Figure S1. Distribution of horizontal divergence at 12.5 km altitude for ERA5 (a, d, g), IFS (b, e, h) and ICON (c, f, i) datasets overlaid with flight location shown by blue star. The temporal evolution is shown for time 11 UTC (upper panel), 12 UTC (middle panel) and 13 UTC (lower panel). The dashed lines represent corresponding horizontal wind speed for values greater than 30 ms^{-1}.
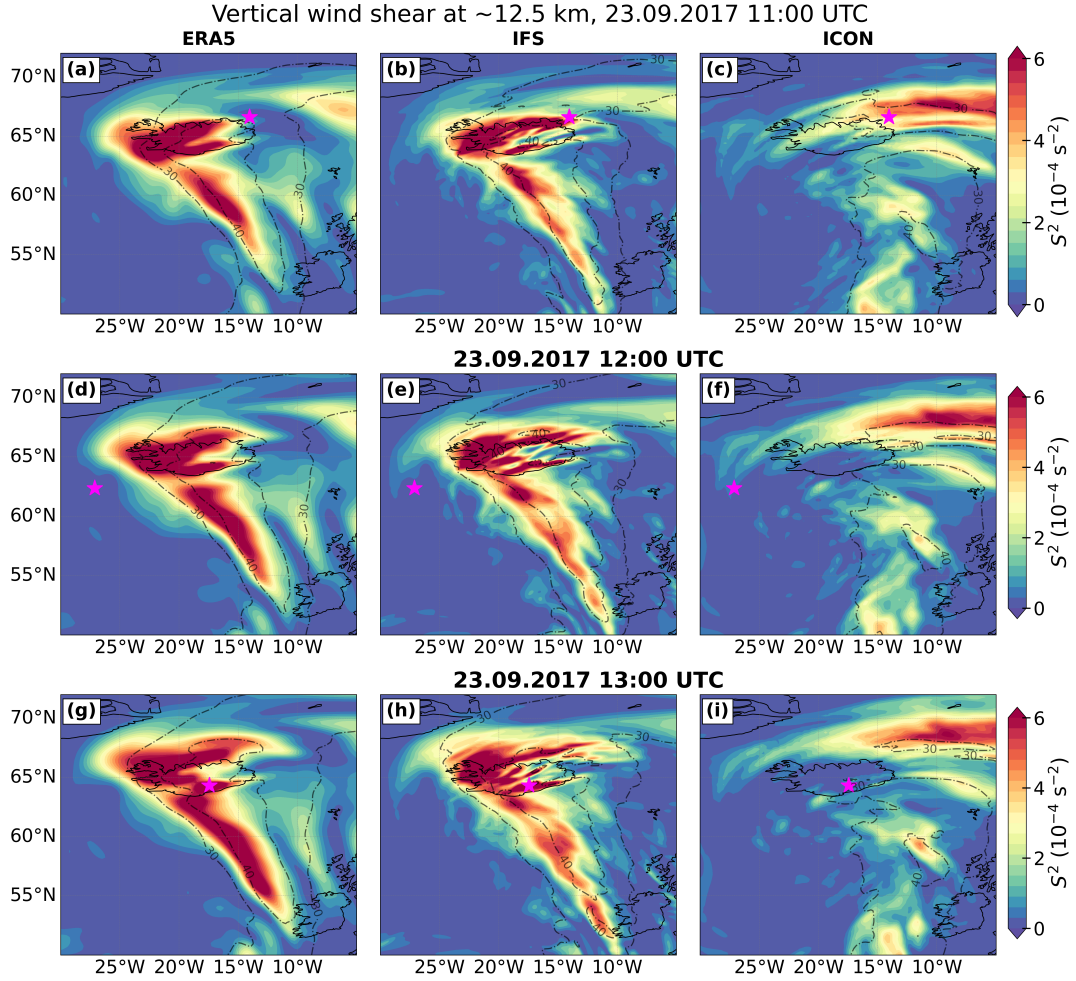
Figure S2. Distribution of vertical wind shear at 12.5 km altitude for ERA5 (a, d, g), IFS (b, e, h) and ICON (c, f, i) datasets with flight location shown by star. The temporal evolution is shown for time 11 (upper panel), 12 (middle panel) and 13 UTC (lower panel). The dashed lines represent corresponding horizontal wind speed for values greater than $30~\mathrm{ms^{-1}}$.
