Hydrogen Emission from the Ionized Gaseous Halos of Low Redshift Galaxies

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arXiv:1611.00004

SDSS DR 12:
Отбор кандидатов:
z>0.05 (избежать звезд и MW)
z<0.2 (Hα+ [NII] на λ<7800)

9,611,765 pairs of primary and secondc galaxies.

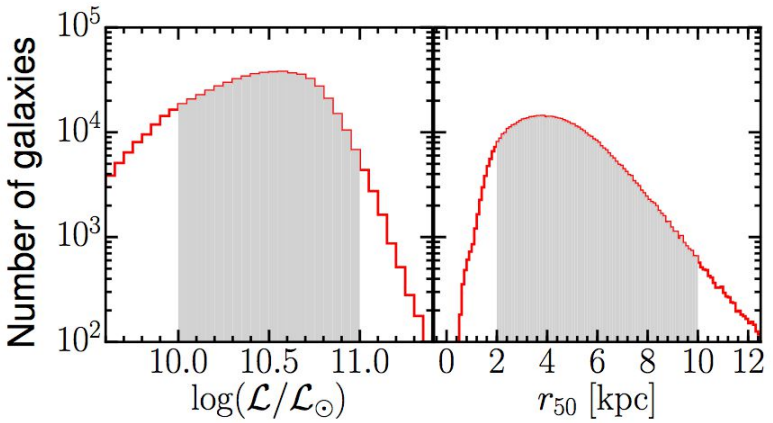


FIG. 1.— The distribution of luminosity and half light radius for candidate primary galaxies. The shaded region marks our selected parameter ranges. Our goal is to ensure a degree of homogeneity in the primary galaxy sample.

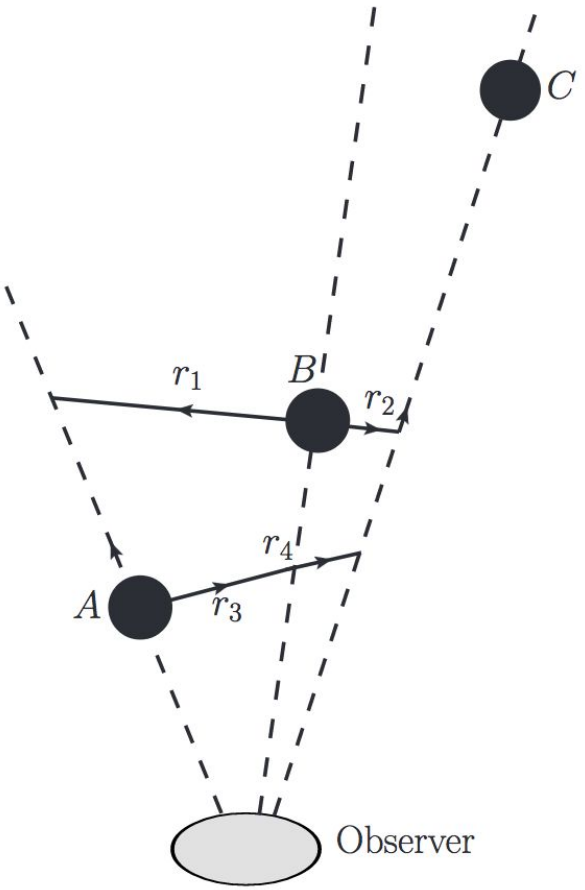


FIG. 2.— Illustration of primary - secondary target geometry. SDSS spectroscopically targets three galaxies, A, B, and C in this scenario that all differ in redshift by more than 0.05. A and B also happen to have $0.05 < z < 0.2$ and are therefore candidate primary targets for our study. If the projected sep-

