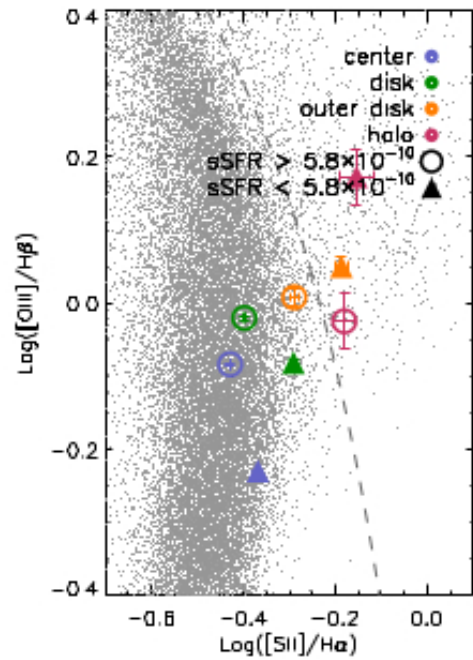
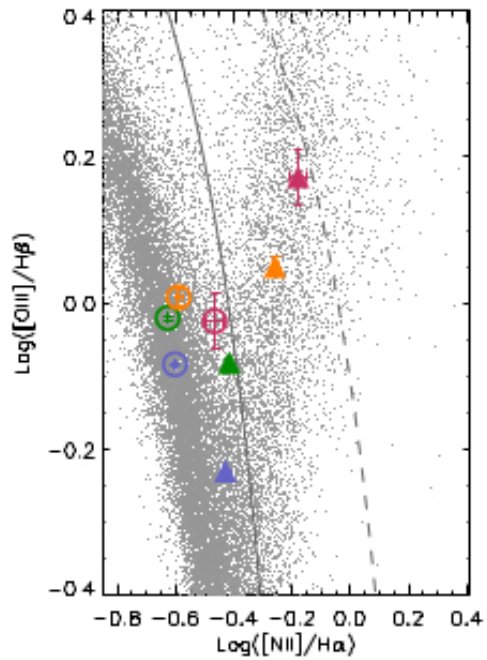


BPT- σ relation in local galaxies

D. Oparin, A. Moiseev.

SAO RAS, Russia

DIG outside the galaxy plane

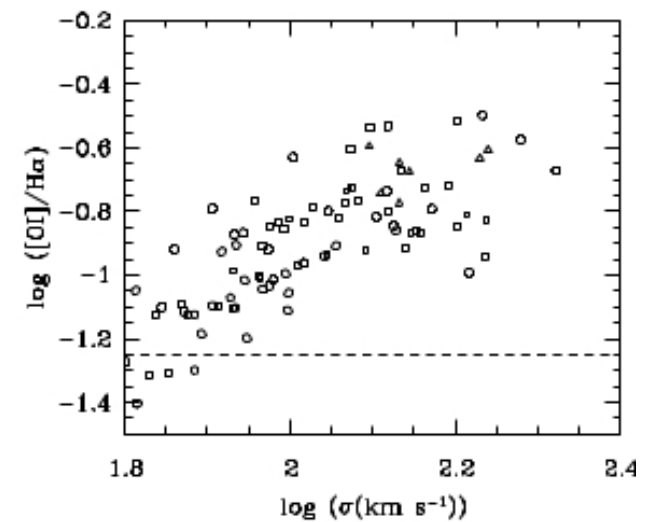
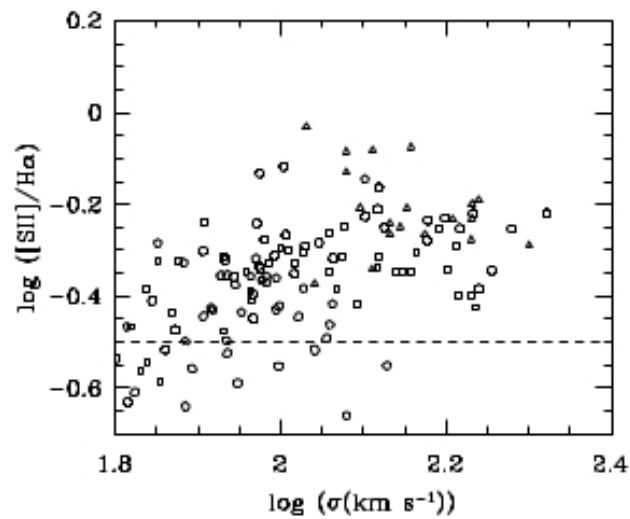
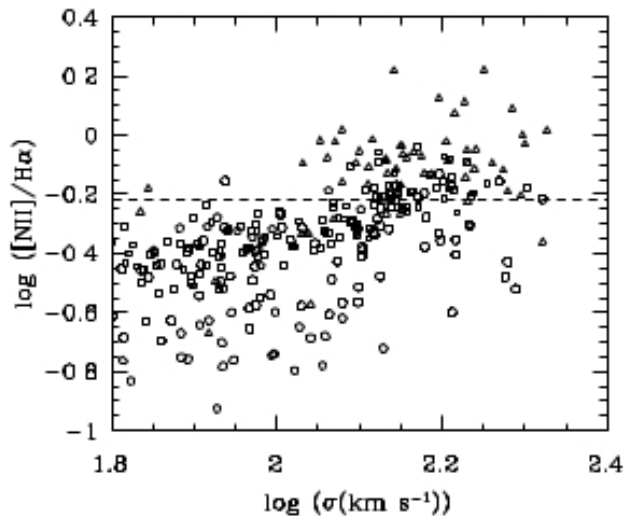


- AGB or shock ionization?

