Rebuttal letter to the Editor (K. Katsumata)

We thank the editor for the careful reading but we believe **some key elements of our response were not considered. In particular, our primary argument regarding the Lee waves was based on a regime diagram we provided: the analysis clearly shows that our observations are outside the parameter space favourable to lee-wave generation.** This dynamical argument precedes any energetic estimate and directly addresses whether lee waves are expected to be relevant. The subsequent flux estimate was only meant as a secondary support. We agree that the wording "small" is insufficiently framed and could be revised, but the conclusion does not rely on that point. Moreover, comparing conversion to vertically integrated dissipation is not sufficient to assess local impact, since a large fraction of wave energy radiates away. **Our regime diagram clearly shows that Lee waves fall outside the relevant parameter space and are therefore not expected to control the observed Rw, with energetics providing only secondary support.**

On the interpretation of Δ-slope, **our approach is not to reconstruct a local wave–topography interaction nor to assume a monochromatic wave field. Instead, we aim to identify statistical links between bathymetry and the internal-wave field as reflected in Rw**. Rw estimates along vertical profiles capture coherent large-scale variations in the internal wave frequency content, enabling meaningful robust inference of propagation slopes and their relative changes throughout the water column. In that context, Δ-slope is not interpreted as the exact slope felt by a given wave, but as a scalar metric that describes the difference between wave geometry (inferred from Rw) and the surrounding bathymetry. The use of the dispersion relation is therefore diagnostic rather than prescriptive, and does not imply dominance of a single frequency. We can clarify this statistical positioning explicitly.

The comment on slope direction is very interesting and valid in a deterministic framework, but does not apply to our approach. Because the wave field is broadband and no propagation direction is constrained by the data, estimating a directional slope would introduce additional, unconstrained assumptions. **The use of an averaged slope is made to define a robust scalar descriptor of the bathymetric environment, consistent with a statistical analysis rather than a process-based one**.

Regarding the shear/strain bandwidth, we agree that using identical wavenumber ranges may be recommended when aiming for a strictly GM-consistent estimate of Rw, for applications such as interpretating estimates of ε or K (which is not our objective), although, as noted, this practice is not universally applied (e.g., Chinn et al. 2016). However, **our objective is different: we do not aim to characterise departures from GM itself, but to diagnose bathymetric effects on the internal wave field from variance estimates within observationally constrained spectral ranges.** We presented the spectra explicitly to highlight the limitations inherent to such measurements, which are common when using similar instruments (i.e., CTD and LADCP). Imposing identical bands would strongly limit the utile bands, reduce the spectral estimators, and introduce observational biases, notably noise contamination in shear at high wavenumbers and background contamination in strain at low wavenumbers. Our approach instead relies on identifying appropriate spectral ranges from the data and selecting integration limits accordingly. **This makes Rw band-dependent, which we acknowledge, but also more representative of the observed spectra**.

Chinn et al. (2016), while using identical bands, also show that Rw departs from a simple GM interpretation and reflects structured spectral variability, supporting our use of Rw as a diagnostic rather than a strictly GM-based parameter.

Overall, we believe the main issue is a mismatch in interpretation. The manuscript was read as attempting a process-resolving analysis, whereas it is designed as a statistical exploration of how bathymetry structures the internal-wave field.