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Dear Editor Attila Demény,

With this letter, we are submitting our detailed point-by-point responses to the editor's and reviewers' comments regarding the major revision of our manuscript, entitled "A spatially resolved 39-month dataset of stable water isotopes in precipitation over Jeju volcanic island, Korea," submitted for publication in *Earth System Science Data*. We sincerely appreciate their constructive comments and have outlined below how each issue is being addressed. The manuscript is, currently, being revised accordingly, and we expect to submit the revised manuscript and accompanying data files shortly after the submission of this response letter.

Reply to the comments by the reviewer 1

1. General Comments

Lee et al. present and discuss a new database of d18O and d2H in precipitation in Jeju Island (Korea). Apart from the usefulness of such data for scientific and practical purposes (e.g., water resources management) it is worth praising the authors for "digging up" decades all data, rather that just leave sit in drawers – it could set an example for groups, as well. To this extent, I suggest adding 1-2 lines, both in the abstract and the main text on the usefulness of such approach. Also, to better support this, I would suggest the authors to add a brief (within the limitations imposed by the journal's instructions) discussion of how their data fits/complements similar studies in the region (see https://doi.org/10.1016/j.ejrh.2026.103141 and references therein). Overall, given the scope of the journal, I would reduce the length of the discussions section, perhaps remove also the entire sections 4.3 and 4.4 and leave these for a dedicated paper. Some of the discussion could be reduced in length, as they are mostly theoretical considerations. A couple of observations detailed below might nevertheless help the authors and future readers better shape and understand, respectively, the paper. A couple of observations detailed below might nevertheless help the authors and future readers better shape and understand, respectively, the paper.

Answer: We sincerely thank the reviewer for the positive assessment of the dataset and for emphasizing the broader scientific value of recovering and publishing historical observations that might otherwise remain inaccessible.

Following this suggestion, we will revise both the Abstract and the end of the Introduction to emphasize the value of recovering, documenting, and openly publishing observations collected more than two decades ago. To avoid adding another repetitive application-oriented statement, we will replace and consolidate the existing closing sentences of the Introduction. The revised closing text will read:

"By recovering, documenting, and openly publishing observations collected more than two decades ago, this work preserves a historical record that might otherwise remain inaccessible and extends the value of the original monitoring effort."

We will also add brief regional context to Sect. 2.2 ("Previous stable isotopic studies on Jeju Island"). The following text will be included:

"Recent work on Jeju Island analyzed stable isotopes in monthly precipitation and groundwater together with isotope mixing to assess the seasonal and elevational origins of groundwater recharge, identifying high-elevation summer precipitation as the dominant recharge source (Kim et al., 2026). The present data paper complements that application-focused study by curating and openly publishing a station-resolved precipitation-isotope record and associated metadata as a dedicated, reusable data product, thereby facilitating transparent reuse and evaluation of spatial, seasonal, and elevation-related isotope patterns."

Finally, we agree that the original Discussion section is disproportionately long for a data paper. We will reorganize Sect. 3 as a combined "Results and discussion" section and remove the standalone Discussion section. The former Sects. 4.1 and 4.2 will be substantially condensed and integrated into the corresponding results subsections. The former Sect. 4.3 will be shortened and incorporated into Sect. 3.3, where it will serve only as an independent consistency check on broad island-scale seasonal patterns and model–observation differences, rather than as a validation of the observations or an evaluation of island-scale spatial patterns. The former Sect. 4.4 will be removed as a standalone subsection, and its extended and speculative discussion will be deleted. Only a brief, explicitly qualified statement concerning possible future paleoclimate relevance, when combined with independent cave-hydrological information, will be retained at the end of Sect. 3.3. This restructuring will focus the manuscript on dataset description, observational patterns, data quality, limitations, and reuse.

Reference

Kim, M.-C., Shin, W.-J., Koh, E.-H., Koh, C.-S., Kim, G.-E., and Lee, K.-S.: Stable isotope signatures of precipitation and implications for groundwater recharge on Jeju volcanic island, South Korea, *Journal of Hydrology: Regional Studies*, **64**, 103141, https://doi.org/10.1016/j.ejrh.2026.103141, 2026.

