

Global distribution of gravity waves in the Venusian atmosphere obtained from high-vertical resolution temperature profiles obtained by Akatsuki radio occultation

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Gravity waves may have a major impact on the maintenance of Venus' atmosphere through the supply of energy and momentum. Therefore, elucidation of the location and factors of generation and disappearance of gravity waves will lead to reveal of the momentum of the super rotation.

Gravity waves have been detected as wavelike structures in temperature profiles in the altitude direction by radio occultation using ESA's Venus Express and JAXA's Akatsuki. In the previous studies using Venus Express, gravity waves were detected globally at each latitude and local time using temperature profiles obtained by geometrical optics method, which limited detectable vertical wavelengths to 1–4 km. However, waves with vertical wavelengths shorter than 1 km have been ubiquitously seen in the Earth' s atmosphere, affecting the atmospheric structure. In addition, the geometrical optics method cannot consider the influence of multipath and the vertical resolution is insufficient in the detection of gravity waves due to the limitation of the Fresnel zone. Here we apply a method called FSI, which is a type of radio holography method, to solve the problem of multipath and achieve a high vertical resolution of ~ 0.5 km. Although Mori et al. (2021) has applied FSI to Akatsuki radio occultation data, they did not show the global distribution.

Using this FSI-based high vertical resolution temperature profile, we will detect gravitational waves globally, identify their generation location, and elucidate the factors that generate gravity waves.

Keywords: Venus, Akatsuki, radio occultation, gravity wave, FSI