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CORRECTION
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Corrigendum: Leaf Waxes and Hemicelluloses in Topsoils Reflect the δ^2H and δ^{18}O Isotopic Composition of Precipitation in Mongolia

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A Corrigendum on

Leaf Waxes and Hemicelluloses in Topsoils Reflect the δ^2H and δ^{18}O Isotopic Composition of Precipitation in Mongolia
by *Struck, J., Bliedtner, M., Strobel, P., Bittner, L., Bazarradnaa, E., Andreeva, D., Zech, W., Glaser, B., Zech, M., and Zech, R. (2020). Front. Earth Sci. 8:343. doi: 10.3389/feart.2020.00343*

In the original article, the presented $\delta^{18}O_{ara}$ values were accidentally not corrected for the oxygen introduced during hydrolysis. The necessary correction results in slightly more positive $\delta^{18}O_{ara}$ values.

The authors apologize for this mistake, and state that this does not change the scientific conclusions of the article in any way, particularly the fact that the calculated apparent fractionation ($\varepsilon_{18O\ ara/p}$) is constant along the Mongolian transect. However, as the apparent fractionation is 44 ± 2‰ (not 41 ± 2‰) and this would affect future data compilations and comparisons, we have corrected all $\delta^{18}O_{ara}$ and $\varepsilon_{18O\ ara/p}$ values in the text, the figures, and the supplementary material. We delete our hypothesis stated in the Supplementary Material that a decreasing partial CO_2 pressure might cause enhanced $^{18}O_{ara}$ enrichment, because the correlation between $\varepsilon_{18O\ ara/p}$ and altitude is not significant anymore ($R^2 = 0.09$, $p = 0.14$). All changes are highlighted in bold.

A correction has been made to the **Abstract.** The corrected version is as follows:

"The apparent fractionation ε_{app}, i.e., the isotopic difference between precipitation and the investigated compounds, shows no strong correlation with climate along the transect ($\varepsilon_{2H\ n\text{-}C29/p} = -129 \pm 14$‰, $\varepsilon_{2H\ n\text{-}C31/p} = -146 \pm 14$‰, and $\varepsilon_{18O\ ara/p} =$ **+44 ± 2‰**). Our results suggest that $\delta^2H_{n\text{-alkane}}$ and $\delta^{18}O_{ara}$ in topsoils from Mongolia reflect the isotopic composition of precipitation and are not strongly modulated by climate. Correlation with the isotopic composition of precipitation has root-mean-square errors of 13.4‰ for $\delta^2H_{n\text{-C29}}$, 12.6 for $\delta^2H_{n\text{-C31}}$, and **2.2‰** for $\delta^{18}O_{ara}$, so our findings corroborate the great potential of compound-specific $\delta^2H_{n\text{-alkane}}$ and $\delta^{18}O_{ara}$ analyzes for paleohydrological research in Mongolia".