2. Specific Comments (The numbers are listed by the reviewer)

1. *The introduction seems perhaps to long, there is really no need to underpin the uniqueness of volcanic islands when it comes to isotopes in precipitation. The lengthy introduction sets some expectations that this characteristic might somehow influence the stable isotopic composition of precipitation, which is not the case. I leave it to the authors to decide whether this comment warrants a change in the text.*

Answer: We thank the reviewer for this helpful observation. We agree that the original Introduction is longer than necessary and that its repeated emphasis on volcanic islands could unintentionally imply that Jeju Island's volcanic origin directly controls the stable isotopic composition of precipitation. This was not our intention.

We will therefore streamline and refocus the Introduction while retaining the scientific background and references included in the submitted manuscript. The revised Introduction will consist of four balanced paragraphs addressing: (1) the general scientific value of spatially distributed precipitation-isotope observations; (2) the climatic and topographic processes potentially relevant to high-relief maritime settings; (3) the observational context provided by previous precipitation, groundwater, and cave studies on Jeju Island; and (4) the scope, limitations, documentation, and preservation value of the present dataset.

Descriptions implying that volcanic islands are intrinsically distinctive in terms of precipitation isotope behavior will be removed. Jeju Island's volcanic geology will be retained only as hydrological context because its permeable basaltic aquifers, limited surface runoff, and strong reliance on groundwater explain the relevance of spatially resolved precipitation-isotope observations to recharge studies. It will not be presented as a direct control on precipitation $\delta^{18}O$ or $\delta^{2}H$ values. Possible atmospheric and orographic influences will also be discussed cautiously without assigning specific moisture sources or mechanisms to individual observations.

Finally, the 39-month record will not be described as directly calibrating or validating long-term paleoclimate reconstructions. Instead, it will be presented as a time-bounded instrumental-period reference that may support cave or speleothem studies only when combined with independent information on recharge, cave hydrology, and isotope-transfer processes. Model comparison will likewise be limited to a broad seasonal consistency check rather than validation. Corresponding wording in the Abstract, Results and discussion, and Summary will be revised for consistency.

2. *"isotopic" jargon. In places, the text follows loose oral communications "rules" leading to, say, inconsistencies, see for example in lines 44-45 "complex atmospheric and hydrological conditions produce significant spatial variability in isotopic fractionation via Rayleigh distillation" or lines-76 "radial topography shapes not only precipitation distribution and orographic lifting processes but also atmospheric cooling trajectories that govern Rayleigh distillation and isotope fractionation".*

Other examples include "isotopic depletion/enrichment" (change to "depletion/enrichment in 18O/2H"), "heavy isotopes are typically enriched" (they are not), "isotopically depleated" (the water is not depleted in isotopes) etc. Combing the entire ms for such loose formulation would greatly improve its accuracy in terms of scientific language.

Answer: We thank the reviewer for identifying the need for more precise and consistent isotope terminology. We agree that several expressions in the original manuscript used isotope-related terms too broadly and did not adequately distinguish among reported $\delta^{18}O$ and $\delta^{2}H$ values, comparisons between materials or phases, and the physical process of isotope fractionation.

We will therefore systematically review the terminology throughout the Abstract, main text, Supplement, tables, equations, figure captions, and figure artwork. Observations will normally be described using explicit expressions such as "higher" or "lower precipitation $\delta^{18}O$ and $\delta^{2}H$ values." The terms "enriched" and "depleted" will be retained only where the material or phase, the isotope concerned, and the reference for comparison are clearly stated. For example, we will use "precipitation collected at higher elevations was depleted in ^{18}O and ^{2}H relative to precipitation collected at lower elevations," rather than the imprecise expression "isotopically depleted precipitation."

The term "isotope fractionation" will be reserved for the physical partitioning of isotopes between phases. Where the original manuscript used this term loosely, we will state either the specific process or the observed change in $\delta^{18}O$ and $\delta^{2}H$ values. As part of the shortened Introduction and Study Area sections, the two broad mechanistic sentences cited by the reviewer will be deleted rather than replaced by another general list of processes. Where interpretation is required in Sect. 3.2, we will use the following more specific and appropriately qualified wording:

"Across Jeju Island, the observed decreases in precipitation $\delta^{18}O$ and $\delta^{2}H$ values with increasing elevation are consistent with orographic uplift, cooling and condensation, and progressive rainout, processes common to mountainous regions."

