XI SERBIAN CONFERENCE ON SPECTRAL LINE SHAPES IN ASTROPHYSICS
August 21-25, 2017, Šabac, Serbia
Book of Abstracts, Eds. L. Č. Popović, A. Kovačević and S. Simić
Astronomical Observatory Belgrade, 2017

Progress Report

ASTA SOFTWARE: AN ADVANCED SPECTRAL ANALYSIS ALGORITHMIC ENVIRONMENT FOR EMISSION AND ABSORPTION LINE SPECTRA

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As we know DACs (in the case of Hot Emission Stars) and BALs (in the case of Quasars) are spectral lines of the same ion and the same wavelength as the main spectral line, shifted at different $\Delta\lambda$, as they are created in different density regions which rotate and move radially with different velocities. The currently accepted view is that BALs and DACs may be due to a flow of many individual density enhancements, called clouds, cloudlets or clumps which are optically thick and very small compared with the size of the central continuum source. These density enhancements are not preexisting entities but are formed inside an unstable and turbulent wind. A second interesting point is that BALs/DACs indicate very complex profiles. According to this phenomenon, a prevailing view is that BALs/DACs are not simple absorption lines, but the synthesis of a group of classical absorption line components of the same spectral line. These complex structures of BALs/DACs pose a series of questions: Can BALs be simulated and analyzed taking into account their complex structure and large widths? How can Si IV and C IV BALs be analyzed? Accepting the point of view that BALs are the synthesis of a series of components, is there a way to study not only the whole profile but the profiles of each individual component (line function of each individual absorbs in the line of sight)? Which is the interpolation polynomial that describes the whole BAL profile? In the case of multiple BAL which is the interpolation polynomial that describes the whole absorbing region? Can the two members of the resonance doublets (e.g. Si IV and C IV) be studied independently? Until now the BALs/DACs doublets the resonance doublets (e.g. C IV and Si IV are considered one spectral line. In order to answer in this set of questions Astrophysical Spectroscopy Team of the National and Kapodistrian University of Athens constructed the GR model which incorporates all the previously mentioned characteristics. At this point it is clear that we need to create a software capable, not only to run GR model but to help accelerate complex mathematical precision checks and confirm the uniqueness of the calculated physical parameters and the number of the absorption components that construct every BAL/DAC. This is the software A.S.T.A. (Astrophysical Team of Athens) which we present in a package with the manual and some information about the mathematical structure of GR Model. The package AS.T.A will be freely available to the scientific community.