Континуум – медианной фильтрацией, обходя особенно мощные спектральные детали

Собирают все спектры в стек, сдвигая к rest-frame

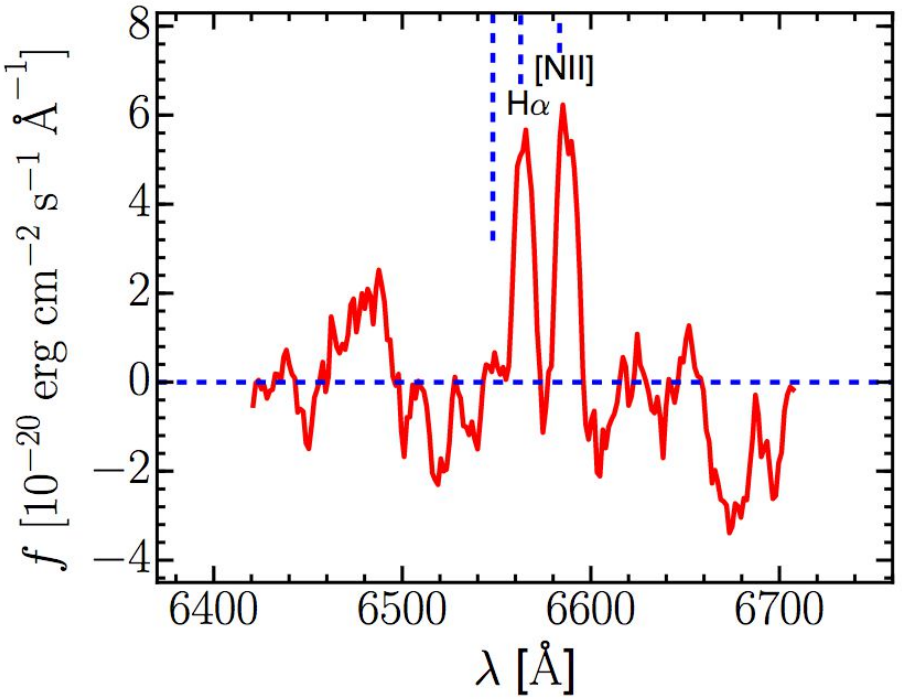


FIG. 4.— The boxcar smoothed composite spectra at $r_p < 50$ kpc, where the boxcar width corresponds to ± 275 km s^{-1} or approximately the maximum rotation velocities of our primary galaxies. We label the location of Hα and the two satellite [NII] lines with vertical dashed lines. The peak values of Hα and the redder of the [N II] lines constitute $> 4\sigma$ detections and the

Много внимания – тестам, источникам систематических ошибок и пр.

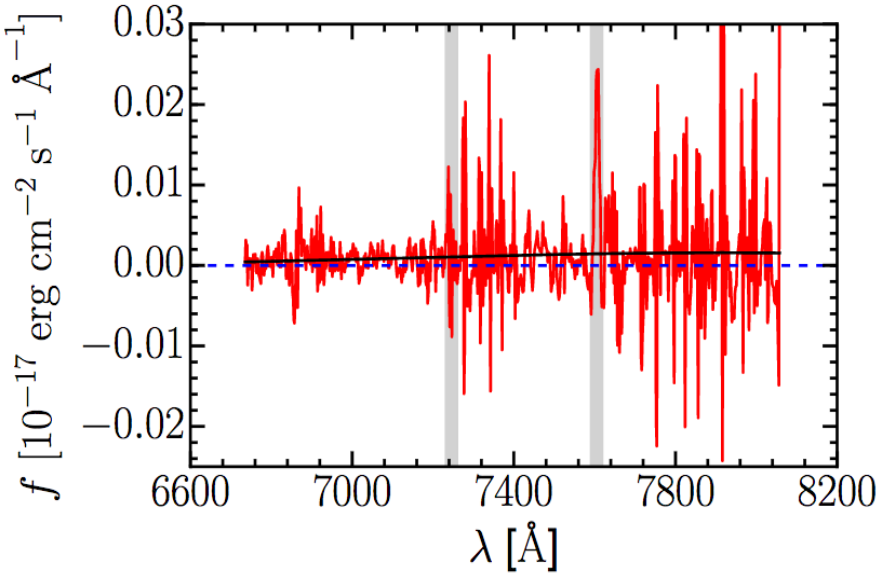
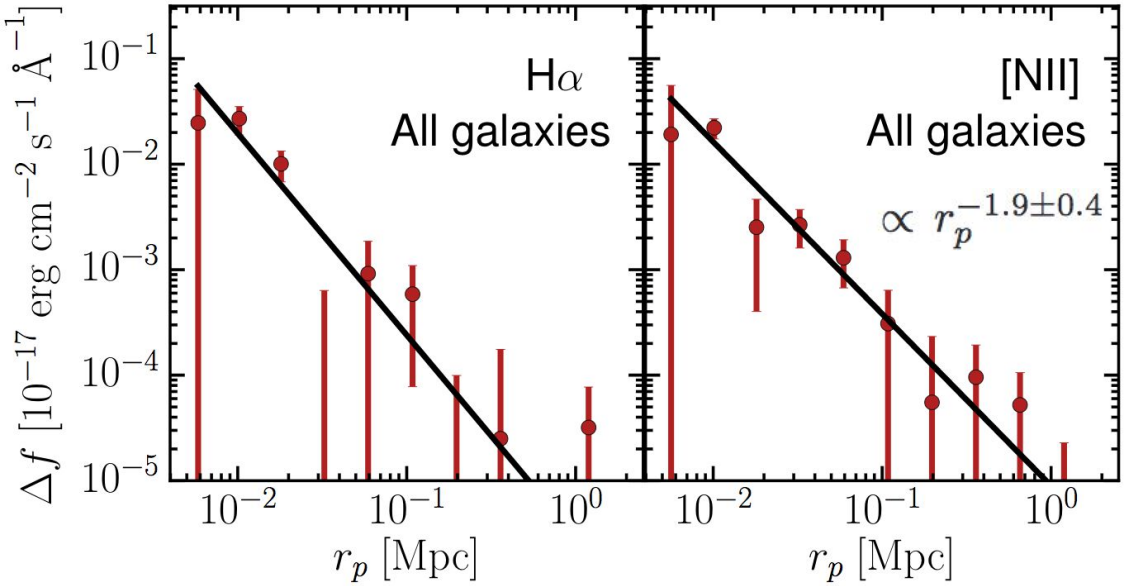
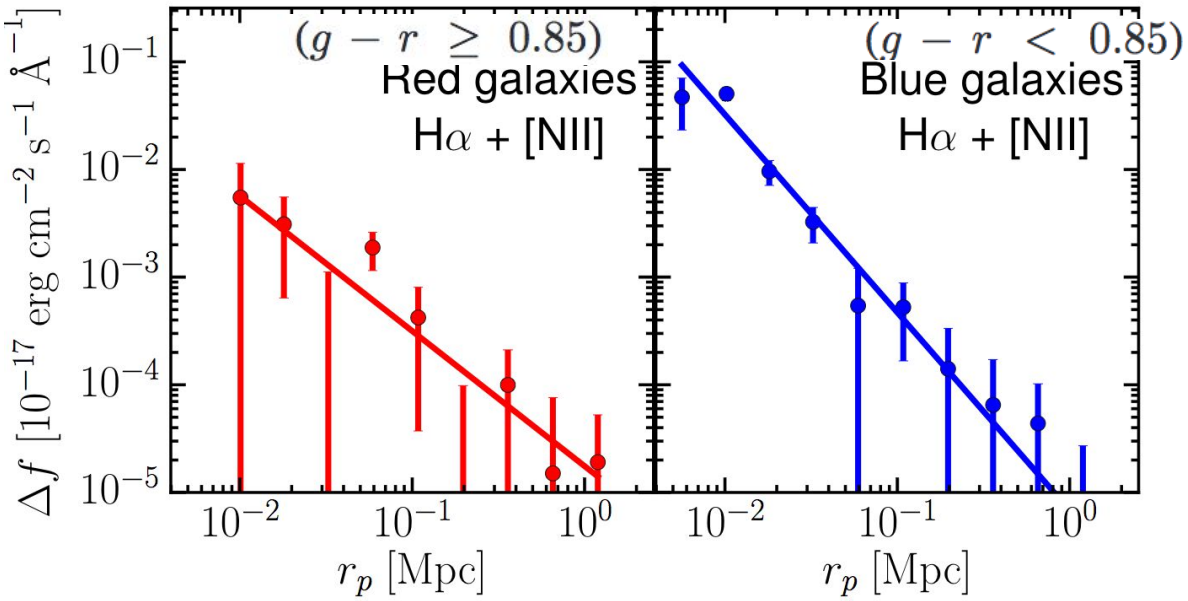