When equilibrium partitioning between phases is discussed, the phases and comparison will be identified explicitly. For example:

"During equilibrium condensation, the condensate is enriched in ^{18}O and ^{2}H relative to the coexisting vapor, while continued removal of condensate leaves the residual vapor progressively depleted in ^{18}O and ^{2}H relative to its initial composition."

We will also distinguish d-excess from the reported isotope-composition values. At first use, d-excess will be defined as the derived parameter $d = \delta^{2}H - 8 \times \delta^{18}O$, calculated for each sample from its $\delta^{2}H$ and $\delta^{18}O$ values. Variations in d-excess will be described using "higher" and "lower d-excess values," rather than enrichment or depletion terminology. Consistent with our other responses, d-excess will not be used by itself to assign individual observations to continental or maritime moisture sources because it can reflect combined influences of source-region evaporation conditions, atmospheric transport, cloud processes, and sub-cloud evaporation.

Hydrogen-isotope notation will be standardized as δ^2H throughout the manuscript, tables, equations, figure captions, figure artwork, and supporting materials. Titles of cited publications containing δD will, however, remain unchanged because bibliographic titles must be reproduced as published.

Finally, we will revise the title from:

"A spatially resolved 39-month dataset of precipitation water isotopes over Jeju volcanic island, Korea" to:

"A spatially resolved 39-month dataset of stable water isotopes in precipitation across Jeju Island, Korea."

The revised title uses standard terminology and removes unnecessary emphasis on the island's volcanic origin. Collectively, these revisions will improve the scientific precision and consistency of the isotope terminology throughout the manuscript.

3. *The "methods" should better present the screening of data. It is not clear (line 152) how "Data screening criteria included excessive exposure time, leakage, and incomplete rainfall events." Was used to remove outliers, "bad" data points etc.*

Response: We thank the reviewer for identifying this ambiguity. We agree that the submitted text conflated sub-cloud evaporation, which is an atmospheric process that may affect valid precipitation, with evaporation of a collected sample before analysis. It also listed field conditions that were not documented as systematic quantitative exclusion criteria. We will therefore replace this text with a transparent account of the screening history.

During compilation of the present dataset, we applied no statistical outlier threshold to $\delta^{18}O$, δ^2H, or d-excess and made no new exclusions solely on the basis of unusually high or low values. We retained one exclusion reported in the contemporaneous study. Lee et al. (2002) identified a May 2001 sample from ST-3 with $\delta^{18}O = -1.9‰$, $\delta^2H = -33‰$, and d-excess = −17.8‰. Because the sample departed strongly from the meteoric-water-line relationship, that study interpreted it as having been affected by substantial evaporation before analysis and excluded it from its calculations. The same sample is excluded from the released observations and from the analyses reported here.

We will therefore delete the original references to sub-cloud evaporation, excessive exposure time, leakage, and incomplete rainfall events as screening criteria. The available archive does not contain sample-level field or laboratory records demonstrating that these conditions were systematically used to exclude observations.

The final dataset contains the remaining 462 paired $\delta^{18}O$ and δ^2H measurements. Site–month combinations without a valid archived isotope measurement remain missing and were not reconstructed or imputed. Precipitation and air-temperature data were used only for contextual analyses and not as numerical isotope-screening criteria. To make the exclusion fully traceable, the revised dataset documentation will report the original sample identifier, sampling period, isotope values, published exclusion rationale, evidence source, and the status of the cross-reference to the current station metadata.

Lee, K.-S., Koh, D.-C., Lee, D., and Park, W.-B.: The temporal and spatial distribution of stable isotope compositions of precipitation in Jeju Island: application to groundwater recharge study, Journal of the Geological Society of Korea, 38, 151–161, 2002.

4. *The "results" section, includes numerous lines that fall under "discussions", see for example the 1st paragraph (lines 158-171). Either shorten the entire section to provide results only, or rename it "results and discussions"*

Answer: We thank the reviewer for identifying the overlap between the original Results and Discussion sections. We agree that the distinction was unclear, particularly in former lines 158–171, where quantitative observations and their interpretation were presented together.

