

Dear Dr. Ogata, dear EGU Editorial Board,

we thank the reviewers for their careful evaluation and constructive comments, which have significantly contributed to improving the clarity, robustness, and completeness of the manuscript. We have addressed all points in a structured point-by-point response and revised the manuscript and Supplement accordingly. Below, we provide our detailed responses, together with a summary of the main changes implemented in the revised version.

Summary of changes in the manuscript

In response to the reviewers' comments, the manuscript has been substantially revised. The main modifications can be summarised as follows:

- Clarification of terminology throughout the manuscript, including explicit definitions of key terms and acronyms (e.g. GHSZ, BSR, MTD, gas flares) at first occurrence in both text and figure captions.
- Revision and expansion of the methodological descriptions, particularly for OBS processing, component rotation, and the identification of converted PS-wave phases. A step-by-step workflow, including phase selection criteria, ambiguity handling, and forward-modelling constraints, has been added to the Supplement.
- Restructuring of the results and discussion for a better separation of these two sections and better readability.
- Substantial extension of the Supplementary Material to include detailed methodological explanations and additional documentation of critical processing and modelling steps.
- Strengthening of the interpretation framework for Vp/Vs modelling, including a clearer separation between observational constraints, modelling assumptions, and geological interpretation. The parametrisation strategy for S-wave velocity models has been explicitly justified.
- Clarification of seismic observations versus interpretational labels, including revised usage of terms such as "seismic chimney", which is now introduced more cautiously and supported by a dedicated discussion of alternative explanations and resolution limits.
- Improvement of figures and figure captions, including enlarged panels of key seismic features, improved labelling, and clearer linkage between interpreted structures (e.g. BSR, MTD, fluid-related anomalies) and their seismic expressions.
- Strengthening of the comparison with MeBo200 borehole data through explicit spatial correlation, stratigraphic correlation of seismic units with lithological units, and improved figure representation of physical property data.
- Revision of the discussion to include more quantitative constraints where appropriate, particularly regarding Vp/Vs ratios as indicators of sediment consolidation, gas influence, and hydrate occurrence. Literature-based reference ranges have been explicitly integrated.
- Expansion of the uncertainty analysis to distinguish between traveltime misfit, model parameter uncertainty due to limited ray coverage, and interpretational non-uniqueness.
- Clarification of data availability and processing workflow transparency, including consistent handling of software references (e.g. MB-System, Kingdom) and reproducibility considerations.
- Minor corrections in figures and text throughout the manuscript, including typographical issues, inconsistencies in phrasing, and improvements to labelling and formatting.

All reviewer comments have been addressed in a structured point-by-point manner. Corresponding changes have been implemented in the manuscript and/or Supplement, and are explicitly documented in the response document.

Additional clarifications and extended discussions have been provided in the online discussion forum associated with the manuscript, ensuring full transparency of the review process and responses.

We thank the Editor and the reviewers once again for their time, effort, and constructive feedback throughout the review process. We believe that the revised manuscript has significantly improved as a result of their input and hope that it now meets the requirements for publication in the journal.

Best regards,
Helene-Sophie Hilbert