Geophysical Research Abstracts
Vol. 16, EGU2014-10945, 2014
EGU General Assembly 2014

Observational filter for limb sounders applied to convective gravity waves

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Gravity waves (GWs) play a key role in the dynamics of the middle atmosphere. In the current work, simulated spectral distribution in term of horizontal and vertical wavenumber of GW momentum flux (GWMF) is analysed by applying an accurate observational filter, which consider sensitivity and sampling geometry of satellite instruments. For this purpose, GWs are simulated for January 2008 by coupling GROGRAT (gravity wave regional or global ray tracer) and ray-based spectral parameterization of convective gravity wave drag (CGWD). Atmospheric background is taken from MERRA (Modern-Era Retrospective Analysis For Research And Applications) data. GW spectra of different spatial and temporal scales from parameterization of CGWD (MF1, MF2, MF3) at 25 km altitude are considered. The observational filter contains the following elements: determination of the wavelength along the line of sight, application of the visibility filter from Preusse et al, JGR, 2002, determination of the along-track wavelength, and aliasing correction as well as correction of GWMF due to larger horizontal wavelength along-track. Sensitivity and sampling geometries of the SABER (Sounding of the Atmosphere using Broadband Emission Radiometry) and HIRDLS (High Resolution Dynamics Limb Sounder) are simulated. Results show that all spectra are shifted to the direction of longer horizontal and vertical wavelength after applying the observational filter. Spectrum MF1 is most influenced and MF3 is least influenced by this filter. Part of the spectra, related to short horizontal wavelength, is cut off and flipped to the part of longer horizontal wavelength by aliasing. Sampling geometry of HIRDLS allows to see a larger part of the spectrum thanks to shorter sampling profile distance. A better vertical resolution of the HIRDLS instrument also helps to increase its sensitivity.