Investigating feedback in the z = 2.92 radio galaxy MRC 0943-242 with XSHOOTER ifu and slit spectroscopy

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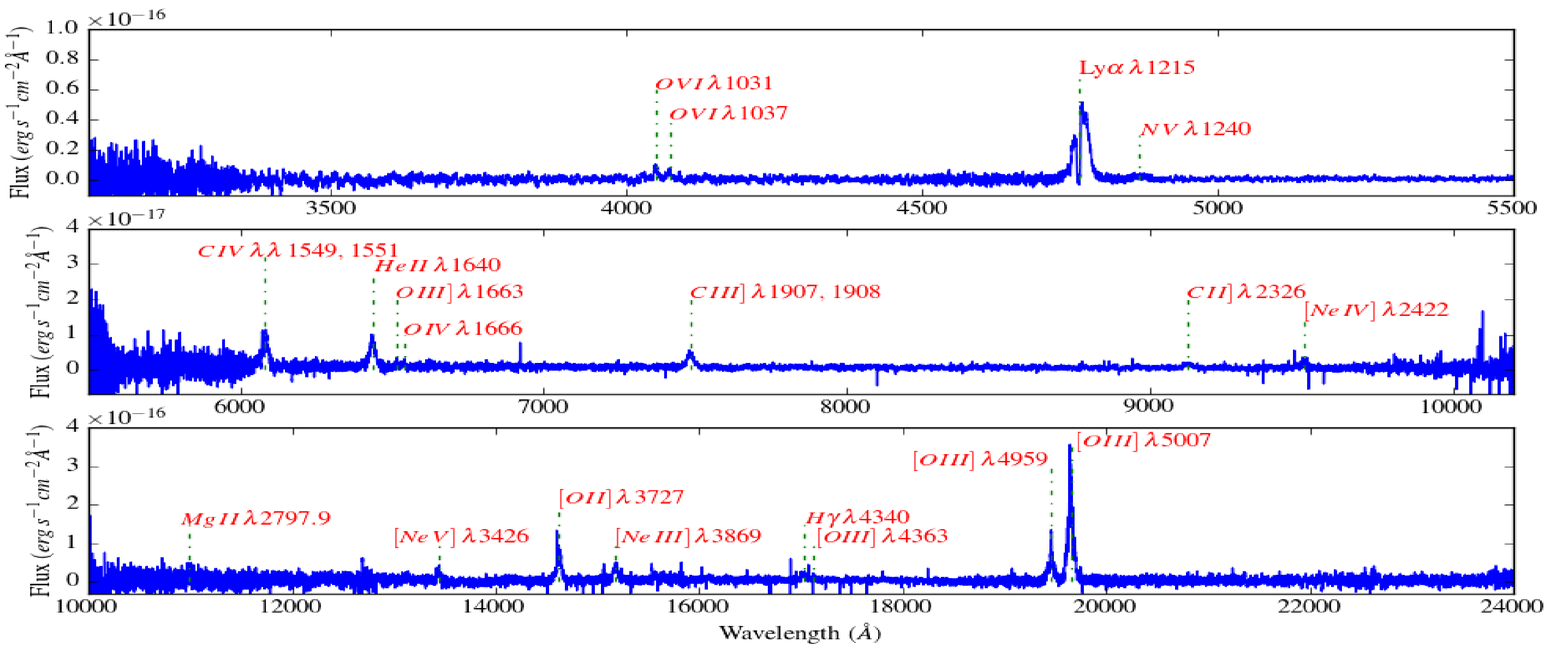
Abstract