Jones et al., 2017

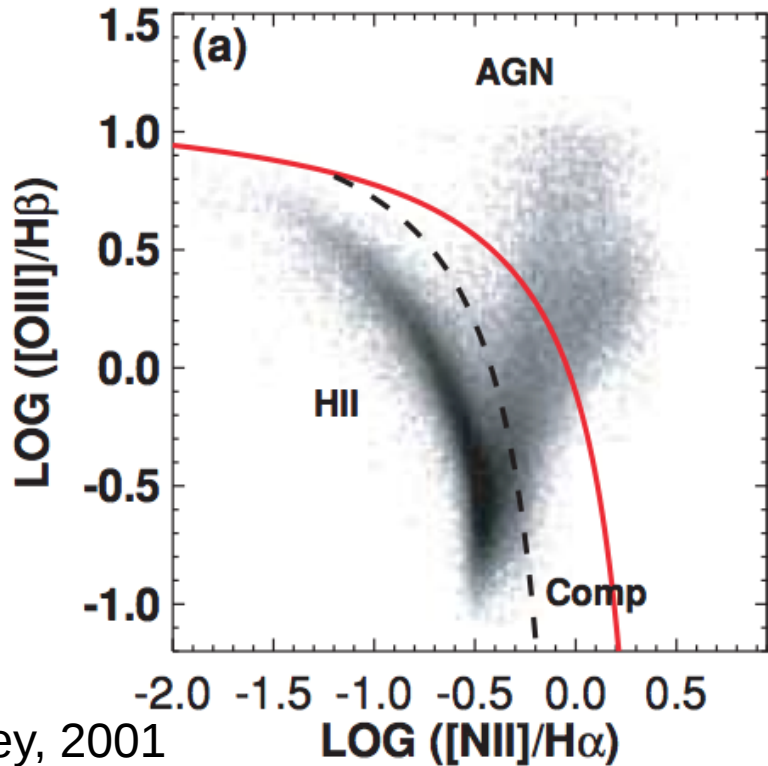
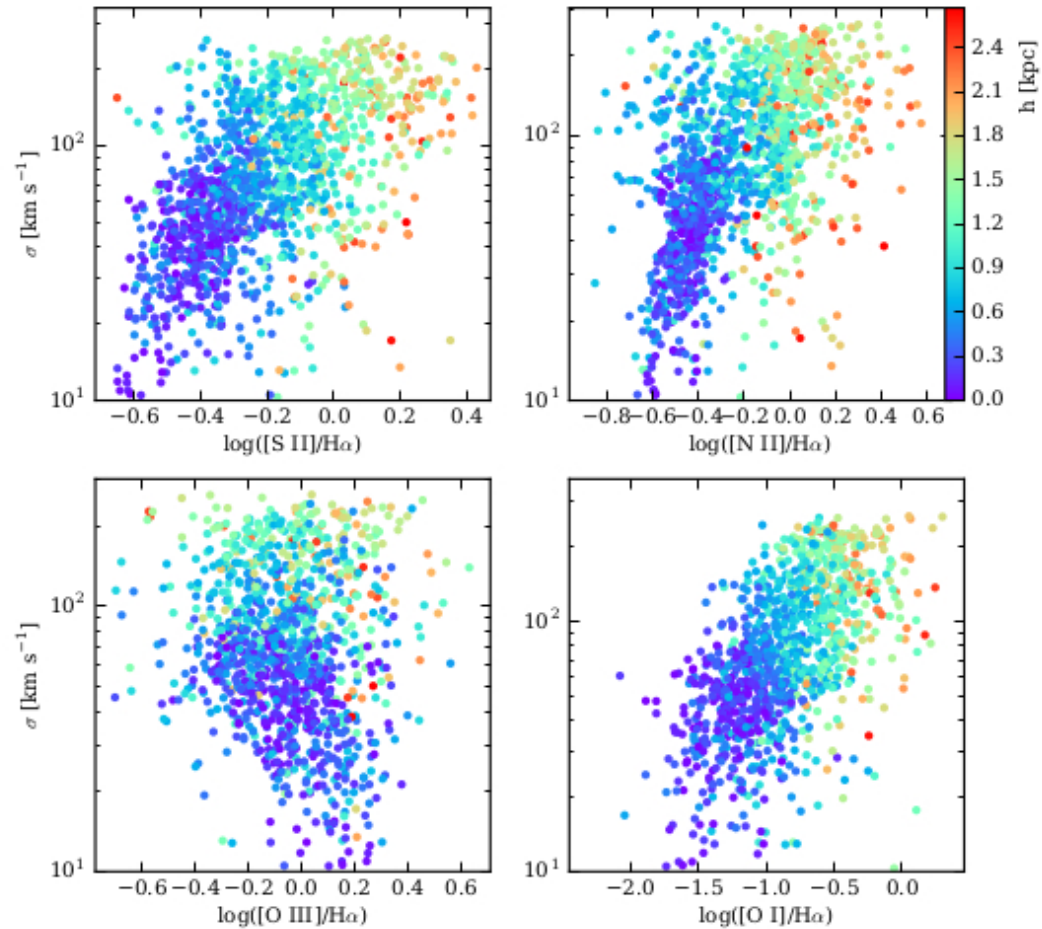
High line-of-sight velocity dispersion indicates shock ionization!

