**Response to the Editor**

We thank the Editor for the positive assessment of the revised manuscript and for the opportunity to address the remaining minor concerns.

In response, we have further strengthened the quantitative assessment of spatial interpolation uncertainty and the limitations imposed by the current monitoring network configuration. In addition to the previously reported leave-one-out cross-validation (LOOCV), we performed an LOOCV-based network-influence diagnostic to assess whether interpolation errors were broadly distributed across the network or concentrated at specific monitoring locations and local spatial contrasts.

The method, results, and implications of this additional diagnostic have been added to Sections 4.5, 5.5, and 6.5 of the revised manuscript, and the complete diagnostic summary is provided in the new Appendix D, Table D1.

To ensure full reproducibility, we also updated the public GitHub/Zenodo repository associated with the manuscript. The revised repository now includes the network-influence diagnostic outputs, well-level error summaries, source data for Appendix D Table D1, and a dedicated reproducibility notebook (04_network_influence_diagnostic.ipynb). The updated repository has been archived on Zenodo as version 1.4:

Sawicka, K., and Jurzyk, K.: GWB43-groundwater-drought-DIPI: Minor-revision reproducibility update, version 1.4, Zenodo, https://doi.org/10.5281/zenodo.22093219, 2026.

The Code and data availability statement and the corresponding reference in the manuscript have been updated accordingly.

**Referee #1**

**Comment 1**

The revised version places greater emphasis on the limitations of DIPI, yet the discussion regarding spatial interpolation uncertainty remains largely qualitative. If error analysis or cross-validation for interpolation falls beyond the scope of this study, I would suggest that the authors further clarify the rationale in the text and explicitly state the constraints imposed by the existing monitoring data on the spatial analysis results.

**Response**

We thank the Referee for this comment. We agree that the implications of interpolation uncertainty and the constraints of the monitoring network required a more explicit quantitative assessment.

The previous revision already included leave-one-out cross-validation of the three interpolated Exposure subcomponents. In the present revision, we extended this assessment by introducing an LOOCV-based network-influence diagnostic. For each monitoring location, we quantified its contribution to the total interpolation error and evaluated whether absolute LOOCV errors increased with local metric contrast, defined as the absolute difference between each piezometer and its nearest neighboring monitoring point.

The analysis showed that interpolation uncertainty is spatially heterogeneous and strongly concentrated at specific monitoring locations. Two piezometers, II/797/1 and II/1285/1, together accounted for 77.8% of the total squared LOOCV error for normalized vulnerability and 72.5% for normalized maximum drought duration, compared with only 8.1% for inverse resilience. Local metric contrast was strongly associated with absolute LOOCV error for vulnerability (Pearson $r = 0.965$) and maximum duration ($r = 0.963$), and more moderately for inverse resilience ($r = 0.658$).

These results demonstrate that the limitation is not attributable solely to the small number or uneven spatial density of monitoring points. It also reflects hydrostratigraphic representativeness: spatially neighboring piezometers may represent different aquifer systems and exhibit strongly contrasting groundwater-drought behavior, which two-dimensional interpolation cannot explicitly capture. We have therefore expanded the Discussion to state more clearly that local predictions are particularly uncertain where monitoring support is sparse or hydrostratigraphically heterogeneous, and that the mapped surfaces should be interpreted as exploratory screening outputs rather than precise regional predictions.

For transparency and reproducibility, the complete diagnostic outputs have also been added to the public repository. The revised archive includes summary network-influence statistics, piezometer-level influence diagnostics, the source data for Appendix D Table D1, and a dedicated notebook that reproduces the calculations.

**Changes in the revised manuscript:** Section 4.5 (lines 306-316: additional network-influence diagnostic); Section 5.5 (lines 602-608: quantitative results); Section 6.5 (lines 784-793: expanded interpretation of monitoring-network constraints); new Appendix D, Table D1; updated Code and data availability statement and repository reference.

**Updated reproducibility archive:** version 1.4, Zenodo, https://doi.org/10.5281/zenodo.22093219.

**Comment 2**

I appreciate that the authors have adopted more cautious wording and appropriately toned down the conclusions concerning the deep confined aquifer. Nevertheless, the previous round of review comments did not merely recommend stylistic revisions—they also suggested that the authors include additional analyses—such as sensitivity or uncertainty analyses—that could demonstrate the reliability of the findings derived from the current monitoring network.

**Response**

We agree and thank the Referee for clarifying this point. The additional analysis in this revision was specifically designed to assess the sensitivity of the spatial results to the configuration and hydrostratigraphic representation of the current monitoring network.

In addition to the original full-network LOOCV statistics, we examined the concentration of prediction error across individual monitoring locations and recalculated diagnostic error statistics after excluding selected held-out observations from the existing LOOCV results. These exclusion scenarios are used strictly as network-influence diagnostics; the interpolation surfaces were not regenerated, and the procedure is not interpreted as a separate leave-two-out cross-validation.

For vulnerability and maximum drought duration, excluding the two most influential held-out observations from the error summary reduced RMSE from 0.317 to 0.160 and from 0.315 to 0.177, respectively. In contrast, inverse resilience remained poorly reconstructed, with RMSE changing only from 0.344 for the full network to 0.353 after exclusion. A complementary diagnostic that excluded the two deep monitoring wells reduced RMSE for vulnerability from 0.317 to 0.234 and for maximum duration from 0.315 to 0.238, whereas inverse resilience remained similarly uncertain (RMSE 0.359).

The results therefore distinguish between two types of uncertainty: locally concentrated sensitivity in vulnerability and maximum duration, and more general network-wide uncertainty in inverse resilience. This provides a quantitative basis for evaluating the reliability of the spatial findings derived from the current network.

We have also expanded Section 6.5 to make the practical implications explicit. Increasing monitoring density alone would not necessarily resolve the identified uncertainty. Improved spatial coverage should be accompanied by more balanced representation of the different aquifer systems, including additional confined-aquifer observations and, where feasible, vertically paired monitoring locations.

The complete diagnostic workflow has been added to the public reproducibility package. The updated repository includes the underlying LOOCV-based diagnostic tables, piezometer-level error summaries, Appendix D Table D1 source data, and the new notebook 04_network_influence_diagnostic.ipynb. The repository documentation has also been updated to distinguish clearly between the original LOOCV and the subsequent network-influence diagnostic.

**Changes in the revised manuscript:** Sections 4.5, 5.5, and 6.5; new Appendix D, Table D1; updated Code and data availability statement and repository citation.

**Updated reproducibility archive:**

Sawicka, K., and Jurzyk, K.: *GWB43-groundwater-drought-DIPI: Minor-revision reproducibility update*, version 1.4, Zenodo, https://doi.org/10.5281/zenodo.22093219, 2026.