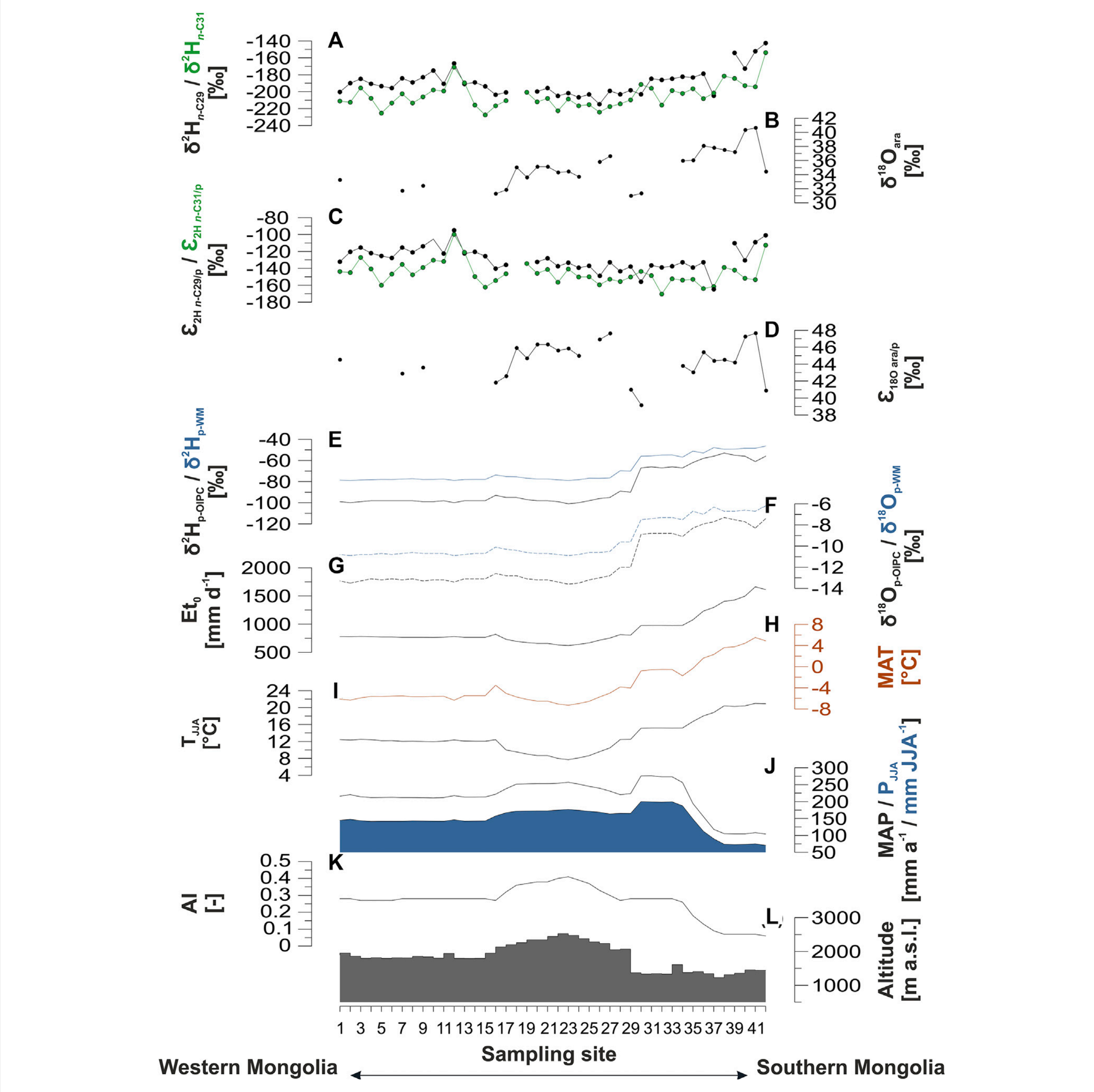

FIGURE 2 | δ^2H and δ^{18}O signatures of leaf wax-derived *n*-alkanes and the hemicellulose sugar arabinose as well as their apparent isotope fractionation (ε_{app}), compared to environmental and climatic parameters along the transect **(A)** Compound-specific δ^2H of the leaf wax-derived *n*-alkane *n*-C_{29} (black) and *n*-C_{31} (green) (this study) **(B)** compound-specific $\delta^{18}O_{ara}$ (this study) **(C)** $\varepsilon_{2H\ n\text{-}C29/p}$ (black) and $\varepsilon_{2H\ n\text{-}C31/p}$ (green) (this study) **(D)** $\varepsilon_{18O\ ara/p}$ (this study) **(E, F)** OIPC isotopic composition of precipitation (black line) and amount-weighted isotopic signature of precipitation (blue line): δ^2H_p **(E)**, and $\delta^{18}O_p$ **(F)**, respectively (Bowen et al., 2005; Bowen, 2019; Fick and Hijmans, 2017; IAEA/WMO, 2015) **(G)** the potential evapotranspiration (Et_0) (Trabucco and Zomer, 2019) **(H)** mean annual temperature (MAP) (Fick and Hijmans, 2017) **(I)** averaged summer temperature of June, July, and August (T_{JJA}) **(J)** black line shows the mean annual precipitation (MAP), blue shaded area the summer precipitation amount (P_{JJA}) (Fick and Hijmans, 2017) **(K)** the aridity index (AI) (Trabucco and Zomer, 2019), and **(L)** the altitude (Jarvis et al., 2008).