Following the reviewer's suggestion, we will reorganize Sect. 3 as a combined "Results and discussion" section and remove the standalone Discussion section. The revised section will comprise:

3.1 Temporal variations in precipitation isotopes
3.2 Spatial variations and isotope–elevation relationships
3.3 Comparison with IsoGSM4 output and potential relevance to paleoclimate interpretation

The observations and essential, non-repetitive interpretation formerly distributed between Sects. 3.1 and 4.1 will be substantially condensed and integrated into revised Sect. 3.1. Similarly, the quantitative spatial results and the limited interpretation retained from former Sect. 4.2 will be combined in revised Sect. 3.2. The former discussion subsections will not be transferred in full. Extended theoretical background, repeated descriptions of potential applications, and unsupported attribution to particular moisture sources, atmospheric pathways, or windward–leeward effects will be deleted.

Former Sect. 4.3 will be substantially shortened and incorporated into Sect. 3.3. The IsoGSM4 configuration and data-processing procedure will be presented in the Sect 3.3 section, followed by a concise presentation of the model–observation comparison in Sect. 3.3. Because the approximately 50 km model grid cannot resolve Jeju Island's detailed topography, local isotope–elevation relationships, or mesoscale precipitation processes, the comparison will be restricted to an independent consistency check on broad seasonal variability and island-scale model–observation differences. It will not be described as a validation of the station observations or as an evaluation of the observed spatial patterns.

Former Sect. 4.4 will be removed as a standalone subsection, and its extended and speculative discussion will be deleted. Sect. 3.3 will retain only a brief, explicitly qualified statement that the 2000–2003 observations may help constrain plausible precipitation-isotope inputs to cave recharge zones when combined with independent information on recharge elevation, seasonal infiltration, cave hydrology, dripwater monitoring, and calcite–water isotope fractionation. We will make clear that the 39-month record cannot characterize long-term climate variability or provide a stand-alone calibration or validation of paleoclimate reconstructions.

Within each revised subsection, quantitative observations and statistical results will be presented first, followed by only the interpretation needed to place the observed patterns in context. Former lines 158–171 will accordingly be shortened to distinguish the directly observed ranges and seasonal variability in $\delta^{18}O$, $\delta^{2}H$, and d-excess from possible atmospheric interpretations. Regional atmospheric information retained from published studies will be identified as background and will not be used to assign particular moisture sources or transport processes to individual precipitation samples.

Following removal of the standalone Discussion section, “Data availability” and “Summary” will be renumbered as Sects. 4 and 5, respectively. This restructuring will eliminate the previous duplication and present the observations, limitations, and essential interpretation in a concise form appropriate for an ESSD data paper.

5. Discussions:

5.1. It is not clear in line 225 what “seasonal offsets in δ18O, δD, and d-excess” are. The entire section 4.1 si more like a theoretical background than real discussion. Further, the text discusses the usefulness of sinusoidal curves used, but no discussion is made on why the d18O and d2H values behave as they do. Also, the discussion of d-excess variability is to simplistic – it is asserted that high values indicate continental sources and low values, maritime. This is not always the case, especially e.g., during warm/dry summers, when sub-cloud evaporation can lead to very low d-excess, regardless of air mass origin. I suggest either support the source partitioning with moisture track analysis (e.g., Lagrangian models) or just leave it out. The journal’s paper format favors the later. The last paragraph of section 4.1 just comes out of nowhere, as no discussion of large-scale atmospheric circulation patterns was presented before.

Answer: The reviewer raises several important issues concerning the structure and interpretation of the former Sect. 4.1. We agree that the expression “seasonal offsets” was unclear and that the subsection contained excessive theoretical background, repeated descriptions of potential applications, and source and process interpretations that were not sufficiently supported by the observations.

In the revised manuscript, the standalone Discussion section will be removed. The observational results formerly presented in Sect. 3.1 and only the essential interpretation retained from former Sect. 4.1 will be substantially condensed and combined in Sect. 3.1, “Temporal variations in precipitation isotopes,” within the revised “Results and discussion” section. Quantitative observations and statistical results will be presented first, followed by only the interpretation necessary to place the seasonal patterns in regional context.