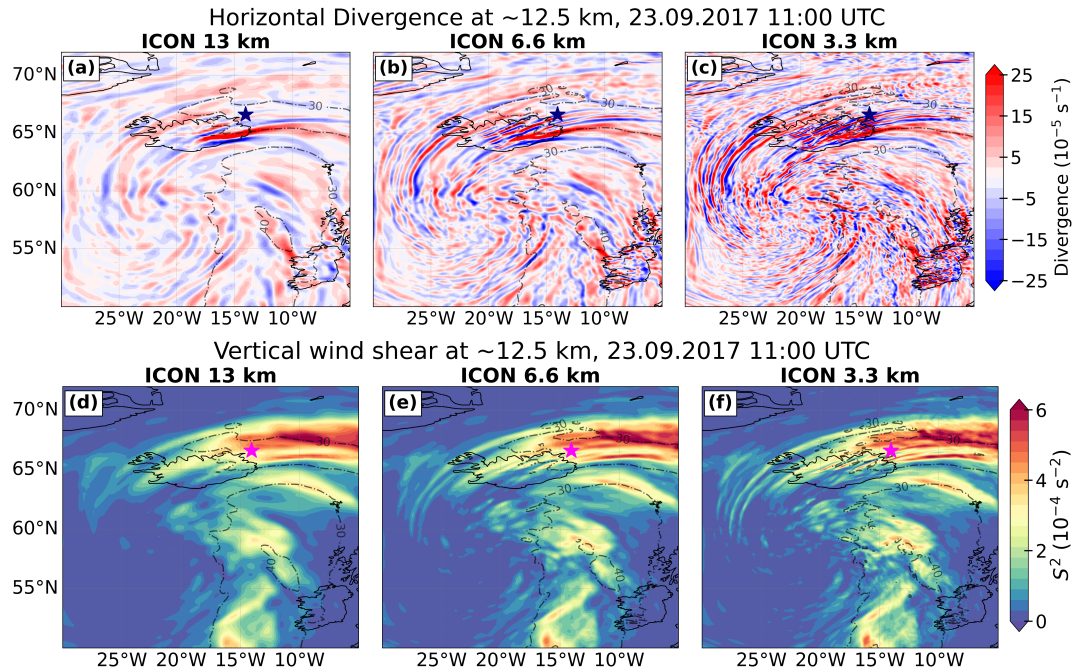
Figure S3. Distribution of horizontal divergence (upper panel) and vertical wind shear (lower panel) at 12.5 km altitude for ICON 13 km, 6.5 km and 3.3 km resolution nested simulations overlaid with flight location at 11 UTC shown by star. The dashed line represent corresponding horizontal wind speed for values greater than 30 ms^{-1}.
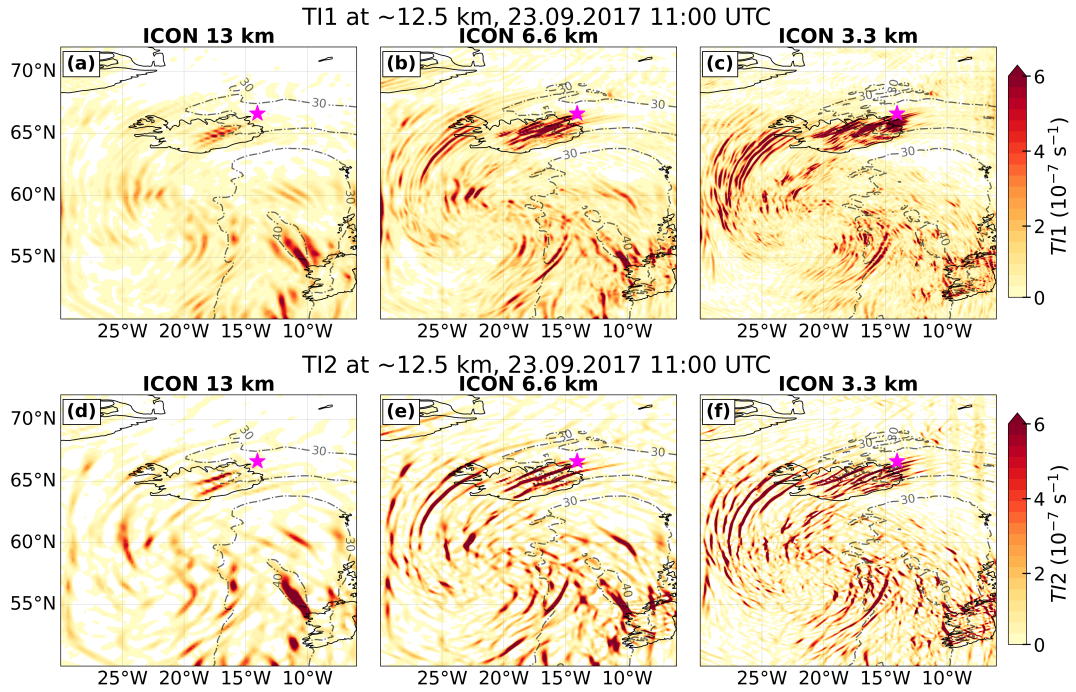
Figure S4. Distribution of turbulence indices TI1 (upper panel) and TI2 (lower panel) at 12.5 km altitude for ICON 13 km, 6.5 km and 3.3 km resolution nested simulations overlaid with flight location at 11 UTC shown by star. The dashed line represent corresponding horizontal wind speed for values greater than 30 ms^{-1}.
