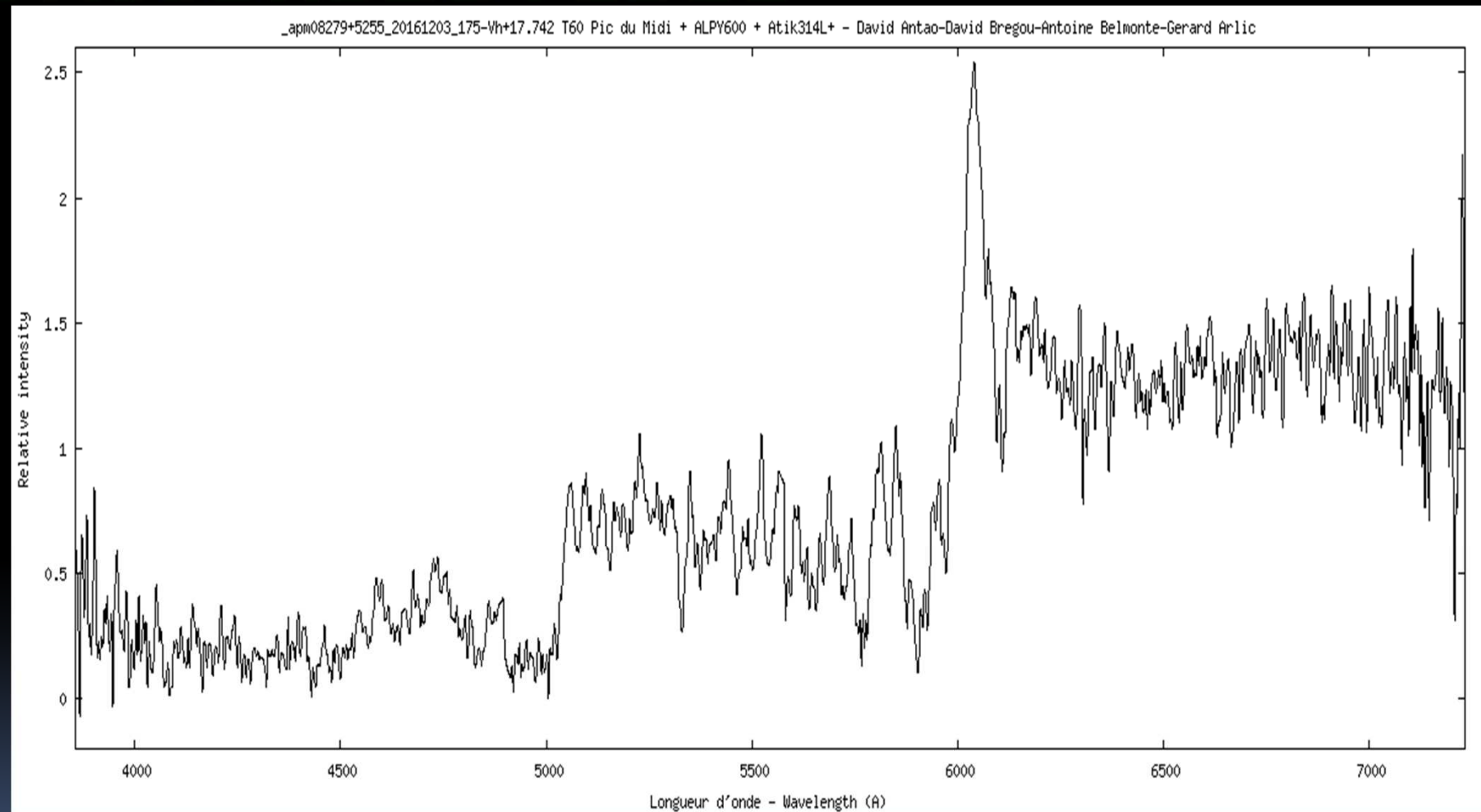


# APM08279+5255



RAAGSO 15 sept 2018

David Antao – Apam



APM 08279+5255: AN ULTRALUMINOUS BROAD ABSORPTION LINE QUASAR AT A  
REDSHIFT  $z = 3.87$

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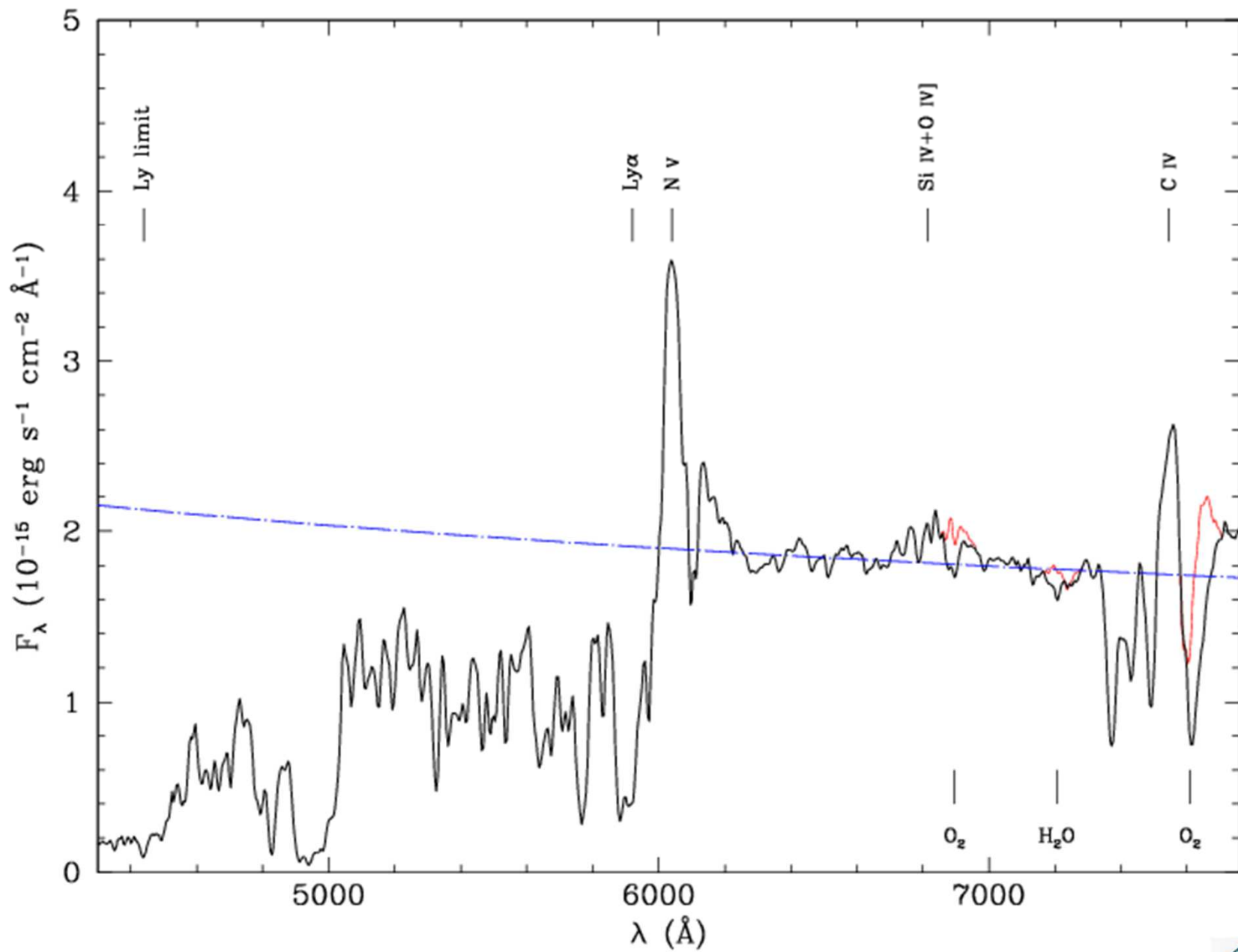
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ABSTRACT

We report on the discovery of a highly luminous, broad absorption line quasar at a redshift of  $z = 3.87$ , which is positionally coincident, within  $1''$ , with the *IRAS* Faint