We will remove the expression “seasonal offsets” and describe explicitly the magnitude and timing of the generally lower monthly precipitation $\delta^{18}O$ and $\delta^{2}H$ values during summer and the higher values during winter. The lower summer values coincided with the main summer rainfall period and are broadly consistent with precipitation-isotope seasonality previously reported for Jeju Island. Cumulative condensation and progressive rainout during the East Asian summer monsoon may contribute to this pattern; however, the monthly composite observations do not independently determine the relative contributions of precipitation amount, transport history, source conditions, air-mass mixing, or sub-cloud processes. Similarly, the higher winter values will be reported as a contrasting seasonal pattern and will not be attributed uniquely to reduced monsoon rainout, local temperature, or a particular moisture source.

Lee et al. (2013) used Aura TES observations of lower-tropospheric water-vapor $\delta^{2}H$, IsoGSM simulations, and 120 h HYSPLIT trajectories to examine seasonal atmospheric transport over Jeju Island. We will cite that study only as regional atmospheric context. Because it examined lower-tropospheric water vapor rather than the precipitation samples included in the present dataset, its trajectory results will not be used as direct evidence for the moisture sources or fractionation processes affecting the individual precipitation observations. We will not conduct a new source-partitioning or trajectory analysis because such an analysis would extend beyond the data-focused scope of this paper.

We will remove the binary interpretation that high d-excess identifies continental moisture and low d-excess identifies maritime moisture. The revised text will explain that d-excess is a derived parameter that may integrate the effects of source-region evaporation conditions, atmospheric transport and mixing, cloud processes, and sub-cloud evaporation. Because the monthly samples may combine multiple precipitation events and transport pathways, d-excess alone cannot provide a unique moisture-source attribution. Correlations of d-excess with air temperature and precipitation amount will be reported only as descriptive statistical relationships among seasonally varying variables and will not be used to establish causality.

The sinusoidal fits to monthly $\delta^{18}O$ and $\delta^{2}H$ values will be described only as empirical summaries of the recurring seasonal patterns observed between September 2000 and December 2003. The fitted mean, amplitude, and phase will provide concise descriptors of the central value, magnitude, and timing of variation during the observation period. The fitting equation, parameter definitions, and Figure 5 will be made consistent. The fitted curves will not be presented as physical models of isotope fractionation, evidence of a stable long-term climatological cycle, or tools for model or proxy calibration. Any descriptive fit retained for d-excess will likewise not be interpreted as evidence of a particular moisture source or kinetic process.

Finally, the extended concluding paragraph concerning large-scale atmospheric circulation and the repeated discussion of potential applications will be deleted. These revisions will keep the interpretation concise, distinguish the observations from possible mechanisms, and maintain the data-oriented scope of ESSD.

5.2. *L258 – valid for every area with high altitude differences, not only on volcanic island. As per the earlier comment, continuous references to the volcanic nature of the island suggest that it could have some effect on the stable isotopic composition of precipitation. It does not.*

Answer: We fully agree with the reviewer that the isotope vs. elevation relationship commonly described as the altitude effect is observed in mountainous regions with substantial relief and is not specific to volcanic islands. We also acknowledge that repeated references to Jeju Island's volcanic origin could unintentionally imply that volcanic geology directly controls the stable isotope composition of precipitation. This was not our intention.

As part of the restructuring described in our responses to Comments 4 and 5.1, the sentence at former line 258 and the associated theoretical discussion in former Sect. 4.2 will be removed. In the revised Sect. 3.2, "Spatial variations and isotope–elevation relationships," we will first present the observed regression results and then use the following qualified interpretation:

"Across Jeju Island, precipitation $\delta^{18}O$ and $\delta^{2}H$ values generally decrease with increasing elevation. This pattern is consistent with orographic uplift, cooling and condensation of ascending air masses, and progressive rainout in a high-relief mountainous setting. The observations document an isotope–elevation relationship but do not independently resolve the relative contributions of these or other atmospheric processes."

