

Martian low-latitude cloud belt and atmospheric waves

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Recently, the importance of the role of water vapor and/or ice clouds has been recently emphasized. Among them, the most important substances are the polar caps and the low-latitude cloud belt which appears in northern summer. It has been widely accepted that this cloud belt should be coupled with the ascending branch of the "cross-equatorial Hadley circulation" which forms in the solstitial seasons.

On the other hand, we discussed the mature and dissipating behaviors of the belt, and its relation to the orographic and evening/morning clouds, based on the observations in 1997, 1999 and 2001 at Steward Observatory of University of Arizona and at Hida Observatory (Nakakushi et al. [2001 on JGR, 2002 on PASJ]; Akabane et al. [2002 on A&A]). Accordingly, we proposed that (1) morning clouds which do not dissipate even in midday due to the growing Hadley circulation and the decreasing solar insolation should tie to evening clouds, forming the cloud belt: (2) the belt should localize longitudinally in the dissipating phase.

These apparently inconsistent theories can be consistently connected by the effects of atmospheric waves, thermal tides in particular, which is proposed in this article. Morning/evening clouds can be recognized firstly to be formed in convergent/upwelling and/or cool regions due to prominence of a semidiurnal tide. This effect should be more prominent by superimposing the increasing Hadley circulation, which forms the cloud belt. In the dissipation, the inverted processes should make the localization of the cloud belt and the background Hadley circulation.