Source Catalog source F08279+5255. A chance alignment of the quasar and the *IRAS* source is extremely unlikely, and we argue that the optical and far-infrared flux are different manifestations of the same object. With an *R*-band magnitude of 15.2 and an *IRAS* 60  $\mu\text{m}$  flux of 0.51 Jy, APM 08279+5255 is (apparently) easily the most intrinsically luminous object known, with  $L_{\text{Bol}} \sim 5 \times 10^{15} L_{\odot}$ . Optical CCD photometry of the system, taken in good seeing, shows evidence that the system is slightly elongated. Although these data are consistent with the superposition of the quasar on a vastly luminous galaxy, we argue that a more likely scenario is that the optical image implies the presence of two unresolved point sources. Such a configuration suggests that gravitational lensing may play a significant role in amplifying the intrinsic properties of the system. Point-spread function fitting of two discrete sources gives a separation of  $\sim 0''.4$  and an intensity ratio  $\sim 1.1$ . The optical spectrum of the quasar clearly reveals the presence of three potential lensing galaxies, Mg II absorption systems at  $z = 1.18$  and  $z = 1.81$ , and a damped Ly $\alpha$  absorption system at  $z = 3.07$ . Additional, as yet unseen, lensing galaxies may also be present. We estimate the total amplification of the optical component to be  $\approx 40$  but, owing to the larger scale of the emitting region, would expect the infrared amplification to be significantly less. Even making the conservative assumption that all