.6 ± 2.4 to as low as -12.0 ± 2.3. The observed $\mu^{182}W$ values seem to correlate with Pb isotopes as well as Nb/Th, W/Th, and Th/Ta ratios, revealing the admixture of lithospheric mantle and crustal material to the plume component. The $\mu^{182}W$ values reported here for the DLIP are in the range of what has been previously reported for the Réunion OIB [1, 4, 6] showing that a plume head and tail do not carry different ^{182}W isotope compositions, as previously suggested [cf. 5], and most likely tap the same reservoir.

[1] Peters et al. (2021), G-Cubed. [2] Mundl et al. (2017), Science. [3] Tusch et al. (2022), PNAS. [4] Jansen et al. (2022), EPSL. [5] Jones et al. (2019), EPSL. [6] Rizo et al. (2019), GPL