Orographic Gravity Waves in the Venus Atmospheric

*Anna Suzuki[1], Masahiro Takagi[1], Yasumitsu Maejima[2], Hiroki Ando[1], Norihiko Sugimoto[3], Yoshihisa Matsuda[4]

1. Kyoto Sangyo University, 2. RIKEN Advanced Institute for Computational Science, 3. Keio University, 4. Tokyo Gakugei University

Fast zonal winds called “super-rotation” are predominant globally in the Venus atmosphere, whose wind speed reaches ~100 m/s at ~70 km level (Schubert et al., 1980). Based on the zonal winds inferred from UV cloud images taken by the Venus Monitoring Camera onboard the Venus Express orbiter, Bertaux et al. (2016) pointed out that the zonal wind at ~70 km might be decreased by about 20 m/s over the Aphrodite terra, and suggested that the gravity waves generated by the Venus topography propagate upward, breaking at the cloud levels, giving their momentum to the atmosphere and decreasing of zonal wind. Young et al. (1987, 1994) numerically investigated the excitation and propagation processes of the gravity waves. Their results show that the gravity waves with horizontal wavelengths of 50 –800 km can propagate to the cloud levels if the zonal wind near the surface is of 2.2–3.0 m/s. However, the momentum transfer by the gravity waves is not examined. In the present study, we investigate the gravity waves in the Venus atmosphere with a focus on their momentum transfer using a cloud resolving numerical model named Cloud Resolving Storm Simulator (CReSS). Our preliminary results suggest that the orographic gravity waves can propagate upward and reach the cloud levels, as shown by Young et al. (1987, 1994). We will examine the momentum transfer by the gravity waves and discuss its effect on the super-rotation.

Keywords: Venus atmosphere, orographic gravity wave