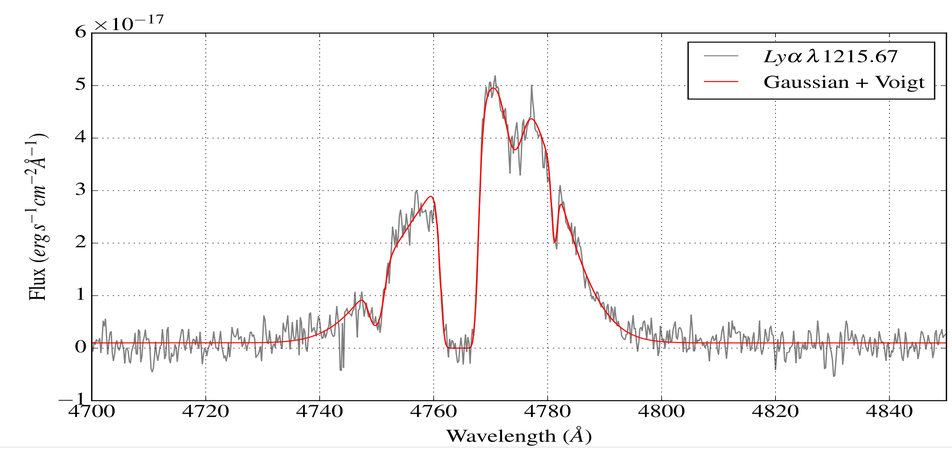
High-redshift radio galaxies present great practical advantages when we want to study the formation and coevolution of massive galaxies and their central black holes. Key questions for understanding the evolution of galaxies include (a) the timing and impact of feedback processes (both positive and negative); (b) the interaction between the central supermassive black hole and the stellar and gaseous components of the host galaxy; (c) the transfer and escape of Lyα and Lyman continuum photons. We are presenting preliminary results from a study of the $z = 2.92$ radio galaxy MRC $0943 - 242$ using VLT Xshooter IFU and slit spectroscopy covering the rest frame UV and optical spectral range. The main scientific goal of our project is to investigate issues relating to galaxy evolution and feedback processes (AGN-mode or radio-mode) on the gas component of the host galaxy, with a spatially resolved investigation using emission and absorption lines such as Lyα $\lambda\,1216$, C IV $\lambda\lambda\,1548, 1551$, [O III] $\lambda\lambda\,4959, 5007$, etc.

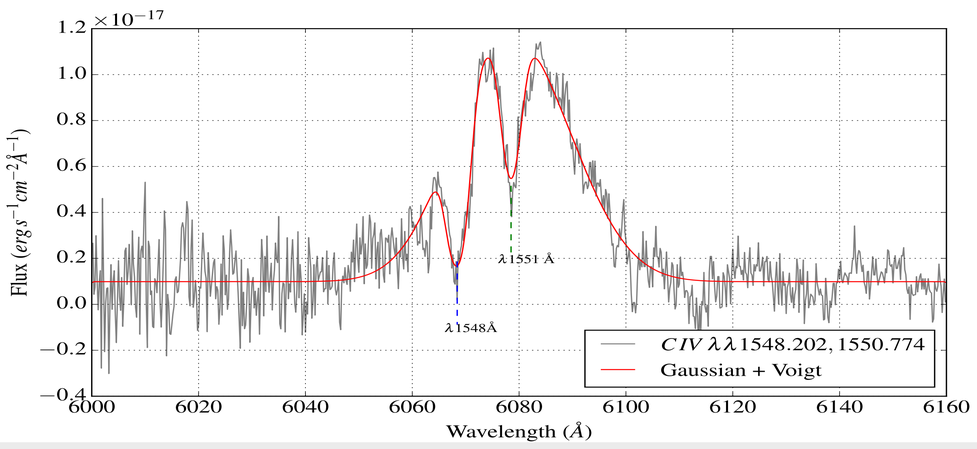
Spectrum of MRC0943-242



Lyα λ1215.67 and CIVλλ1548.2, 1550.8 profiles

The Lyα and CIV profile with our model fits superimposed. For Lyα we have found a HI column density $log_{10}N_{HI} = 15.41 \pm 0.07$. Assuming this absorber is a spherical shell of radius > 60 kpc (Binette et al. 2000; Gullberg et al. 2015) we estimate the HI mass to be at least $\sim 10^6\,M_\odot$.

