Cloud top altimetry of Venus with Akatsuki/IR2 dayside images

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We have analyzed a total of 93 Venus' dayside images taken by the 2.02-micron channel of 2-micron Camera (IR2) onboard Japanese Venus orbiter, Akatsuki, during the period from April 4 to May 25, 2016 (Orbits 12-16), for the purpose of mapping cloud top altitude. Since the 2.02-micron channel locates in a CO_2 absorption band, the observed brightness contrast is interpreted as resulting from the difference of the optical path length to the cloud top: the cloud top altitude can be retrieved by reproducing the observed radiance with radiative transfer calculation. We first investigated the observed phase curve (solar phase angle dependence of the radiance) for the equatorial region to constrain the averaged cloud top structure characterized by cloud top altitude (z_c), cloud modal radius (Mode 2, $r_{g,2}$), and cloud scale height (H). The best-fit model was obtained at the combination of z_c=70.3 km, $r_{g,2}$=1.07 micron, and H=5.1 km. Once the best-fit combination of $r_{g,2}$ and H was determined, as the second step, we retrieved cloud top altitude maps under the assumptions that the pixel-to-pixel radiance variation arises as the deviation from the averaged cloud top structure and can be explained by the change of the cloud top altitude while keeping the other parameters ($r_{g,2}$ and H) unchanged. The average of zonally-averaged cloud top profiles was found to be symmetrical with respect to the equator. The averaged cloud top in the low and middle latitudes ($<$45 deg) exists in altitude of 68-70 km. It rapidly decreases in latitudes of 50-60 deg and reaches 61 km poleward of 70 deg. This global pattern is consistent with the previous studies with Venus Express data.