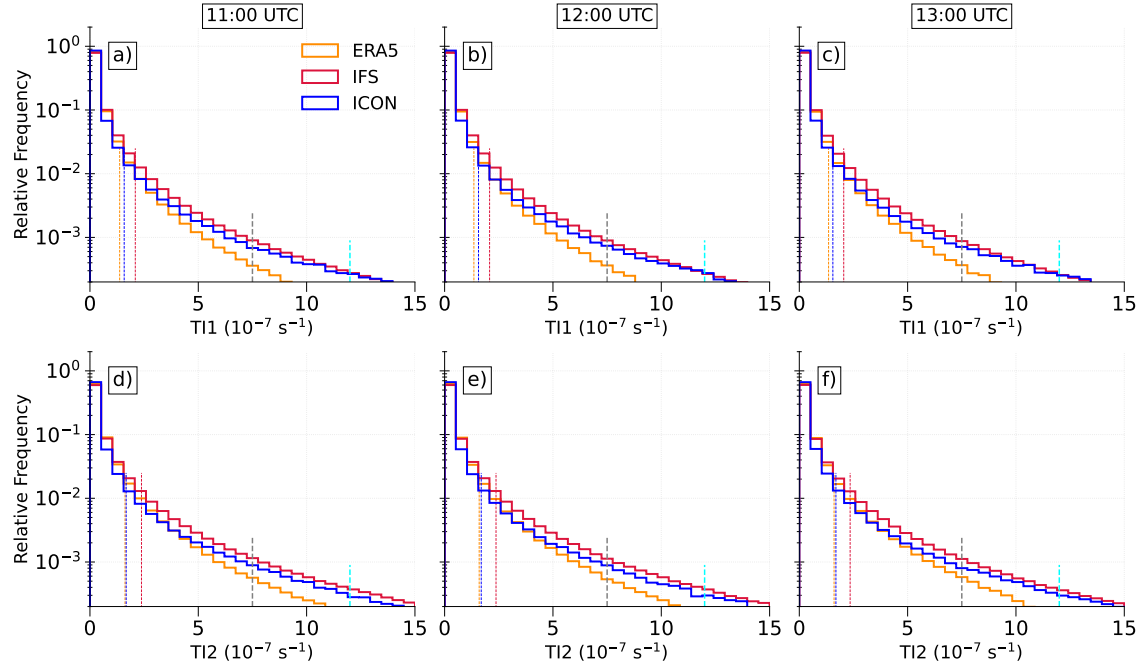
Figure S5. Relative frequency distribution of turbulence indices TI1 (upper panel) and TI2 (lower panel) over the LMS for time 11 UTC (a, d), 12 UTC (b, e) and 13 (c, f) UTC.
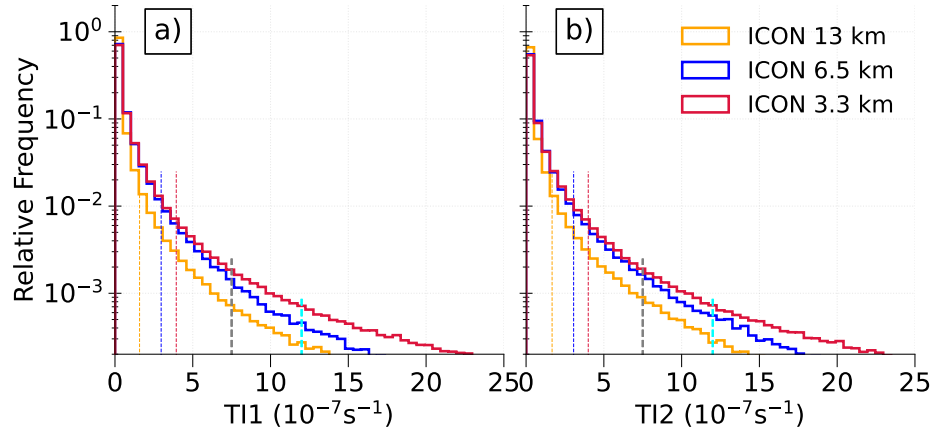
Figure S6. Relative frequency distribution of turbulence indices TI1 (a) and TI2 (b) over the LMS for ICON 13 km, 6.5 km and 3.3 km resolution nested simulations at 11 UTC.
