XIV Serbian Conference on Spectral Line Shapes in Astrophysics
Bajina Bašta, Serbia, June 19 - 23, 2023
Book of Abstracts, Eds. Luka Č. Popović, Nataša Bon, Edi Bon and Sylvie Sahal-Bréchot

HIGH-REDSHIFT GALAXIES SPECTROSCOPIC DIAGNOSTICS

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If the characteristics of the extragalactic interstellar medium depend on the mechanisms of evolution of the host galaxy, the formation and evolution of galaxies also depend on the physico-chemical properties of their interstellar medium. We need to extract from the information conveyed in galaxies multi-wavelength spectral energy distribution (SED the parameters relevant to the galaxy evolution (star formation history, initial mass function, density, metallicity, cosmic ray, photoradiation field, ...) as the retroaction processes (galactic fountain, stellar feedback, AGN outlflow) from the epoch of re-ionization ($6 \leq z \leq 25$) to now ($z=0$), in order to interpret observations from existing observatories (ALMA, NOEMA, SPT, HST, JWST) and to prepare observations for future observatories (VLT/MOONS, Subaru/PFS, ELT/Mosaic, OST, PRIMA, ATHENA,...).

I will present how we combined photometry and spectroscopy (atomic and molecular lines) of H II regions to generate spectral templates on 2508 sources of the COSMOS field also observed with Subaru/FMOS in the range $0.6 \leq z \leq 1.6$. UV-to-MIR photometric data of the COSMOS2015 catalog are fitted with the CIGALE SED fitting code to get the stellar continuum emission and infer star formation rates and stellar masses. Then the nebular emission is added from libraries of CLOUDY models. A gas phase metallicity and a ionization parameter are assigned to each source and CIGALE iss run again to generate emission lines consistent with the UV-to-MIR continuum. I will also present how it is possible to constrain parameters relevant to photon dominated regions using IR emission line ratios and IR emission line diagnostic diagrams using the strongest IR lines such as $[O^{2+}]52$ μm, [O]63 μm and $[O^{2+}]88$ μm or $[C^{+}]158$ μm lines. I will then present work in progress on Active Galactic Nuclei broad and narrow line regions spectroscopy.