[EE] Evening Poster | P (Space and Planetary Sciences) | P-PS Planetary Sciences

[P-PS04]Results from Akatsuki and advances in Venus science

convener:Takehiko Satoh(Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency), Takeshi Horinouchi(Faculty of Environmental Earth Science, Hokkaido University), Masaru Yamamoto(九州大学応用力学研究所, 共同), Kevin McGouldrick(University of Colorado Boulder)
Tue. May 22, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
More than two earth years in Venus orbit, Akatsuki has acquired a volume of high-quality data, unveiled many new phenomena and is allowing researchers to investigate the underlying mechanisms. As the data accumulate, numerical models and theories are being advanced as well. We are no doubt living in the new golden era of Venus studies. This session invites papers of the new scientific results with Akatsuki data and the latest results of theoretical and numerical works. We expect participants of this session share the latest research results through presentations and discussion.

[PPS04-P03]A Three-dimensional Numerical Simulation of Venus' Cloud-level Convection

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Although convection has been suggested to occur in the lower part of Venus' cloud layer by some observational evidences, its structure remains to be clarified. In the previous studies, Baker et al (1998, 2000) and Imamura et al (2014) try to simulate Venus' cloud-level convection, but the model they utilized is two-dimensional. Lefevre et al (2017) also perform a three-dimensional simulation using only similar settings of Imamura et al (2014). However, a three-dimensional numerical calculation using similar settings of Baker et al has not been performed yet. Here we report on the results of our numerical simulations performed in order to investigate a possible three-dimensional structure of Venus' cloud-level convection using similar settings of both Baker's and Imamura's.

We use the convection resolving model developed by Sugiyama et al. (2009). The model is based on the quasi-compressible system (Klemp and Wilhelmson, 1978), and is used in the simulations of the atmospheric convections of Jupiter (Sugiyama et al., 2011, 2014) and Mars (Yamashita et al. 2017). We perform two experiments. The first one, which we call Ext.B, is based on Baker et al. (1998). A constant turbulent mixing coefficient is used in the whole computational domain, and a constant heat flux is given at the upper and lower boundaries as a substitute for radiative forcing. The second one, which we call Exp.I, is based on Imamura et al. (2014). The sub-grid turbulence process is implemented by Klemp and Wilhelmson (1989), and an infrared heating profile obtained in a radiative-convective equilibrium calculation (Ikeda, 2011) is used. In both of the experiments, the temporally averaged solar heating profile is used. The spatial resolution is 200 m in the horizontal direction and 125 m in the vertical direction. The domain covers 128 km x 128 km horizontally and altitudes from 40 km to 60 km. The horizontal domain size is set to be larger than that employed in Lefevre et al (2017) in order to permit the excitation of larger scale gravity waves.

In our poster, we will discuss the difference of convective motions and heat budgets obtained in Exp.B and

Exp.I. We will also show the propagation of gravity wave driven by convection.