- ULIRGs



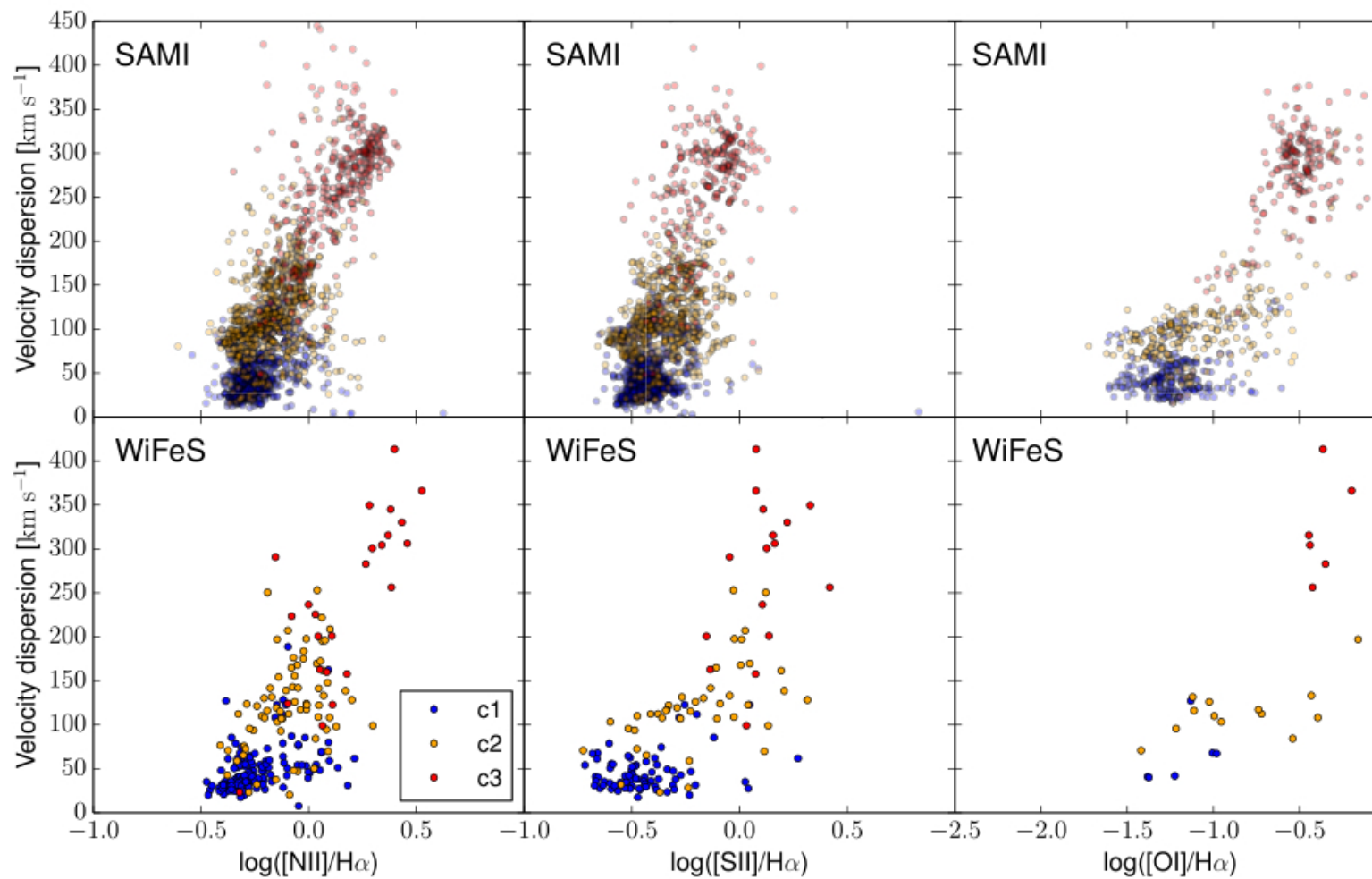
Monreal-Ibero et al. 2006

- Usually *BPT- σ* was used for objects with $\text{SFR} > 1 \text{ M}_{\odot}$
- High spectral resolution of FPI allows to analyze galaxies with $\text{SFR} < 0.5$

