Oxygen dayglow observations on Mars by SPICAM IR on Mars-Express

S. Guslyakova, A. Fedorova (1), F. Lefevre

(1) Space Research Institute (IKI), Russia

(2) LATMOS, France

Limb Observations. Oxygen dayglow at 1.27 µm reflects the distribution of ozone in the Martian atmosphere as it is a result of ozone photolysis by solar UV radiation. SPICAM IR on Mars-Express mission performed the continuous observations of the O2 dayglow at limb from 2004 to 2013 with resolving power of 2000. In spite of large field-of-view the results of O2 dayglow observations have been compared with LMD GCM simulation [Forget et al., 2012] of exited O2 to study seasonal variations and sensitivity to kinetic parameters. The distribution of ozone on Mars is sensitive to the vertical and spatial distribution of water vapor that is an effective destructor of the ozone. Although the GCM well reproduce recent MCS observations the comparison of the observed O2 dayglow with the modeled one shows a seasonal trend from northern vernal (Ls=0°) to autumnal equinox (Ls=180°) in the high northern latitudes with overestimation of the emission by the model from Ls=0° to Ls=50° and an underestimation from Ls=60° to Ls=150°. The explanation of such disagreement could relate to the vertical distribution of water. The recent observations of the vertical distribution of water by SPICAM have shown supersaturation at Ls=60-100° above 30 km in the middle and high northern latitudes that have to decrease the ozone amount at this altitudes. The GCM modeling of water cycle with supersaturation shows a good agreement with SPICAM data. The vertical distribution of the O2 dayglow could serve as an important tracer not only for the ozone but the vertical distribution of water vapor.

Nadir observations. A seasonal distribution of the O2 dayglow has been obtained for 4 martian years based on SPICAM IR nadir measurements. Similarly to limb observations we have reproduced the model seasonal map. A rate constant k for the reaction of collisional deactivation (O2(a1Δg)+CO2→O2(X3Σg)+CO2) is known with a large uncertainty. Varying this parameter we can choose a value for k in case of which a modeling map will provide a good agreement with the most part of the SPICAM observations in a rms sense. For the brightest polar regions we have received K = 0.9*10-20 cm3/molec/sec, if the model accounts for the water vapor supersaturation (LMD GCM 2012).