We will also systematically remove expressions that frame the isotope–elevation relationship or precipitation-isotope variability as specific to volcanic islands. The title, Abstract, Introduction, Results and discussion, Summary, and figure captions will normally refer simply to "Jeju Island" or, where topographic context is directly relevant, to its "high-relief setting." References to Jeju Island's volcanic geology will be retained only where they establish hydrogeological context—briefly in the Introduction and descriptively in the Study Area—because its permeable basaltic aquifers, limited surface runoff, and groundwater-dominated hydrology explain the relevance of the precipitation-isotope dataset to recharge studies. Volcanic geology will not be presented as a control on precipitation δ^{18}O or δ^{2}H values. Official titles of cited publications will remain unchanged.

These revisions will distinguish the general atmospheric and topographic context of the observed isotope–elevation relationship from the separate hydrogeological relevance of Jeju Island's volcanic substrate.

5.3. *As for section 4.1, the 1st paragraph in section 4.2 is theoretical and too long. The ms could do without it. The discussion for the different lapse rates needs some more depth. The proximity to the ocean does not explain lower condensation efficiency; the explanation must lie in a different place. Perhaps the strength of the circulation could do it? This would be a good place to insert a discussion on the role of atmospheric circulation patterns. The last paragraph of this section (4.2) is again too long and mostly theoretical. And again, it is unclear what it is being mean by "isotopic fractionation". Is it a change in fractionation factor? Rate of change? Magnitude? It needs to be explained.*

Answer: We agree with the reviewer that the opening and concluding paragraphs of the former Sect. 4.2 were overly theoretical and disproportionate for a data paper. These paragraphs will therefore be removed rather than transferred to the revised manuscript. The quantitative spatial results and only the interpretation necessary to place them in context will be integrated into Sect. 3.2, "Spatial variations and isotope–elevation relationships," within the combined "Results and discussion" section.

The revised subsection will begin with the observed relationships between station elevation and station-mean precipitation δ^{18}O and δ^{2}H values. To avoid confounding spatial differences with unequal station record lengths, the station means used for sector comparisons will be recalculated over the common 2002–2003 network period. We will report the regression gradient and its standard error, coefficient of determination, p value, number of stations, and elevation coverage.

Because each sector contains only three or four stations, the sector-specific regression estimates will be treated as exploratory. Separate regressions do not by themselves demonstrate that their slopes differ significantly. Comparative descriptions such as "stronger" or "weaker" will therefore be used only if supported by an appropriate elevation-by-sector interaction test. Otherwise, the point estimates and their uncertainties will be reported descriptively without inferring distinct sectoral controls.

We agree that proximity to the ocean does not, by itself, demonstrate reduced condensation efficiency, and this explanation will be removed. Atmospheric circulation and slope exposure may plausibly influence precipitation-isotope patterns, but these factors were not evaluated directly for the samples in the present dataset. Lee et al. (2013) will be cited only as regional evidence that atmospheric transport pathways over Jeju Island vary seasonally. Because that study examined lower-tropospheric water vapor and because the present monthly samples may integrate multiple precipitation events, it will not be used as direct evidence that circulation strength, slope exposure, windward–leeward position, or a particular moisture source caused the sector-specific regression estimates. Testing these mechanisms would require event-resolved wind, precipitation, and moisture-trajectory analyses beyond the scope of this data paper.

We also agree that the expression “isotopic fractionation” was ambiguous. In the original text, it was not intended to indicate a measured change in the fractionation factor, fractionation rate, or fractionation magnitude; none of these quantities was calculated in this study. The ambiguous expression will therefore be removed, and the observations will instead be described directly as decreases in precipitation $\delta^{18}O$ and $\delta^{2}H$ values with increasing elevation. Where limited process context is necessary, we will distinguish isotope partitioning between vapor and condensate during cooling and condensation from the progressive removal of condensate during rainout.

The application-oriented concluding paragraph of the former Sect. 4.2 will also be deleted. We will retain only a qualified statement that, within the sampled elevation range of 5–1,230 m and the 2000–2003 observation period, the statistically supported network-wide regression provides a first-order description of mean precipitation $\delta^{18}O$ and $\delta^{2}H$ variation with elevation. It may serve as one input to future regional isoscape or recharge studies, but it is not a stand-alone predictive isoscape and does not directly calibrate groundwater recharge elevations, cave dripwater, or speleothem records.