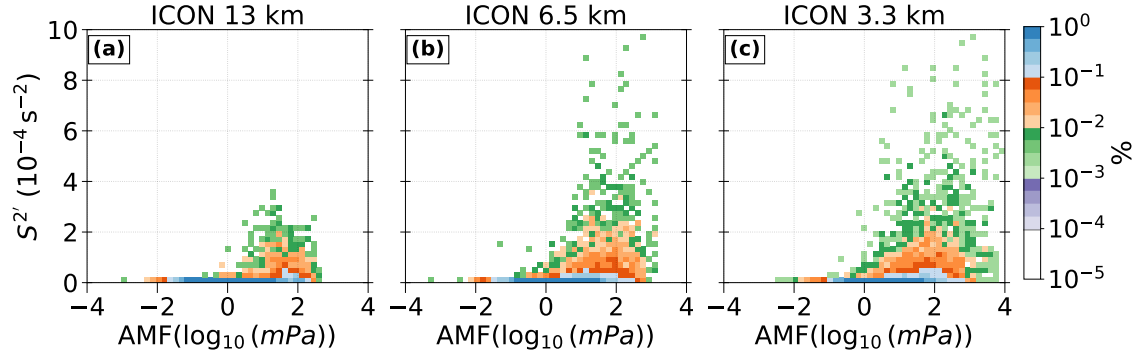
Figure S7. Relative occurrence frequency distribution of absolute momentum flux due to GWs-vertical shear perturbations pair in the LMS for $0 \leq Ri \leq 1$ for ICON 13 km, 6.5 km and 3.3 km resolution nested simulations at 11 UTC. Normalized counts of PDFs distribution is shown. Logarithmic occurrence frequency color scale is applied.
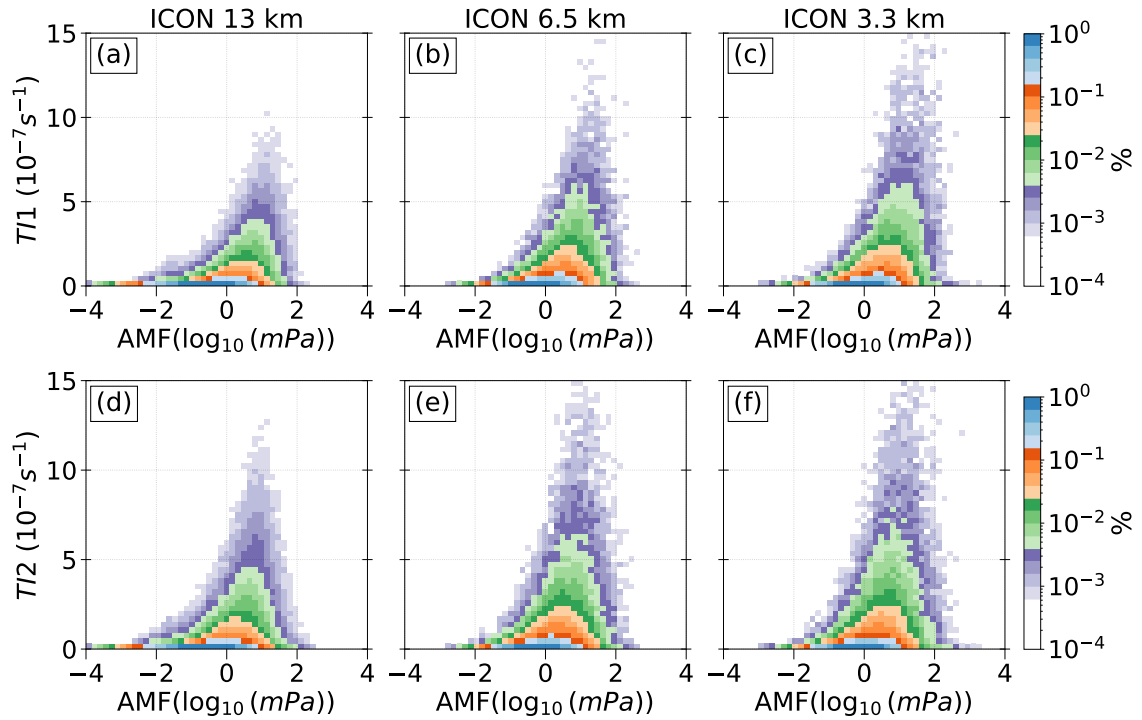
Figure S8. Frequency (%) distribution of absolute momentum flux-Turbulent indices TI1 (a-c), TI2 (d-f) in pairs over the LMS for ICON 13 km, 6.5 km and 3.3 km resolution nested simulations at 11 UTC. Normalized counts of PDFs distribution is shown. Logarithmic occurrence frequency color scale is applied.