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In this study, the GW potential energy (PE) in the stratosphere between 20 km to 35 km is retrieved from the dry temperature profiles provided by multi- Global Navigation Satellite System (GNSS) radio occultation (RO) missions, including COSMIC, CHAMP, GRACE, and METOP-A/B, during the 11 years from 2007 to 2017, from which the periodic variation of global GW activity are analyzed. The average linear trend of GW PE over the globe, and the response of GW PE to solar activity, quasi biennial oscillation (QBO) and El Niño-Southern Oscillation (ENSO), are investigated using multiple linear regression. It is found that at the altitude range of 25-35 km, the GW activity presents a biannual period, with the peaks appearing during the winter and summer solstices and the valley appearing during the spring and autumn equinoxes, while at the altitude range of 21-25 km, the valley values exist from July to October of every year. Over the latitude region of 45°S- 60°S, both the time series of the monthly means of GW PE during July and those of the de-seasonalized GW PE present significant positive trend. By using ERA-Interim reanalysis data to analyze the average trend of zonal wind near 50°S, it is found that the significant positive trend of GW PE near this latitude should be related to the enhancement of westerlies during winter seasons, which might be due to the strengthening of the polar stratospheric jets. The response of GW PE to solar activity is mostly negative at different altitudes over 40°S-40°N, while is significantly positive at 25-35 km over the latitudes of 50°N-60°N. The response of GW PE to QBO (as indicated by 30 hPa zonal winds over the equator) is mostly negative over the latitudes of 30°S-30°N, which is significant at the altitudes of 25-35 km, and this negative response extends to higher latitudes at 20-25 km. The response of GW PE to ENSO (as indicated by the Multivariate ENSO Index) is generally positive, which is significant at 30-35 km over the tropics.
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