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Global scale gravity wave observations and analysis with the ESA Earth Explorer 11 candidate CAIRT

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The ESA Earth Explorer 11 Candidate CAIRT is a prime candidate for reliably observing gravity wave (GW) activity throughout the middle atmosphere up to the MLT region from about 15 km to 90 km altitude. A horizontally panning spectrometer with limb viewing geometry allows for the measurement of 3-dimensional temperature fields with high vertical resolution that can be used to quantify the global GW distributions and spectra as well as individual GW events. The detected horizontal spectrum of GWs would cover scales of about 100 km and above. Here, we show how the temperature retrieved by CAIRT can be utilized for characterizing GW parameters such as wave vector, amplitude, and phase. This wave-based approach allows for a precise estimation of the GW momentum flux (GWMF) and its development and distribution in the middle atmosphere, e.g., during an SSW event. The vertical resolution of the data is high enough for estimating the GW drag, shedding light on the role of GWs during global-scale dynamic phenomena. In addition, we show the applicability of using ray tracing the estimated GWs along the orbit tracks, which provides a means for increased horizontal coverage and better representation of GW drag due to accounting for horizontal propagation of the GWs.