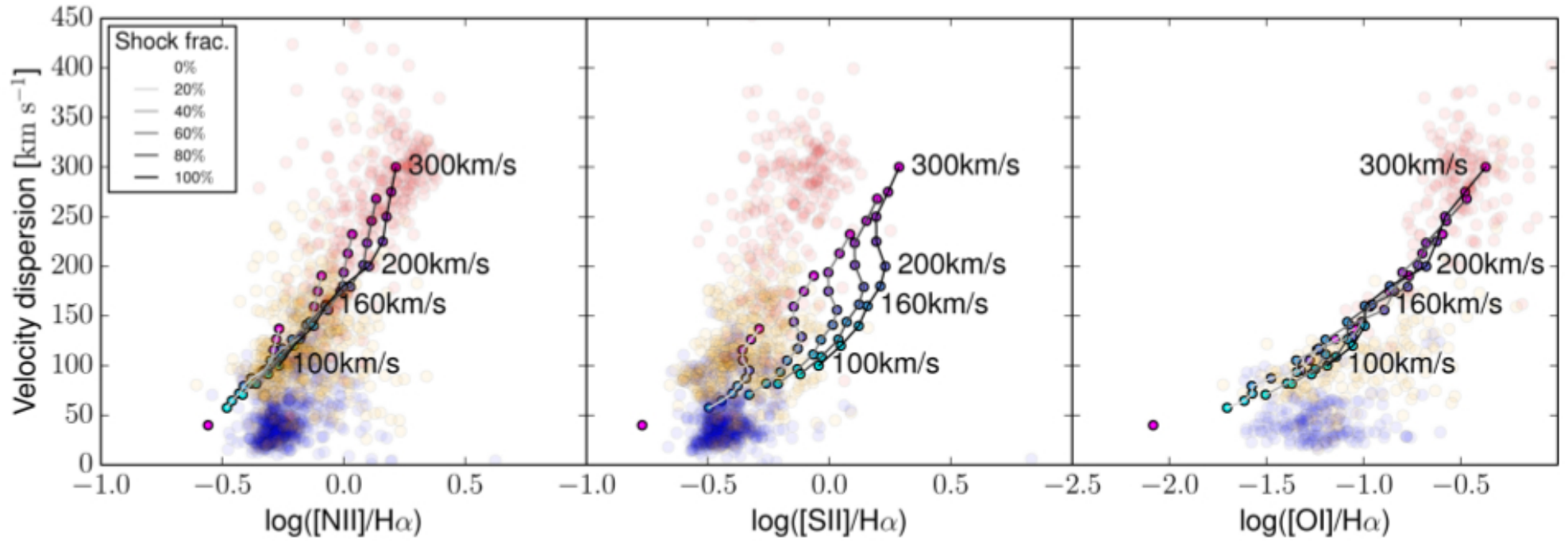


Kewley, 2001

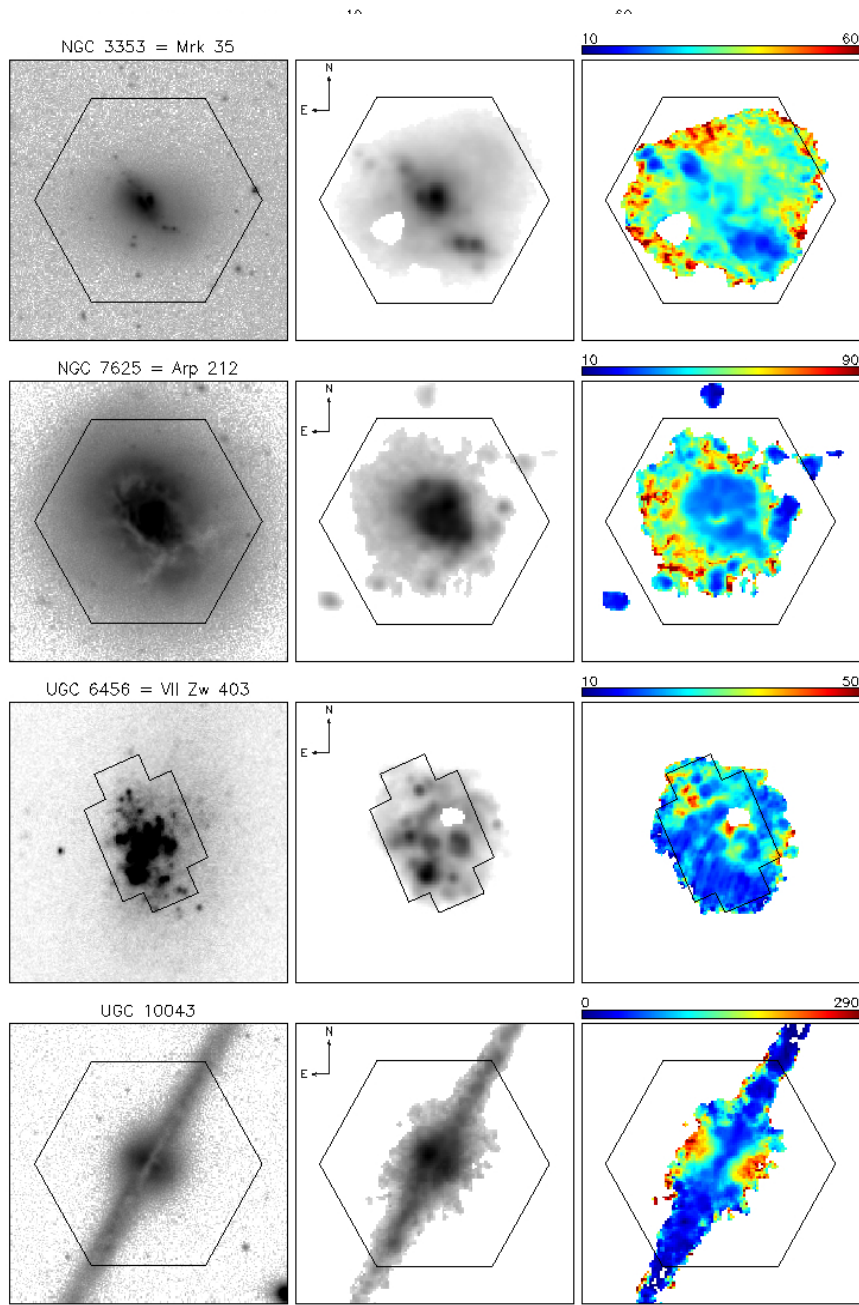
Starburst



*Ho, Kewley et al.
2014*



*Ho, Kewley et al.
2014*



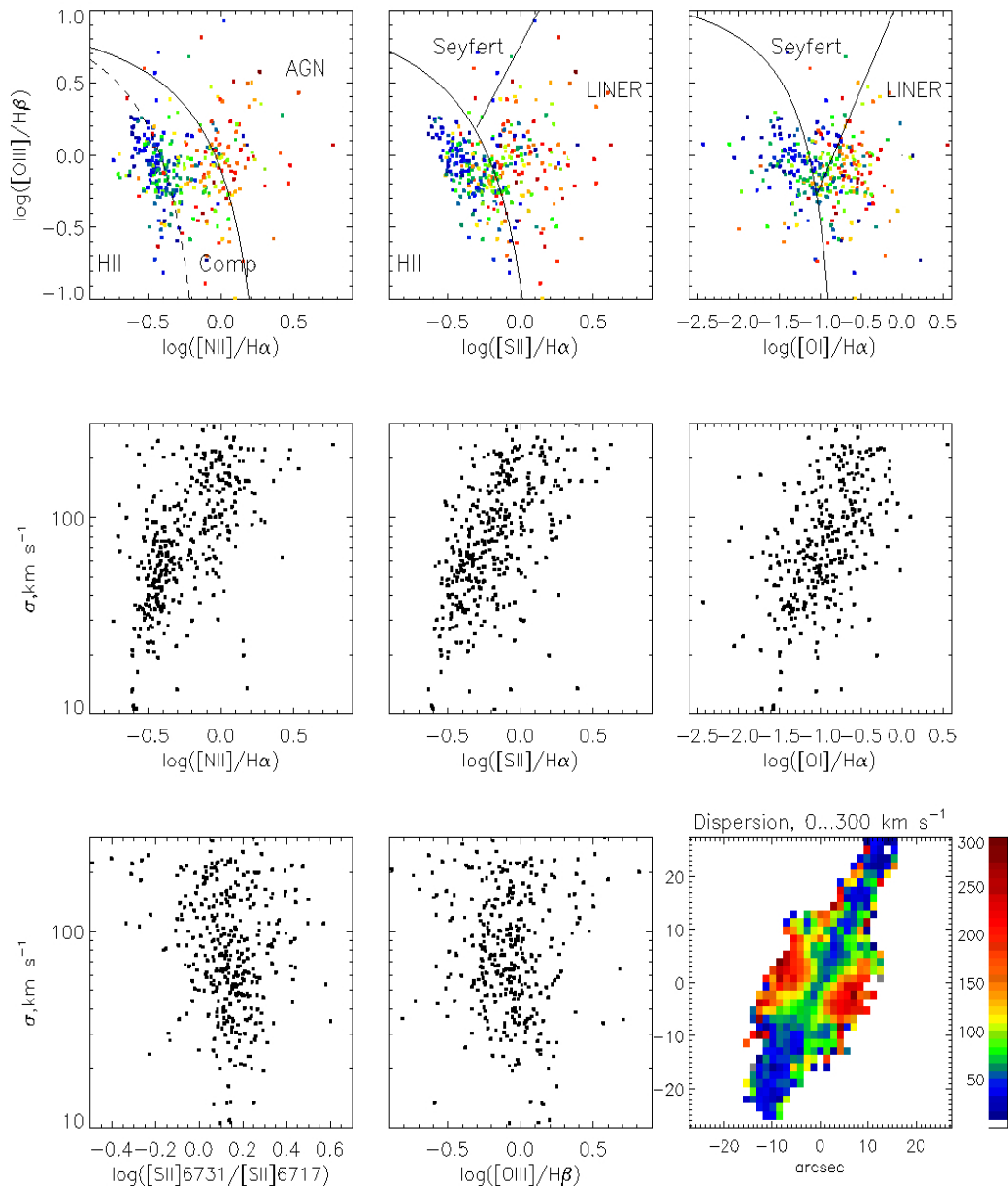
- 4 galaxies (Mrk 35, Arp 212, VII Zw 403, UGC 10043)
- Combination of FPI data and other 3D-spectroscopy observations