FIG. 5.— Average residual sky background from a stack of 7,245,797 spectra. The solid curve is the best fit polynomial to the sky background. The



We obtain a 3 σ detection of Hα+ [NII] emission in the 50-100 kpc bins

up to 100 kpc (Figure 9). The mean value of the emission from this sample at projected radii between 50 and 100 kpc is $(1.10 \pm 0.35) \times 10^{-20}$ erg s^{-1} cm^{-2} Å^{-1}. The units of



Эмиссия в “голубых” галактиках на r< 20 kpc
заметно больше, чем в красных

be the situation. The emission rate per cm^3 is given by $N_e N_p \alpha^{\rm eff}_{\rm H\alpha}$, where N_e and N_p are the electron and proton volume number densities and $\alpha^{\rm eff}_{\rm H\alpha}$ is the effective recombination rate ($cm^3 s^{-1}$). The electron and proton densities are taken to be equal and roughly $10^{-3.8}$ cm^{-3} using $n_{\rm H} = 10^{-4.2}(r_p/{\rm R_{vir}})^{-0.8}$ (Werk et al. 2014) and $r_p/{\rm R_{vir}} = 0.3$ for the middle of the 50 to 100 kpc r_p bin. The energy released in one Hα photon is 3×10^{-12} erg, enabling us to convert the recombination rate into a power. The luminosity distance at a typical redshift in the sample, $z = 0.1$, is 460 Mpc and the angular diameter distance is 380 Mpc. If we assume emission detected in a fiber comes from a 3 arcsec tube on the sky that is 75 kpc in length along the line of sight, we estimate that the measured flux should be $1.6 \times 10^{-7} \alpha^{\rm eff}_{\rm H\alpha}$ erg s^{-1} cm^{-2} $arcsec^{-2}$. In these units, our detection in the 50 to 100 kpc bin (Table 4) corresponds to 1.9×10^{-20} for Hα + [NII] and 1.0×10^{-20} for Hα only. For $\alpha^{\rm eff}_{\rm H\alpha}$, we adopt the fitting formula presented by Pequignot, Petitjean & Boisson (1991),

$$\alpha^{\rm eff}_{\rm H\alpha} = 10^{-13} \frac{2.274\ {\rm T}^{-0.659}}{1 + 1.939\ {\rm T}^{0.574}},$$

where T is the temperature in units of 10^4 K. Solving for T, we find that our observed flux, in combination with the density profile from Werk et al. (2014), result in an estimated temperature of ~12,000 K.

Очень общие соображения об измерении T, самиэто отмечают, но рады, что получили физически осмысленную величину :)

Говорят, о “нормальных галактиках”, но не было селекции AGN/QSO :(