Gravity waves characterization in the lower ionosphere using VLF observations at Comandante Ferraz Brazilian Antarctic Station

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Abstract:

The general circulation and thermal structure as well as the transport of energy at the middle atmosphere is well known to be affected by the effects of Gravity Waves (GW) (Alexander et al., 2010). Today the majority of the observations of GWs has been conducted by airglow all-sky imagers, which are able to study GWs at about 90km of height, here with the analysis of the VLF signal it's possible to characterize the waves by the impact of these at the base of the ionosphere. The passage of a GW at the region of reflection of the VLF signal induces spatial modulations in the neutral density that affects the electron production rate changing the electron density of the region, which can be detected as fluctuations in the amplitude and phase of the VLF signals. The characteristics of GWs are obtained through Morlet's Wavelet analysis of the VLF signal. The analysis of VLF signals from different transmitters, for example from NPM (Hawaii) and NAA (West Coast of the USA) and recorded at Brazilian Antarctic Station Comandante Ferraz (EACF), made possible to infer the direction of propagation of GW events, as well as duration and even the morphology of the events, which are compared with the characteristics obtained from airglow observations. Here will be presented a case study of a GW that was a mesospheric front event observed at EACF on July 10, 2007 which characteristics are obtained using the wavelet analysis applied to the VLF amplitude. The GW event characteristics obtained with the VLF technique presents a close correspondence with the ones from airglow observations (Correia et al., 2020). **Key words:** gravity waves, VLF, airglow.

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References:

CORREIA, E.; RAUNHEITTE, L. T.; BAGESTON, J. V.; D'AMICO, D. E.; Characterization of gravity waves in the lower ionosphere using very low frequency observations at Comandante Ferraz Brazilian Antartic Station; Annales Geophysicae 38, p. 385-394, 2020.

Alexander, M. J., Geller, M., McLandress, C., Polavarapu, S., Preusse, P., Sassi, F., Sato, K., Ern, M., Hertzog, A., Kawatani, Y., Pulido, M., Shaw, T., Sigmond, M., Vincent, R., and Watanabe, S.: Recent developments in gravity wave effects in climate models and the global distribution of gravity wave momentum flux from observations and models, Q. J. R. Meteorol. Soc., 136, 1103–1124, https://doi.org/10.1002/qj.637, 2010.

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