Semester Report 2017/2018 fall

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Ph. D. Thesis Topic: Star formation and active galactic nuclei

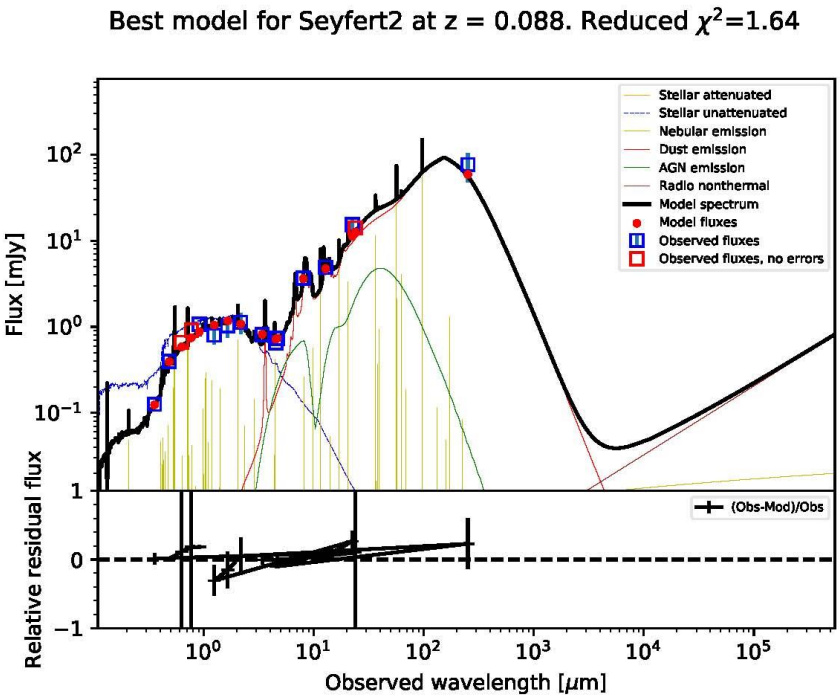
Introduction

Galaxy interactions were frequent in the early Universe. As a consequence, star formation was intensified and the growth of super massive black holes accelerated. The peak of the star formation rate is expected at the late phases of merging, the same epochs when the galactic nuclei are activated. Both processes may be shielded by the dense dusty interstellar medium. The timing and relation of the processes is yet not well known. The radio emission travels through the dusty media and allows a study of the active nucleus and its physical processes. Molecular line emission on the other hand indicates the physical properties of the interstellar medium.

The planned research will uncover parameters of the infrared bright galaxies using high-resolution radio interferometry measurements. A statistical sample of galaxies should be investigated sampling all evolutionary phases and a range of galaxy masses. Dedicated measurements should be planned and carried out using European and American array systems, besides an intensive data mining in existing archives. The analysis of the obtained data set should include modeling. This research is to be carried out in an international collaboration.

Description of research work

In my first semester of doctoral school, I have started to study the physical properties for a small sample of AGN galaxies (13 galaxy), such as the star formation rate, AGN luminosity, dust luminosity, Stellar luminosity, dust mass, mass of stars, mass of gas, and the metallicity. And that by fitting the spectral energy distribution from far-UV to far-IR of the galaxy using CIGALE (S. Noll et al. 2009) software with running more than million of models for each galaxy to get acceptable fitting. The data which I use from Simbad, ViziR, NED data base and another useful website. One of these fitting for 2MASX J16092593+5315091 galaxy with the physical properties in the following figure:



Star Formation Rate ($M_\odot$/yr) = 1.68	Stellar Luminosity (W) = 6.16×10^{35}
AGN Luminosity (W) = 1.23×10^{36}	Stellar. m_star ($M_\odot$) = 1.84×10^{10}
AGN Scattering Luminosity (W) = 2.89×10^{33}	Stellar. m_ gas ($M_\odot$) = 6.72×10^{9}
Dust Luminosity (W) = 9.97×10^{36}	Metallicity = 0.004
Dust Mass ($M_\odot$) = 1.41×10^{8}	SFH age(MYr) = 4000

In next semester, I am going to fit several more AGN galaxies to find the relations and the behavior of these physical properties with different redshifts. Then I will compare my own results with previous works from the literature.

Educational activities in the current semester

I have participated in four ELTE courses in weekly frequency:

Introduction to astronomy: That was an introductory course by Dr. Kristóf Petrovay, based on the Fundamental Astronomy text book by Karttunen, where I learnt the basics and a lot of definitions. The topics were about the universe in general, especially the solar system.

Information technology in astronomy 1: The lecturer was Dr. Suli Aron. It followed the "Introduction to Linux" text book by Machtelt Garrels. We learnt the most important features of Linux, we started to run it, discussed the files and directories on a Linux system in more detail. Also, we have learnt sequences of processes.

Radio astronomy I.: Was given at the Konkoly observatory by Dr. Sandor Frey and Dr. Krisztina Gabanyi, based on the book "Tools of Radio Astronomy" by T. L. Wilson et al. They talked about the history of radio astronomy, basic radio astronomy terms and definitions, masers, single dish telescopes and radio interferometry, then they also entered in more details to Very Large Baseline Interferometry (VLBI) networks and imaging. Finally, the students made seminars about related topics with a certain published paper, and I had a chance to do a seminar with my colleague M. Talafha, it was about a software application for the interferometry technique, APSYNSIM; The APerture SYNthesis SIMulator is a Python-based interactive tool to help the students visualize and understand the basics of the Aperture Synthesis technique, applied to astronomical interferometers, it was made by Marti-Vidal, I. (2017).

Infrared astronomy I: The course was given by Dr. L. Viktor Tóth, and it was based on the Infrared Astronomy text book by L. Viktor Tóth et al. 2013. In this course I learned about the discovery of IR by Herschel, and the history (full story) of the IR astronomy. We discussed its usage in different fields of science, medicine and technology. I learned about the atmospheric transparency, the basics of IR photometry, and IR photometric systems. We discussed in more details the IR all sky surveys and satellite observatories. In addition, we understood the composition and basic physics of interstellar medium, and how that is seen in IR, as well as briefly the young stellar objects and its classification and evolution.

Conferences in current semester:

I attended a one-day conference organized by the Hungarian Academy of Sciences commemorating the 50th anniversary of the discovery of pulsars on November 6th, 2017.

I plan to apply for an IAU grant, and I would like to participate at the 30th IAU General Assembly in Vienna August 2018. I want to present my results on the AGN SED fitting.