A correction has been made to the **Results**. The corrected version is as follows:

"The $\delta^{18}O_{ara}$ values range from **+31‰** to **+41‰** with an average of **+35 ± 3‰** (**Figure 2B**). All compounds show the same trend as the isotopic composition of precipitation (**Figures 2E,F**), and are significantly more positive in the arid part of the transect (ID: 34–42) compared to the rest ($\delta^2H_{n\text{-}C29}$: $p = 0.017$, $\delta^2H_{n\text{-}C31}$: $p = 7.08e^{-4}$, $\delta^{18}O_{ara}$: $p = \mathbf{2.95e^{-5}}$).

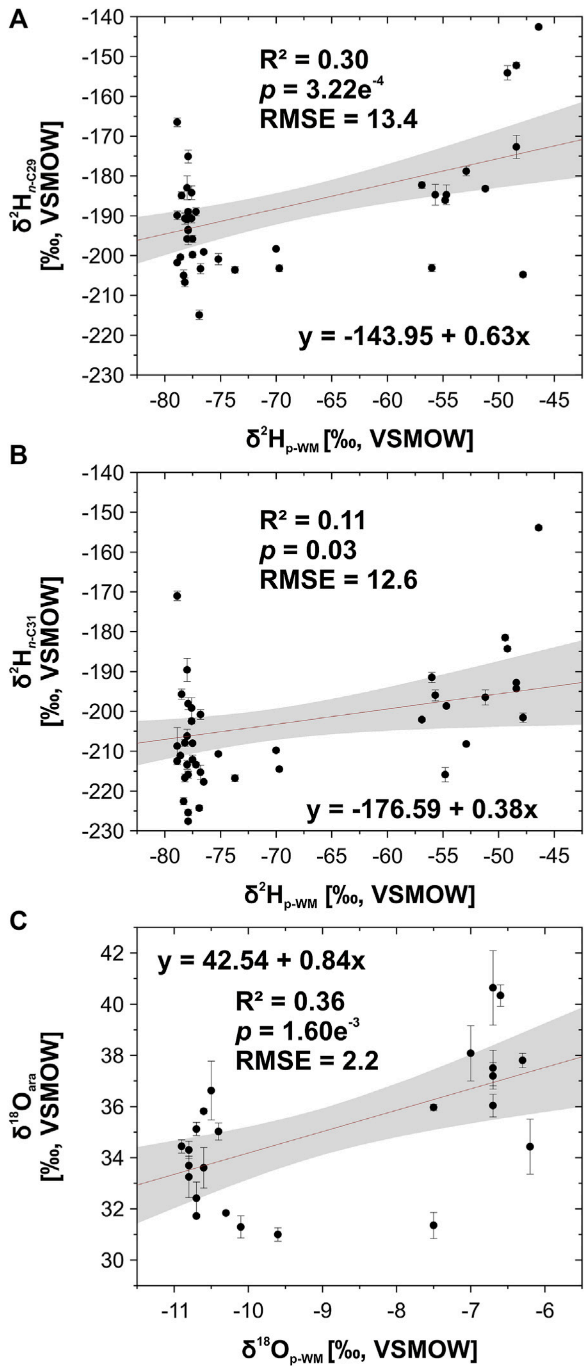

FIGURE 3 | δ^2H signatures of the leaf wax-derived *n*-alkanes **(A)** *n*-C_{29} and **(B)** *n*-C_{31}, as well as **(C)** $\delta^{18}O_{ara}$ signatures from the topsoil transect through Mongolia plotted against the amount-weighted δ^2H and δ^{18}O signature of precipitation ($\delta^2H_{p\text{-}WM}/\delta^{18}O_{p\text{-}WM}$). Red trend lines illustrate linear regressions, gray shaded areas the 95% confidence interval. Bold R^2/*p*-values indicate the level of significance (α = 0.05).

$\varepsilon_{18O\ ara/p}$ ranges from **+39‰ to +48‰** with an average of **+44** ± 2‰ (**Figure 2D**). ε_{app} is not statistically different in the arid part of the transect ($\varepsilon_{2H\ n\text{-}C29/p}$: p = 0.791, $\varepsilon_{2H\ n\text{-}C31/p}$: p = 0.554, $\varepsilon_{18O\ ara/p}$: p = **0.824**)".

