

Key note: Gravity Wave observations and analysis of CAIRT, an ESA Earth Explorer 11 candidate

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The proposed satellite mission CAIRT (Changing-Atmosphere Infra-Red Tomography Explorer), an ESA Earth Explorer 11 candidate, is an instrument capable of measuring trace gas concentrations and temperature throughout the Middle Atmosphere. The aim is to observe the altitude range of about 5 to 115 km at a 1 km vertical sampling across a swath width of about 400 km using a limb-viewing measurement geometry. The instrument will allow for a 50 km along-track and about 25 km across-track sampling, giving unprecedented coverage of global Gravity Wave events. Thereby, CAIRT will be the first mission to provide a comprehensive view of the middle atmosphere including circulation and its driving, composition, and chemistry (more information at <https://www.cairt.eu/>).

To assess the possible GW observations with CAIRT, we use synthetic temperature measurements and apply our wave analysis tool, S3D, to determine the GW content. This results in the full characterization of the GW amplitude, 3D wave vector, and phase of up to 6 wave components from small 3D cuboids of the residual temperature field. We show that the global GWMF distributions as simulated from the CAIRT observations are in agreement with the wave analysis directly applied to the high-resolution model winds. Furthermore, spectra of wavelength and phase speeds (and their direction) can be determined from the observations. In particular, the latter poses a challenge to the quality of the observations; however, even with higher-than-expected instrument noise, the phase speed spectra are in good agreement with the reference data.

Finally, the high vertical resolution of the observations allows the estimation of GW drag directly from the GWMF distributions via the vertical rate of change. In particular, we investigate the role and distribution of GW drag during the northern hemisphere SSW in January 2006.

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