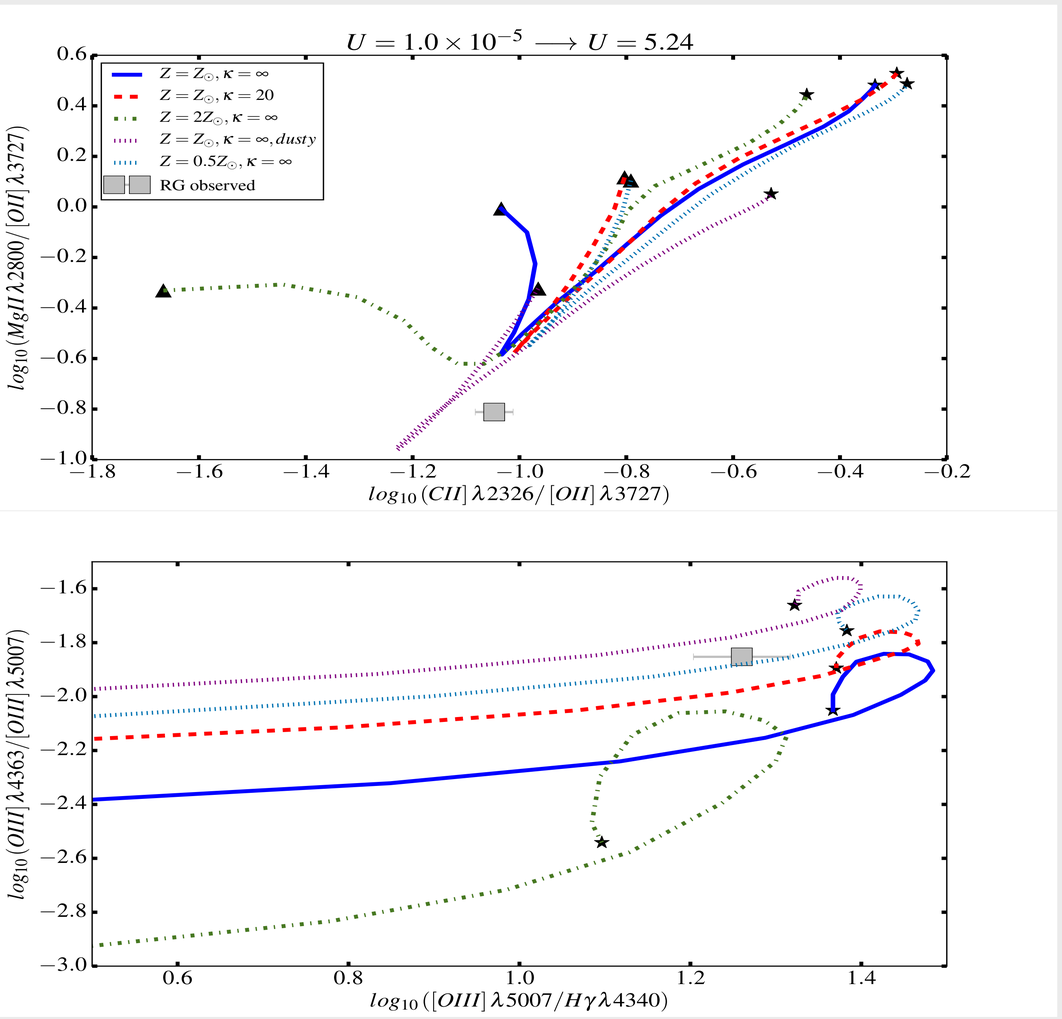




The two troughs correspond to the CIV$\lambda\lambda$1548.2, 1550.8 doublet produced by the main absorption system, showing the absorber is ionized and metal enriched. For the main absorber we have found a CIV column density $log_{10}N_{CIV} = 14.61 \pm 0.03$ compatible with previous studies (Binette et al. 2000; Jarvis et al. 2002).

AGN Photoionization Models

Photoionization model line fluxes using ionizing powerlaw $\alpha = -1.5$ and the ionization parameter U varying from left to right. Our preliminary analysis shows significant deviations from our baseline solar metallicity model sequence. For example, Mg II is unexpectedly weak, possibly due to depletion of Mg into dust or absorption. The electron temperature is unexpectedly high which may be explained by subsolar gas metallicity, κ - distributed electron energies, or perhaps shocks [not shown].



References

• Binette, L. et al., 2000,A&A 356, 23 • Gullberg et al., 2015, A&A 586,A124 • Humphrey, A. et al. 2007, MNRAS 375, 705 • Jarvis, M. J. et al., 2003, MNRAS 338, 263 • Villar-Martin,M. et al., 2003, MNRAS 346, 273