UGC10043

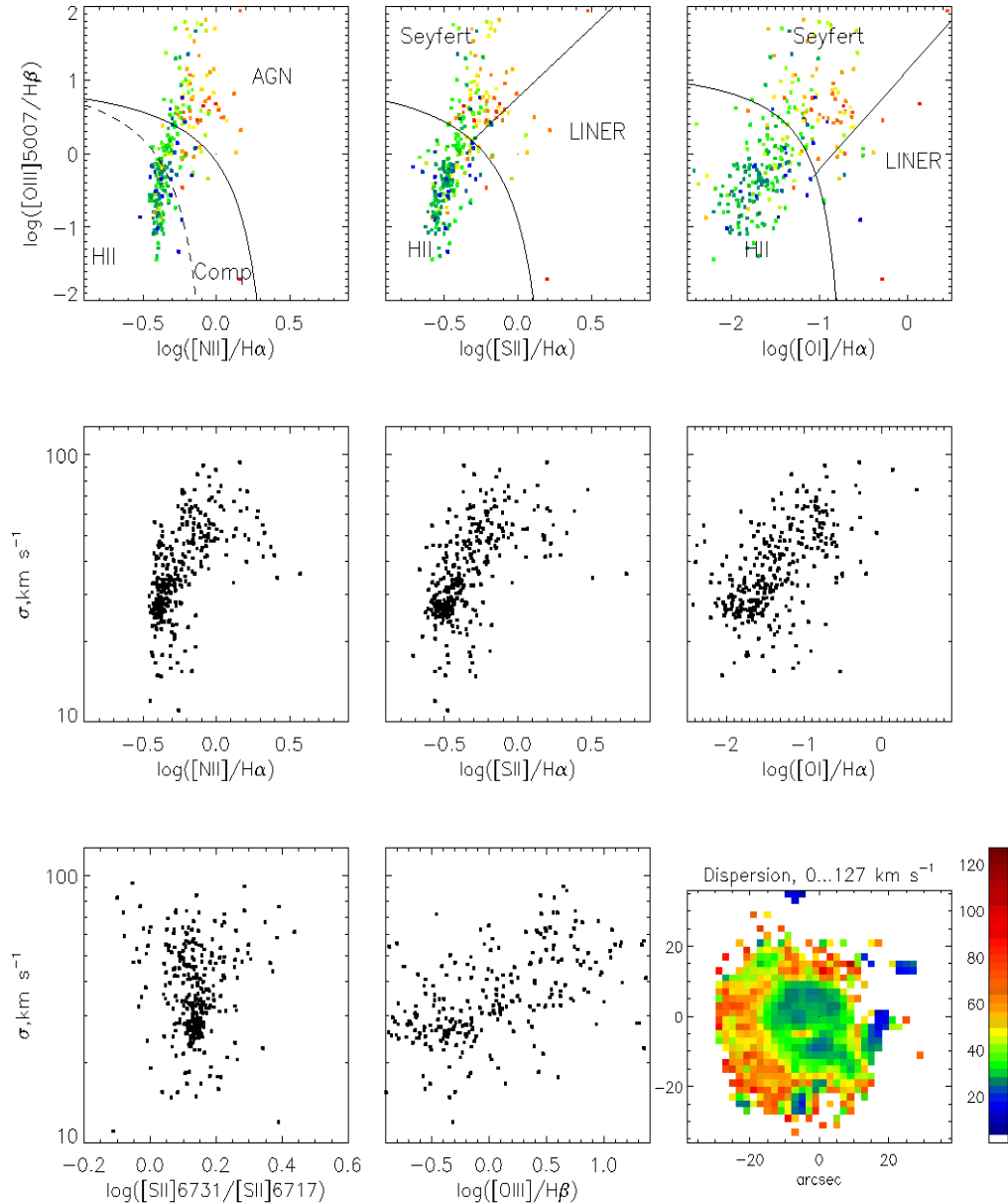
UGC 10043. Galactic wind

UGC10043 is an edge-on spiral galaxy.

- An extended perpendicular to galaxy disc emission structure was found here. Adding σ to BPT diagrams allowed to say that it was generated by galactic wind. With the help of a shock excitation model and FPI gas velocity field, a wind velocity was constrained: less than 250 km/s.. (Lopez-Coba et al.,2017)
- There is a positive correlation between the relations of line fluxes of [S II]/ H α , of [N II]/H α , of [O I]/H α and σ . A negative correlation is observed between the ratio of the sulfur doublet lines ([S II]6731/[S II]6717) and σ . This means that a higher velocity dispersion is characteristic of the diffuse gas with a lower electron density n_e .