A correction has been made to **Discussion, $\delta^2H_{n\text{-}alkane}$ and $\delta^{18}O_{ara}$ Against the Isotopic Composition of Precipitation.** The corrected version is as follows:

"The $\delta^2H_{n\text{-}alkane}$ and $\delta^{18}O_{ara}$ values correlate significantly with the $\delta^2H_{p\text{-}WM}$ and $\delta^{18}O_{p\text{-}WM}$ values (**Figure 3**, R^2 = 0.30, p = $3.22e^{-4}$ for $\delta^2H_{n\text{-}C29}$; 0.11 and 0.03 for $\delta^2H_{n\text{-}C31}$; and **0.36 and $1.60e^{-3}$** for $\delta^{18}O_{ara}$).

The RMSE is 13.4‰ for $\delta^2H_{n\text{-}C29}$, 12.6‰ for $\delta^2H_{n\text{-}C31}$ and **2.2‰** for $\delta^{18}O_{ara}$ (**Figure 3**) and thus indicates that the biomarkers accurately record the isotopic composition of precipitation along our transect".

A correction has been made to **Discussion, Apparent Fractionation Against Climate.** The corrected version is as follows:

"Thus, this correlation should not be over interpreted. We conclude that ε_{app} is nearly constant with $\varepsilon_{2H\ n\text{-}C29/p}$ = −129 ± 14‰, $\varepsilon_{2H\ n\text{-}C31/p}$ = −146 ± 14‰, and $\varepsilon_{18O\ ara/p}$ = **+44 ± 2‰**.

Assuming a constant ε_{bio} factor of +27‰ for arabinose (Lehmann et al., 2017; Hepp et al., 2020) evapotranspirative enrichment would be ~**17‰** for $\delta^{18}O_{ara}$".

A correction has been made to **Discussion, Comparison With Other Studies.** The corrected version is as follows:

"The $\varepsilon_{18O\ ara/p}$ values for Mongolia (**44 ± 2‰**) are similar to values reported by Strobel et al. (2020) for relatively arid regions in South Africa. There, the more humid regions have a significantly lower $\varepsilon_{18O\ ara/p}$ (~37‰), quite similar to the C_3 grass sites in Europe (Hepp et al., 2020). The deciduous tree sites in Europe, however, are again characterized by more enriched $\delta^{18}O_{sugar}$ values ($\varepsilon_{18O\ sugar/p}$ = ~43‰). All this indicates that δ^{18}O is more sensitive to evapotranspirative enrichment than δ^2H, so that climate can more strongly modulate $\delta^{18}O_{sugar}$, and again that grasses show the signal dampening much more pronounced than dicotyledons".

A correction has been made to the **Conclusion.** The corrected version is as follows:

- "Leaf wax-derived *n*-alkanes and the hemicellulose-derived sugar arabinose are significantly more enriched in ^{2}H and ^{18}O in the more arid southern and eastern parts of the transect. This reflects the changes in the isotopic composition of precipitation along the transect, and the correlations with $\delta^2H_{p\text{-}WM}$ and $\delta^{18}O_{p\text{-}WM}$ have RMSE of 13.4‰ for $\delta^2H_{n\text{-}alkane}$ and **2.2‰** for $\delta^{18}O_{ara}$.
- The apparent fractionation remains mostly constant at −129 ± 14‰, −146 ± 14‰, and at **+44** ± 2‰ for $\varepsilon_{2H\ n\text{-}C29/p}$, $\varepsilon_{2H\ n\text{-}C31/p}$ and $\varepsilon_{18O\ ara/p}$, respectively. There are no significant differences along the transect, nor strong correlations with climate".

