Effects by CO2 phase-change processes on the structure of horizontal wind in Martian GCM

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In Martian atmosphere, major component of the atmosphere, CO_2, condenses and sublimates while minor component of the atmosphere, H_2O, condenses and evaporates exclusively in terrestrial atmosphere. It means that atmospheric mass changes seasonally on Mars. Recently, processes of CO_2 sublimation and condensation have been taken into account in many Martian general circulation model (MGCM). Forget et al. (1999) incorporated CO_2 sublimation and condensation processes into their model and successfully simulated Martian thermal structure consistent with observations by Mars Global Surveyor (MGS). However, they did not evaluate effects of the CO_2 phase-change processes on mean wind fields quantitatively. It is very important to estimate quantitatively the effects of atmospheric mass change due to CO_2 sublimation and condensation on the motion of the atmosphere in order to understand atmospheric dynamics and transportation of dust and H_2O. Therefore, we will report how the change of atmospheric mass due to CO_2 phase-change affects on mean atmospheric structure.

We introduced CO_2 phase-change processes presented by Forget et al. (1998) into our MGCM and compared the results with those by the previous version of our model. On northern summer solstice, differences of zonal mean zonal wind between results by the new and previous version of our model can not be found clearly. CO_2 phase-change processes have little effect on mean horizontal velocity in the lower atmosphere. However, mean horizontal velocity around the jet in the upper atmosphere in the southern hemisphere changes by taking into account CO_2 phase-change processes. We will present additional results in other seasons and try to understand why such differences of mean velocity are resulted from CO_2 sublimation and condensation processes in the model.