IX SERBIAN CONFERENCE ON SPECTRAL LINE SHAPES IN ASTROPHYSICS
May 13-17, 2013, Banja Koviljača, Serbia
Book of Abstracts, Eds. L. Č. Popović, M. S. Dimitrijević, Z. Simić and M. Stalevski
Astronomical Observatory Belgrade, 2013

ABSORPTION QUASI-MOLECULAR BANDS AS FACTORS OF THE SOLAR PHOTOSPHERE OPACITY ABOVE SUNSPOTS

V. A. Srećković[1], A. A. Mihajlov[1], Lj. M. Ignjatović[1], M. S. Dimitrijević[2] and A. Metropoulos[3]

[1] *Institute of Physics, Belgrade University, Pregrevica 118, Zemun, 11080 Belgrade, Serbia*
[2] *Astronomical Observatory, Volgina 7, 11060 Belgrade 38, Serbia*
[3] *Theoretical and Physical Chemistry Institute, National Hellenic Research Foundation, Athens, Greece*

E-mail: vlada@ipb.ac.rs, mihajlov@ipb.ac.rs

In the previous work it was shown already that the radiative processes in strongly non-symmetric ion-atom collisions in the solar photosphere generate the absorption quasi-molecular bands in UV and VUV regions which could significantly influence on the opacity of the quiet Sun atmosphere [1]. The aim of this research is to show that the similar absorption quasi-molecular bands may be of the same importance also for the solar photosphere opacity above sunspots. Within this work the H+A+ ion-atom collision systems, where A is the relevant metal atom (A = Mg, Ca, Na, Si, Al), are taken into account. Here, the non-symmetric radiative processes are considered under the conditions characterizing the corresponding umbral model [2], which gives the possibility to perform all needed calculations and determine the corresponding spectral absorption coefficients. The needed characteristics of the corresponding molecular ions, i.e. molecular potential curves and dipole matrix elements, have been determined. The examined processes generate rather wide quasi-molecular absorption bands in the UV and VUV regions, whose intensity could be comparable with the relevant concurrent radiative processes including here the so called H^- continuum. The presented results suggest that the non-symmetric ion-atom absorption processes have to be further examined and consequently could be included in standard models of the sunspot atmosphere.

References

[1] Mihajlov, A. A., Ignjatović, Lj. M., Srećković, A., Dimitrijević, M. S., Metropoulos, A.: 2013, *MNRAS*, **431**, 589.
[2] Maltby, P., Averett, E. H., Carlson, M., Kjeldseth-Moe, O., Kurucz, R. L., Loeser, R.: 1986, *ApJ*, **306**, 284.