Geophysical Research Abstracts
Vol. 18, EGU2016-7477, 2016
EGU General Assembly 2016

Simplified Analytical Solution for Martian OH*-layer Altitude

Mykhaylo Grygalashvyly and Gerd Sonnemann
Leibniz-Institute of Atmospheric Physics, Theory and Modelling, Kühlungsborn, Germany (gryga@iap-kborn.de)

In the Earth atmosphere airglow emissions of OH* are used in very diverse branches of research from gravity waves (GWs) and tides observations to minor chemical constituents and temperature measurements. Moreover, the airglow observations have good potential as, for example, for water vapor profile retrieval in the mesopause region. Recently, hydroxyl emissions were found in Mars and in Venus atmospheres. Thus, the applicability potential has been increased in spurts.
Even for Earth's atmosphere there is a lack of knowledge on morphology of OH*-layer, i.e. on altitude, number density and shape variability with the intro- and extra-annual cycles, due to planetary waves (PWs), GWs, and tides. The questions on relations between OH* layer altitude, number density (volume emission, intensity), surrounding temperature, and winds (meridional and vertical) are still open.
Modern satellite airglow measurements are not enough precise with a typical error in determination of altitude ∼2-3 km, while the ground-based measurements are restricted by local point of observations and integrated volume emission. Thus, retrievals of emission altitudes variations to derive are awkward. The difficulties are much stronger for the investigation of the Martian OH*-layer variability and altitude diagnostics.
We introduce a simplified analytical approach for OH*-layer altitude in the Martian atmosphere. The expressions for the number density and height of the OH*-layer peak, as well as relationship between both parameters, are derived for night time conditions. These OH*-layer parameters are determined by the temperature, atomic oxygen density and their vertical gradients. The approximations can be useful for analysis of ground-based and satellite-borne airglow observations. We discuss the consequences following from the derived expression.