Arp 212

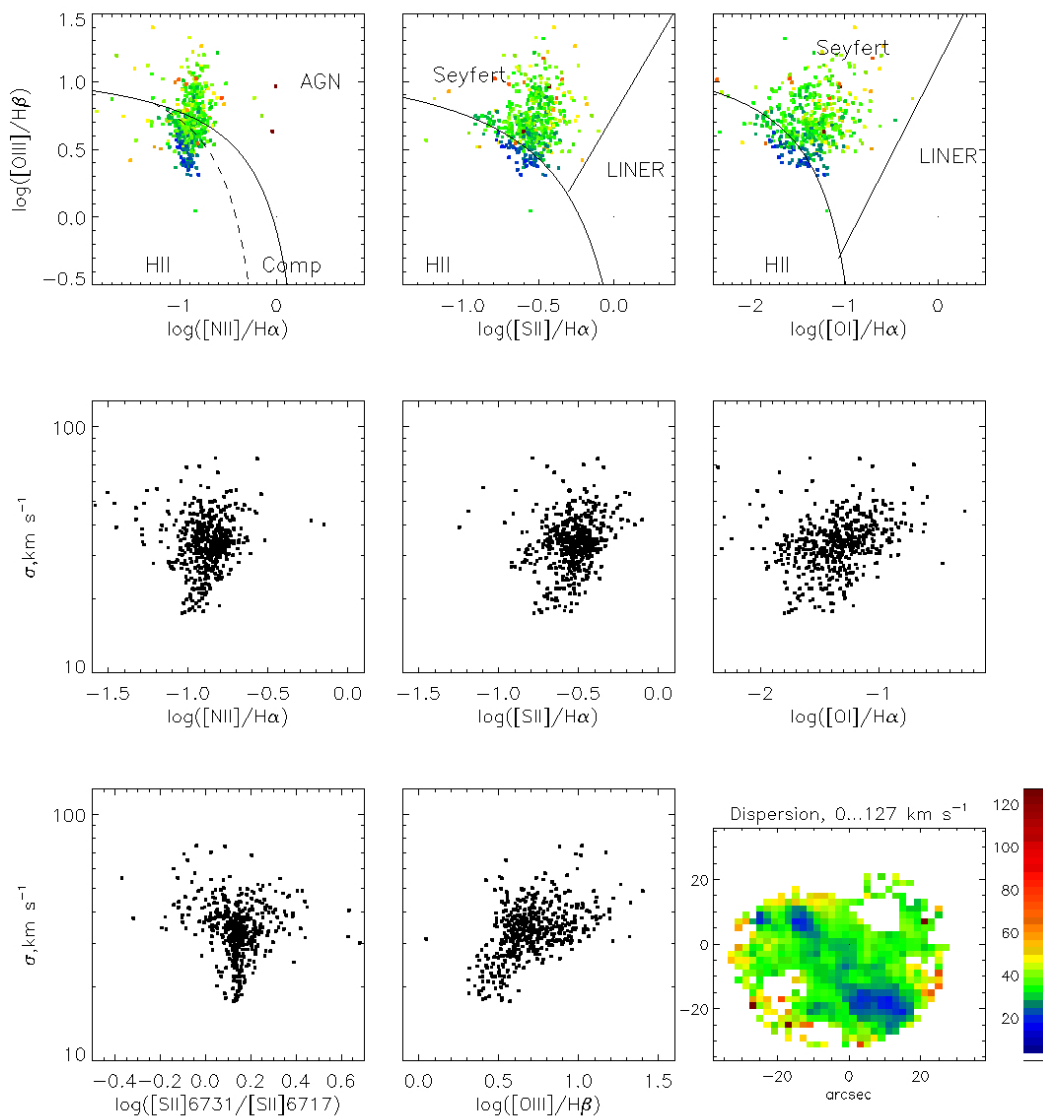


Arp 212. A galaxy with polar ring

Arp 212 is a peculiar galaxy with two rotating gas subsystems that are kinematically different: an internal disk and outer H II regions whose orbits are inclined at a significant angle to the stellar disk

- photoionization dominates in the central region of the galaxy while the border regions between the ring and galaxy disc are shifted towards the dominance of shock ionization in the BPT diagrams. This proves the assumption of direct collision of gaseous clouds on inclined orbits with the main disk of the galaxy generating shock fronts.
- the sulfur lines ratio does not show any pronounced dependence on σ . It shows that high velocity dispersion is observed not only in DIG with low electron density but also in a denser medium of colliding gaseous clouds.

