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New methods for remote sensing of altitude profiles of the O (³P), O₃ and CO₂ in the daytime mesosphere and lower thermosphere

Valentine A Yankovsky

St. Petersburg State University, Russia

For daytime, the altitude profiles of concentrations of electronical-vibrationally excited molecules, O₂ (b¹Σ_g⁺, v=0, 1 and 2), depend on distributions of the O(³P), O₃ and, partially, CO₂ in the MLT region. It allows the use of emission bands originating from the O₂(b¹Σ_g⁺, v= 0, 1 and 2) levels as a proxy for non-emitting, but it is very important for the atmospheric photochemistry, small components of the atmosphere. Contemporary model of O₃ and O₂ photolysis in the MLT, YM2011, has been investigated by methods of the sensitivity study and uncertainty analysis. It has been shown that simultaneously measuring of altitude profiles of two proxies concentrations, O₂(b¹Σ_g⁺, v=0) and O₂(b¹Σ_g⁺, v=1), allows to retrieve, simultaneously, profiles: [O₃] and [CO₂] in the range 50-90 km; [O(³P)], [O₃] and, perhaps, [CO₂] in the range 90 – 100 km (here, it is necessary to use a third proxy, O₂(b¹Σ_g⁺, v = 2), in addition to the two above-mentioned); [O(³P)] and [O₂] in the range 100-140 km. We believe that new remote sensing methods described above can be more fully realized as limb emission measurements from the satellite.

Biography

Valentine A Yankovsky is an Associate Professor in Atmospheric Physics of St. Petersburg State University (from 1990). In 1986, he has completed his PhD from SPBU "Laboratory studies of aeronomical reactions with participation of negative ions, excited oxygen atoms and molecules" which was based on his investigation of processes in the glow discharge oxygen plasma. His main fields are the atmospheric photochemistry in the MLT region, the sensitivity and uncertainty study of complex photochemical systems and the retrieval of ozone and atomic oxygen in the MLT. He has published more than 20 papers in reputed journals.

vyankovsky@gmail.com

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