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# Quantifying the impact of gravity waves on infrasound propagation using high-resolution global models for atmospheric specifications

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Gravity Waves (GW) alter the propagation path of acoustic energy in the middle atmospheric waveguide and complexify the large scale picture where infrasound (IS) propagation is mainly driven by the seasonal changes in stratospheric winds. Thus, GW affect the detection capability of the IS station network of the International Monitoring System (IMS) established to monitor the compliance with the Comprehensive Nuclear-Test-Ban Treaty (CTBT). Atmospheric models explicitly resolving a part of the GW spectrum are relevant tools to be considered for investigating the effect of GW on infrasound propagation, given increasing computing means made available by HPC facilities. Parabolic equation simulations allow accounting for the partial reflections induced by GW. They can be used to quantify the impact of GW on infrasound transmission loss, for instance. Here, we use atmospheric specification fields obtained in the framework of the Dynamics of the Atmospheric General Circulation Modeled on Nonhydrostatic Domains (DYAMOND). DYAMOND is an international project, initiated by the Max Planck Institute for Meteorology (MPIM) and the University of Tokyo. It describes a framework for the intercomparison of high-resolution global models. It mainly focuses on the troposphere, but some models were run with a high enough top so that GW are resolved up to the stratosphere. Lidar observations are used to validate the model at Observatoire de Haute Provence (France) and we investigate the potential energy of GW activity across the IMS. By filtering out small-scale perturbations (GW) in atmospheric specifications and comparing parabolic equation simulations with and without GW, respectively, we quantify the impact of GW on the main atmospheric waveguide. We focus on the transmission loss derived at the surface, and more particularly in the shadow zones, for different national or IMS infrasound stations during the (northern hemisphere) winter.