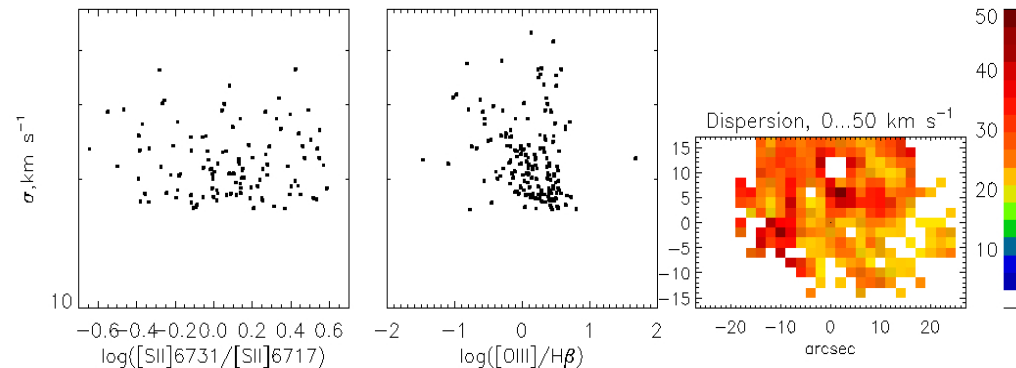
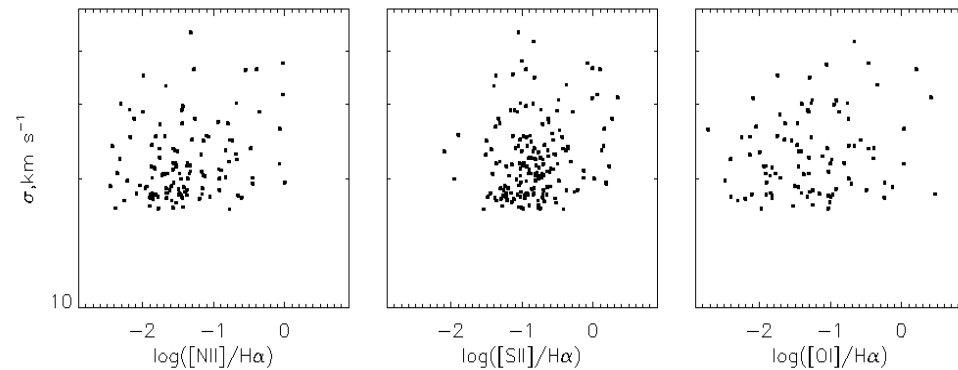
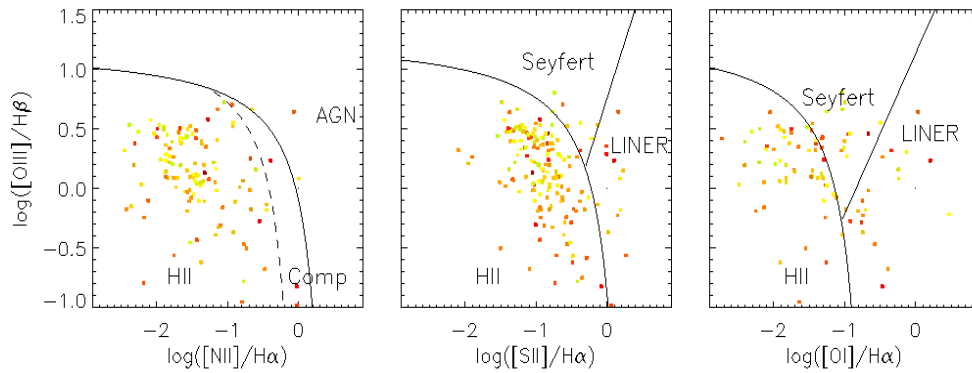
Mrk 35



Mrk 35 is a blue compact galaxy. The ongoing star formation here is concentrated in several bright compact regions.

- In the central regions σ lies within the range of 20–35 km/s. The highest σ about 70 km/s is in the gas located between three central regions of star formation. In the “arms”, the dispersion does not exceed 20 km/s.
- In the BPT diagrams the points corresponding to the regions with the ongoing star formation are located in the region of photoionization. The outer parts of the galaxy, characterized by low surface brightness and high dispersion of radial velocities, appear near the separation curves which suggests a certain contribution of shock waves to the gas ionization in these regions.
- The sulfur lines ratio demonstrates the anticorrelation..

VII Zw 403

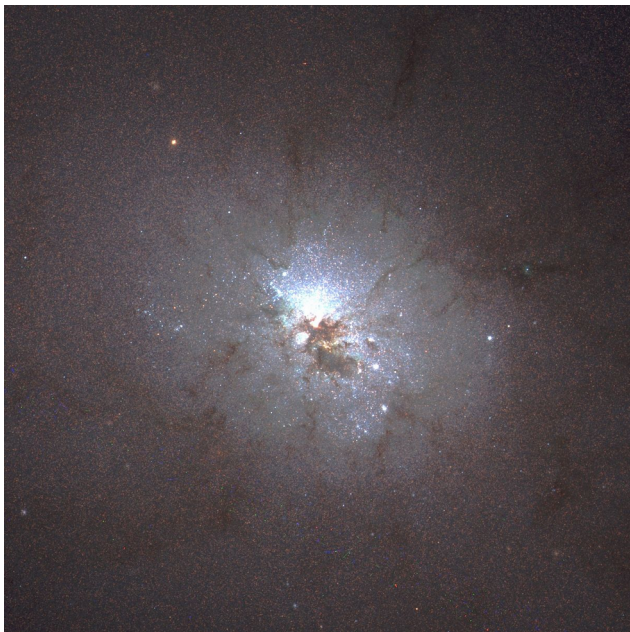


VII Zw 403 and Mrk 35. Dwarf galaxies with burst of star formation

VII Zw403 is one of the nearest blue compact dwarf galaxies with several episodes of recent star formation

- In the BPT diagrams, most points are located in the region of photoionization. There are no noticeably significant correlations in the “lines ratio– σ ” diagrams. Therefore the contribution of shock excitation to gas ionization in this galaxy is negligible and even at the boundaries of the expanding shells it is noticeably inferior to photoionization (the H II type)

