Takahashi, Y. O., Y.-Y. Hayashi, G. L. Hashimoto, K. Kuramoto, and M. Ishiwatari, 2023: Development of a Line-by-line and a Correlated k-distribution Radiation Models for Planetary Atmospheres. *J. Meteor. Soc. Japan*, **101**, 39-66.
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Plain Language Summary: We have developed a set of line-by-line and correlated k-distribution radiation models aiming for applications in simulations and examinations of Venus and Mars-like planetary atmospheres. We demonstrate a common procedure for constructing parameter tables for the correlated k-distribution models for Venus and Mars-like atmospheres. Radiation fields of various planetary atmospheres with CO_2 as the major component can be investigated by the use of these models.

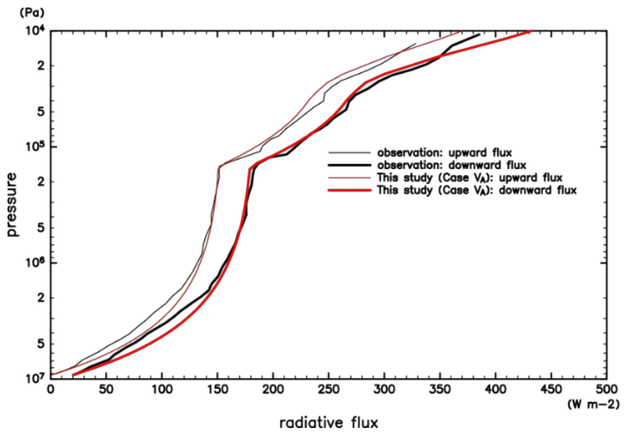

Figure 1. Upward and downward shortwave (0.4-1.0 μm) radiative flux profiles at the solar zenith angle of 65.6° calculated by the line-by-line model for Venus (red). Black lines show fluxes observed by the Pioneer Venus probe. Thin and thick lines show upward and downward fluxes, respectively.

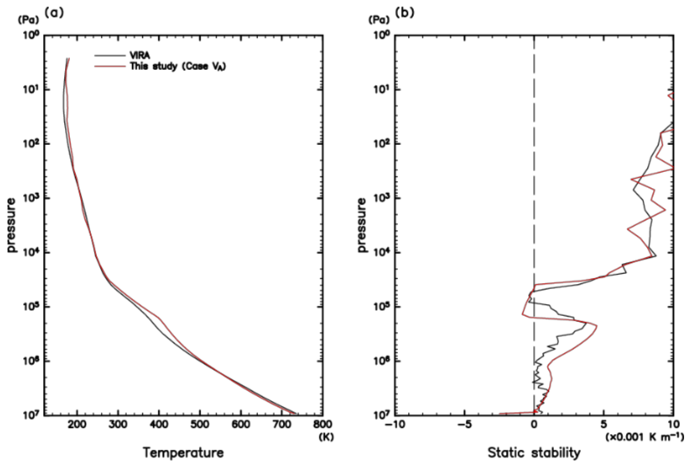

Figure 2. Radiative-convective equilibrium profiles of Venus calculated by the use of the developed correlated k-distribution model: (a) temperature and (b) static stability. Black lines show profiles of the Venus International Reference Atmosphere (VIRA).

Highlights:

- The developed line-by-line model agrees well with the results of observations and are within the range of those of previous studies for Venus and Mars-like atmospheres.
- The radiation fields calculated by our correlated k-distribution model sufficiently agree with those by our line-by-line model for the atmospheres with a wide range of surface pressure.
- The radiative-convective equilibrium profiles for Venus and Mars calculated by the use of the correlated k-distribution model shows that the vertical thermal structures are qualitatively consistent with observations for Venus, and the behaviors of surface pressure and surface temperature are similar to those reported by previous studies for Mars, respectively.