

Ground-based observation of 4.7um Venusian airglow

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At first, the main part of the proposal on May 2014 to NASA/IRTF was 'To investigate the driving mechanism of the Super Rotation by comparing the waves at 60km by 1.7um spectroscopy and those at 70km by VEX/VMC'. Although agreement of simultaneous observation was there, it was canceled suddenly. Then we decided to get 70km data using 5um spectroscopy.

This is because cloud particles become black above 3um, and the height of tau=1 appears at 70km. This means the 5um observation will see waves at 70km. We selected 5.04um and 4.7um; the former is the region of least gas absorption and the latter is for comparison with Kouyama 4.7um data.

The 5.04um spectrum was successfully synthesized, but that at 4.7um was not with 2 emission lines appear at 2127.6 and 2127.9 cm⁻¹. In the figure from top to bottom, solar(red), earth absorption(blue), Venus day(Kamiyama condition, pink), observed(black), Venus day(May condition, pink), Venus night(May condition, gray). A strong earth's CO absorption line is seen at 2127.6 cm⁻¹. Those emission lines are seen even before sky subtraction on the Venus disk meaning them to be Venus origin.

However, no such pair of lines was found in HITRAN. I thought 'It may be a new finding?'. However, by searching old papers, it was found that the 4.7um Venus dayglow was observed 20 year ago. They are P4(1,0) and R2(2,1) lines, and the latter may be used to fined out CO distribution at the cloud top.

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