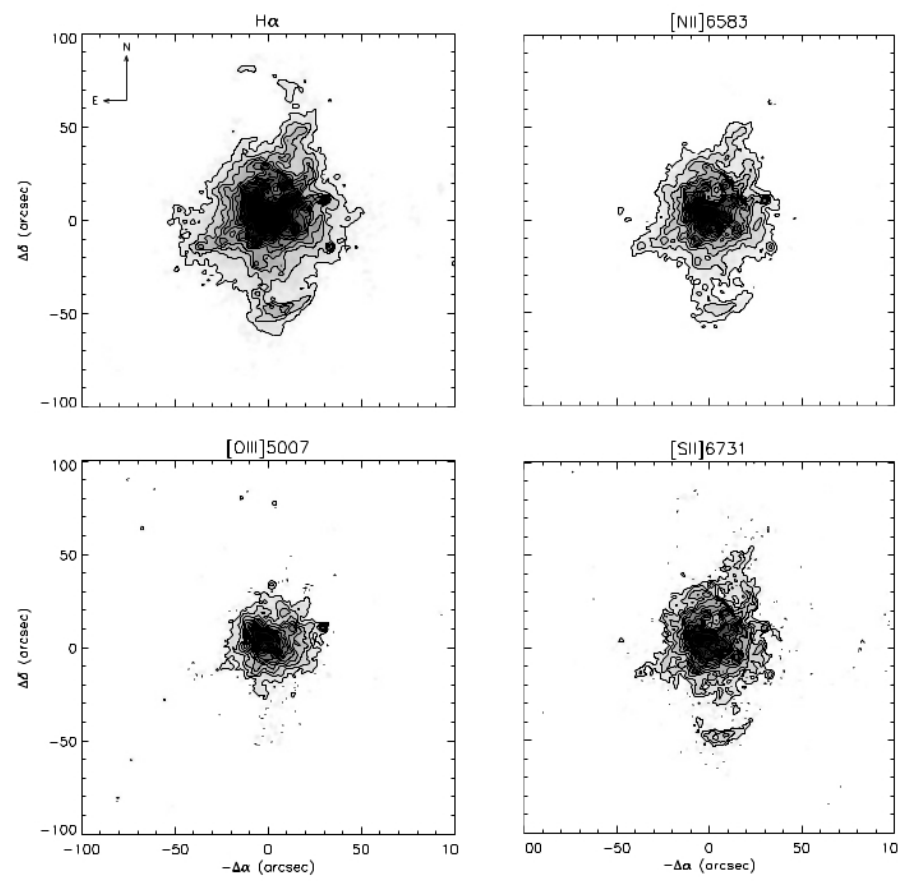
NGC3077

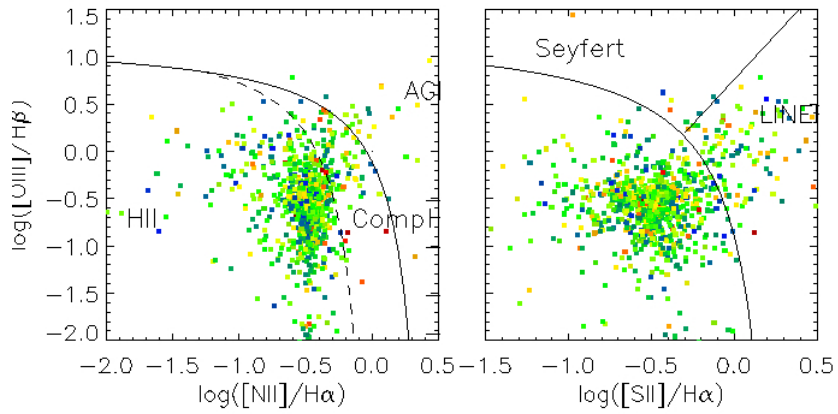


SDSS

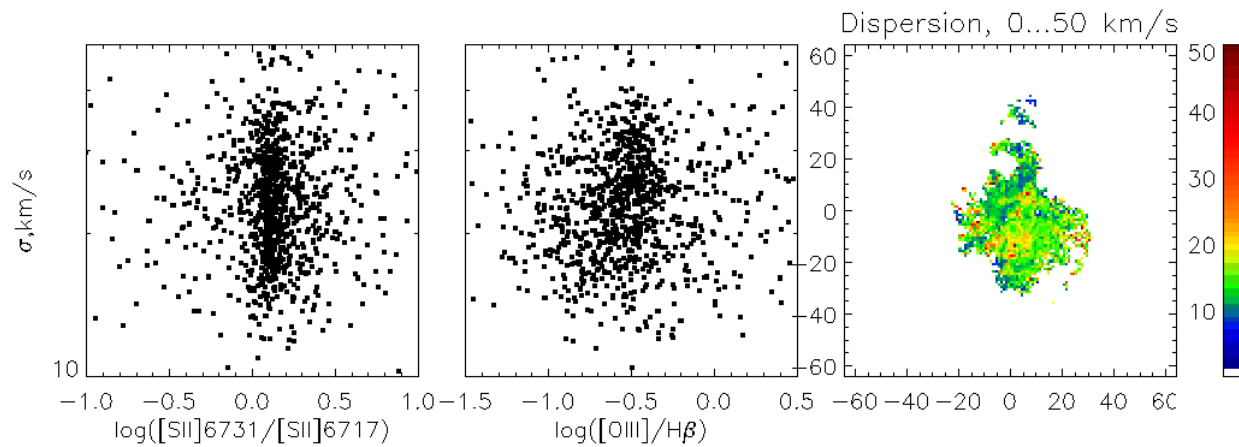
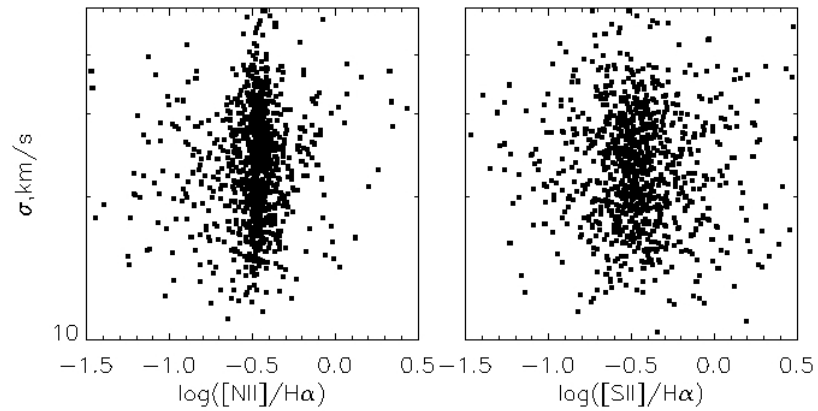
- Complex distribution of HI in M81 group
- Data: 6-m BTA (SCORPIO-2: FPI и LS), 2.5-m KGO (MaNGaL: tunable filter)

MaNGaL





- Сложное распределение HI в группе M81. Попытка понять характер движений и ионизации газа



Summary

- Studying of gas outflows phenomenon requires spatial resolved spectroscopy. Thus combining of LS and 3D-spectroscopy (including FPI) methods is necessary.
- FPI velocity dispersion maps in addition to BPT diagrams allow to determine the source of ionization of the gas forming the wind structure.