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Concentric Gravity Waves Observed by OH Airglow over Brazil

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We present first statistical results of concentric/circular gravity waves (CGWs) observed in the OH airglow emission over the Brazilian equatorial and low latitude regions. All-sky imagers located at São João do Cariri [7.39°S, 36.53°W], Petrolina [9.39°S, 40.50°W], Cachoeira Paulista [22.66°S, 45.00°W] and São Martinho da Serra [29.48°S, 53.87°W] were used in the acquisition of the images. Using 20 years of observational data (between 1998 and 2018), 3525 nights of airglow observations were taken. However, only 40 CGW(s) cases were found with small-scale wave characteristics. The CGW(s) events showed horizontal wavelengths between 20 and 40 km, horizontal phase speed between 40 and 107 m/s and periods ranging from 6 to 11 minutes. Most of the CGW(s) structures were well defined with coherent wave patterns expanding concentrically with 97.5% having semi-circle or arc-like shapes. The occurrence of CGWs was found to coincide mostly with the seasons of strong tropospheric convective activity as well as low background winds, which corresponded to non-solstice months. This suggested a low level of wave breaking or critical level absorption/filtering, allowing the CGWs to propagate up to the mesosphere and lower thermosphere (MLT) region. The yearly latitudinal distribution of CGWs showed higher occurrence in the subtropics (28°S), followed by the equatorial latitudes (7°S) with the tropical latitudes (23°S) recording the lowest occurrence.

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