A correction has been made to the **Supplementary Material, Apparent Fractionation Against Climate.** The corrected version is as follows:

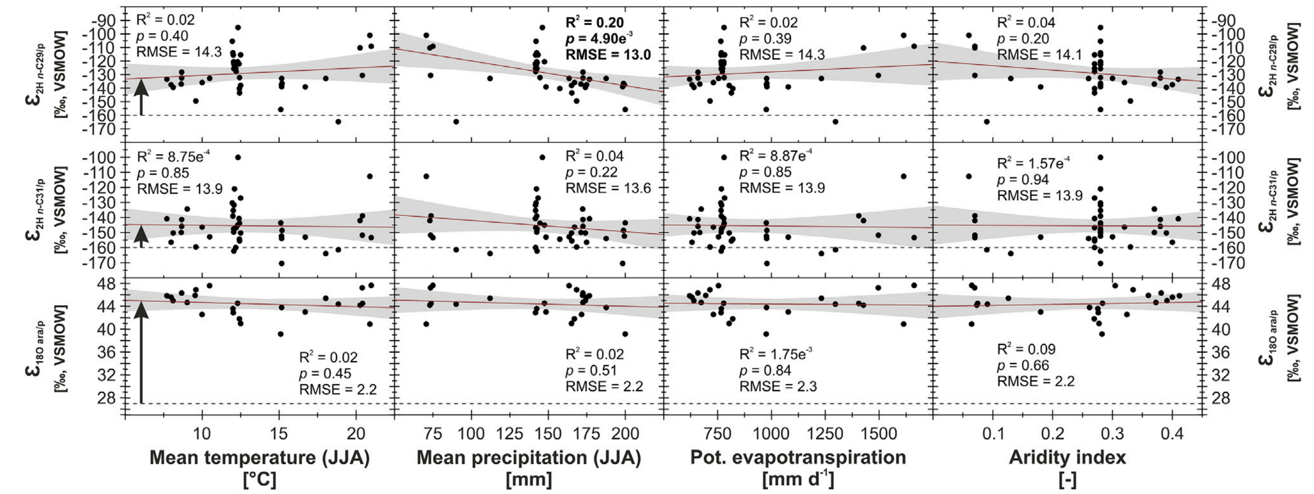

FIGURE 4 | Apparent fractionation $\varepsilon_{2H\ n\text{-}C29/p}$, $\varepsilon_{2H\ n\text{-}C31/p}$ and $\varepsilon_{18O\ ara/p}$ from the topsoil transect through Mongolia plotted against T_{JJA}, P_{JJA}, Et_0, AI (Fick and Hijmans, 2017; Trabucco and Zomer, 2019). Red trend lines illustrate linear regressions, gray shaded areas the 95% confidence interval. Bold R^2/p-values indicate the level of significance ($\alpha = 0.05$). Black dashed lines illustrate values for the biosynthetic fractionation, and black arrows indicate the effect of evapotranspirative enrichment (biosynthetic fractionation factors of −160‰ and +27‰ are assumed for the n-alkanes and arabinose, respectively).

"In addition to climate, we correlated the ε_{app} values against altitude, to test for altitude-controlled evapotranspirative enrichment. In contrast to a previous study by Polissar and Freeman (2010), no impact could be observed for $\delta^2H_{n\text{-alkane}}$ **and** $\boldsymbol{\delta^{18}O_{ara}}$, with $\varepsilon_{2H\ n\text{-}C29/p}$, $\varepsilon_{2H\ n\text{-}C31/p}$ **and** $\boldsymbol{\varepsilon_{18Oara/p}}$ being constant along our investigated transect (**Supplementary Figure 1**)".

The corrected caption for **Supplementary Figure 1** is as follows:

"The corrected $\delta^{18}O_{ara}$ values affect the presented data in **Figures 2–4**, and the **Supplementary Figure 1**".

The authors apologize for these errors and state that this does not change the scientific conclusions of the article in any way. The original article has been updated.

AUTHOR CONTRIBUTIONS

JS, MB, PS, MZ, and RZ designed the study. MB and RZ collected the samples along transect I in 2016. JS and RZ collected the samples along transect II in 2017. JS carried out the major part of the laboratory analyzes in the laboratory of RZ and BG, assisted by LB, PS, and MB. EB, DA, and WZ organized the sample logistics in 2016 and 2017. JS wrote the manuscript with contributions of all coauthors. All authors contributed to the article and approved the submitted version.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feart.2020.619100/full#supplementary-material.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.