These revisions will focus Sect. 3.2 on the demonstrated spatial relationships, report the limitations of the sector-specific regressions transparently, and distinguish the observations from atmospheric mechanisms that were not directly evaluated.

5.4. *Section 4.3. What is the spatial resolution of the grid cells used in the GCM? Was it only 3 cells for the entire island? The putative limitation in the representation of mesoscale convective systems would also affect summer precipitation, and I would somehow expect a stronger role of these during summer, not winter. Please be more specific about this explanation.*

Answer: We thank the reviewer for pointing out that the original description did not adequately explain the model grid and that the proposed interpretation of the seasonal model–observation differences was overly specific.

IsoGSM4 (IsoGSM-HR) has a T248 spectral resolution, corresponding to a nominal horizontal grid spacing of approximately 50 km. This is comparatively high resolution for an isotope-enabled global model. The relevant limitation in the present comparison is therefore the scale mismatch between the model grid and Jeju Island’s detailed topography and local-to-mesoscale precipitation processes, rather than generally coarse resolution relative to other global models.

The comparison used three neighboring grid points in a single latitude row, centered at 33.31416° N and 126.0937°, 126.5624°, and 127.0312° E. The central grid-point centre is geographically located on Jeju Island, whereas the western and eastern centres are offshore. Collectively, these grid-point areas cover Jeju Island and its immediate marine surroundings. Their unweighted mean will therefore be described as an island–nearshore regional approximation, rather than as an average of three land grid cells or a spatially detailed representation of the island. Because the published monthly files do not provide a model land–sea mask or land fraction, we will report the geographic locations of the grid-point centres without assigning unsupported model mask classifications.

To make the comparison fully reproducible, we will regenerate it using the postprocessed monthly precipitation-isotope product (https://doi.org/10.5281/zenodo.14676091). We will document the exact product and annual files, precipitation screening applied during postprocessing, calculation of precipitation $\delta^{18}O$ and $\delta^{2}H$ from the isotopologue fluxes, calculation of d-excess, grid-point selection, and spatial and temporal averaging procedures at the beginning of Sect. 3.3.

For each year and month, the three retained model grid-point values will be averaged without spatial weighting and compared with the unweighted mean of the available station observations. The archived sampling dates will be assigned to their corresponding observation months according to the uninterrupted September 2000–December 2003 sequence documented in the dataset. Calendar-month means will then be calculated from the year-specific island-scale means. Any shaded variability range in Fig. 7 will be defined explicitly; variability among the selected model grid points will not be described as model uncertainty.

After correcting the sampling-month sequence and regenerating the comparison, the mean model-minus-observation differences are +1.4‰ for $\delta^{18}O$, +5.9‰ for $\delta^{2}H$, and −5.1‰ for d-excess during November–April, compared with +0.3‰, +1.2‰, and −1.2‰, respectively, during May–October. These values demonstrate larger mean differences during November–April but do not identify their physical cause.

We agree that the mismatch in spatial scale and the parameterized representation of local and mesoscale precipitation processes may affect both warm- and cold-season simulations. ERA5 spectral nudging constrains the large-scale atmospheric circulation but does not enable IsoGSM4 to resolve Jeju Island's detailed topography or individual convective systems. We will therefore remove the previous implication that this limitation applies mainly to winter precipitation or that warm-season precipitation is necessarily well represented.

Unresolved topography and land–sea contrasts, spatial representativeness, and parameterized cloud and precipitation processes may contribute to the differences. However, the present monthly comparison does not contain the event classification or process diagnostics needed to distinguish among these possible contributors. We will therefore remove the specific attribution to unresolved winter snow bands and present the comparison only as an independent island-scale consistency check on broad seasonal variability and model–observation differences, not as model validation or process attribution.

Thank you very much for your time, effort, and patience in handling our manuscript. We look forward to your favorable consideration and to the opportunity for publication in Earth System Science Data.

Sincerely,
Jeonghoon Lee