wavelengths are amplified by a factor 40, APM 08279+5255 still possesses a phenomenal luminosity of  $\gtrsim 10^{14} L_{\odot}$ , indicating that it belongs to a small but significant population of high-redshift, hyperluminous objects with copious infrared emission.

*Subject headings:* gravitational lensing — infrared: galaxies — quasars: absorption lines —  
quasars: individual (APM 08279+5255)





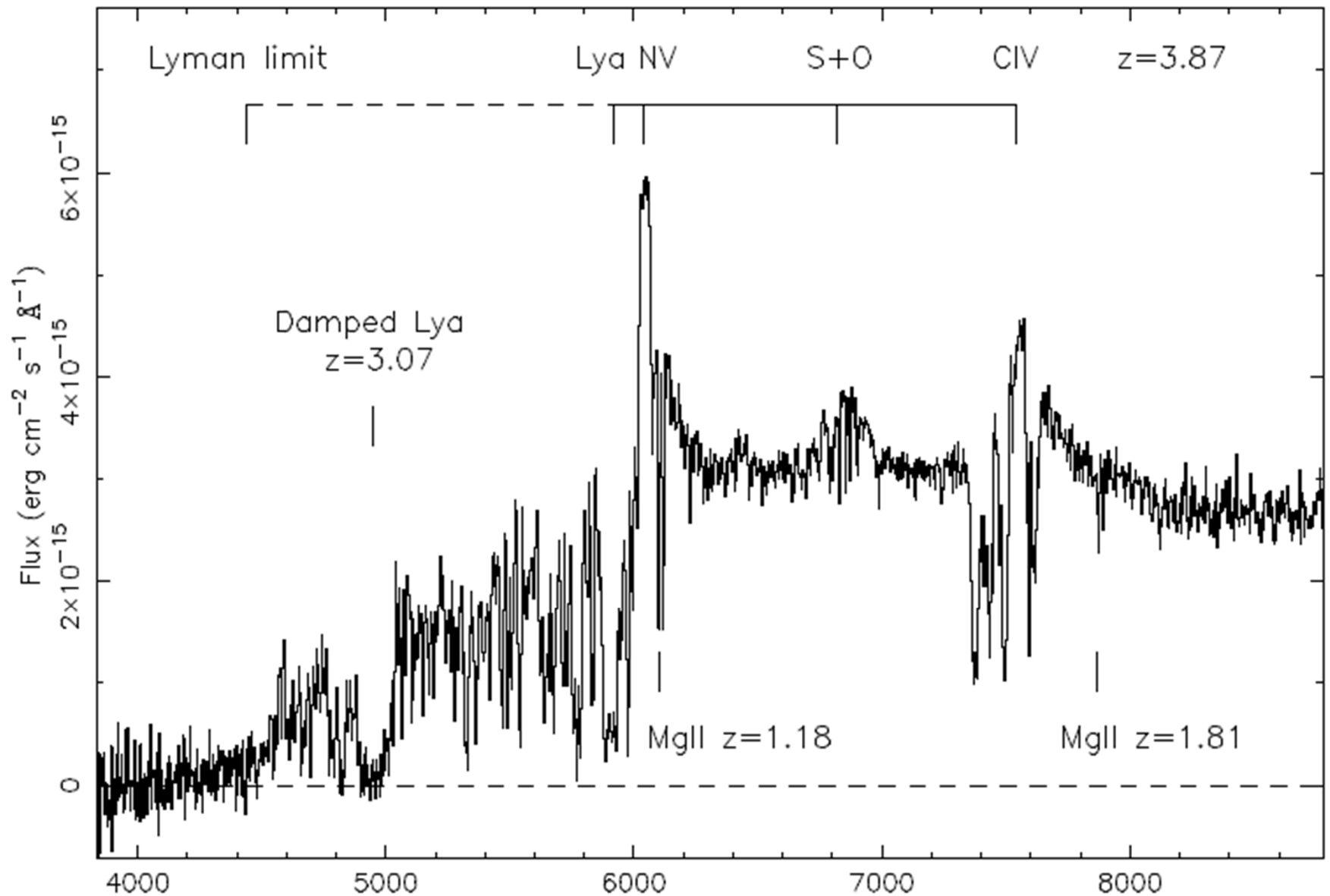
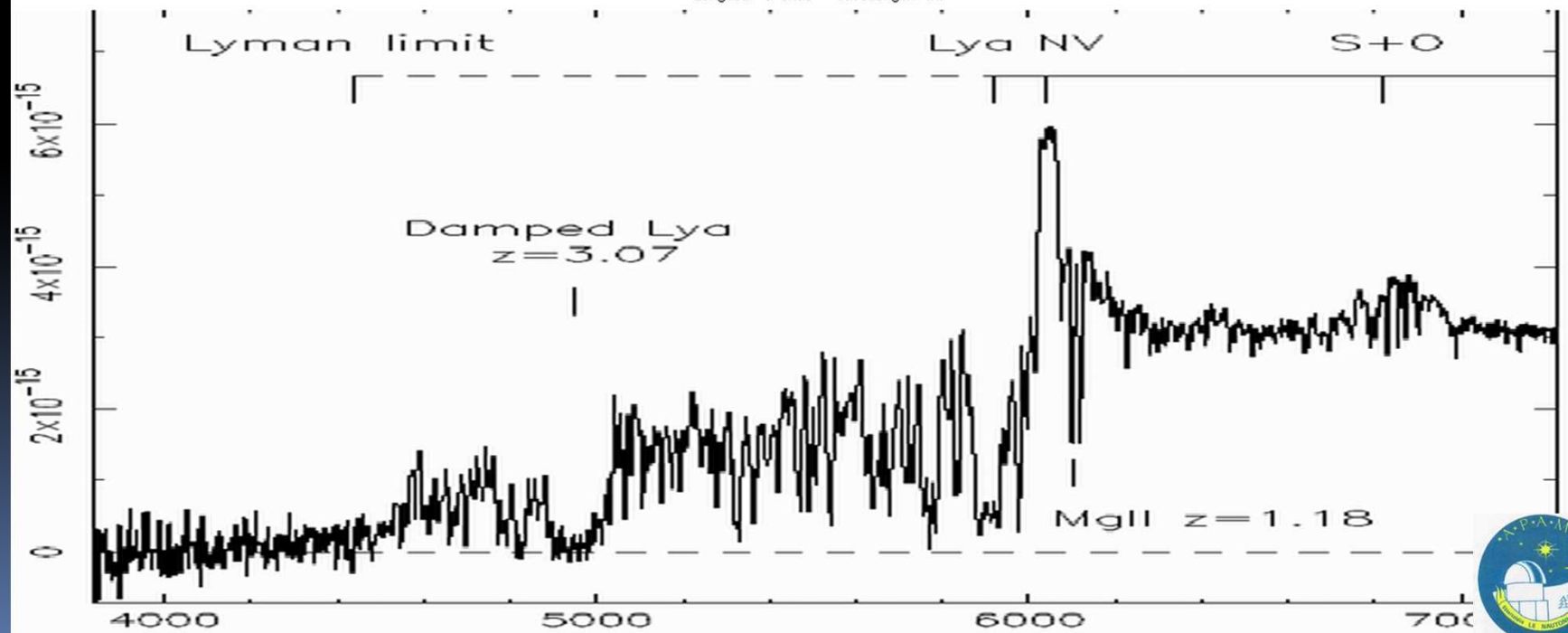
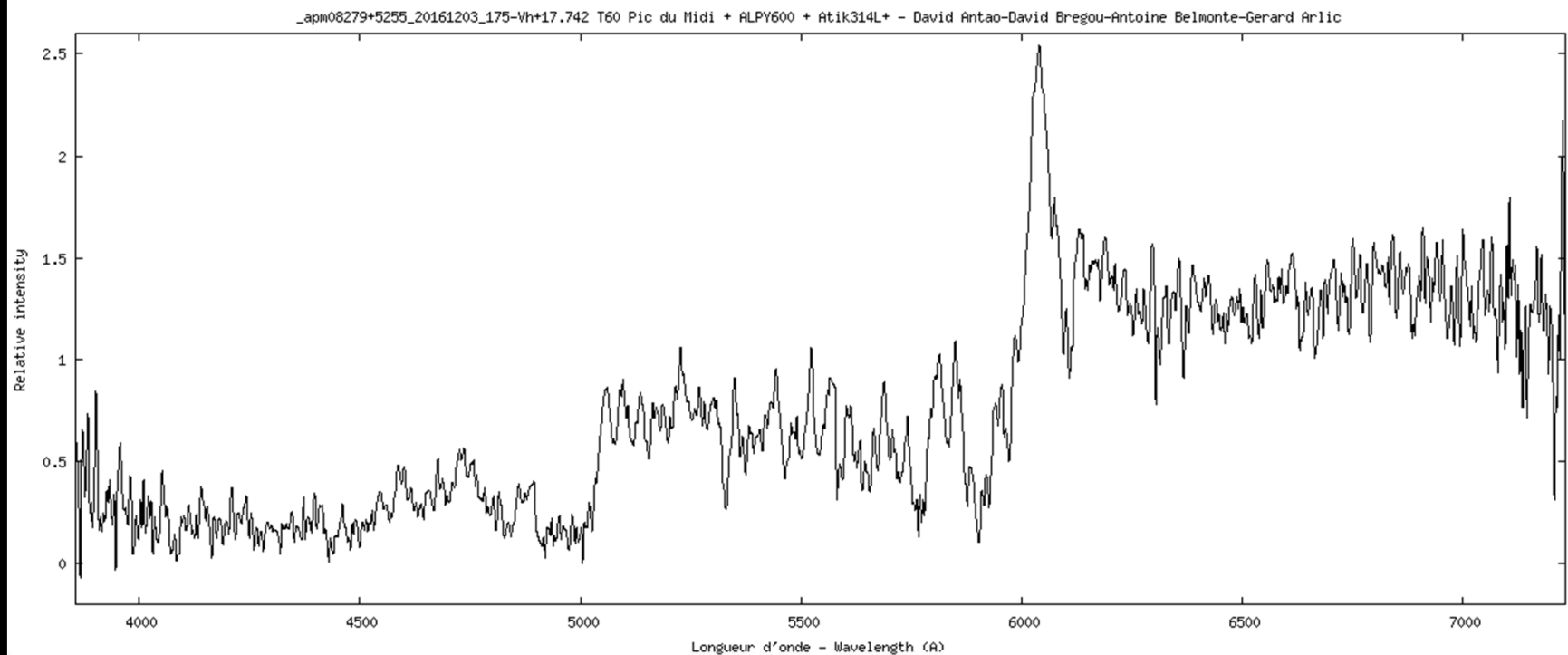
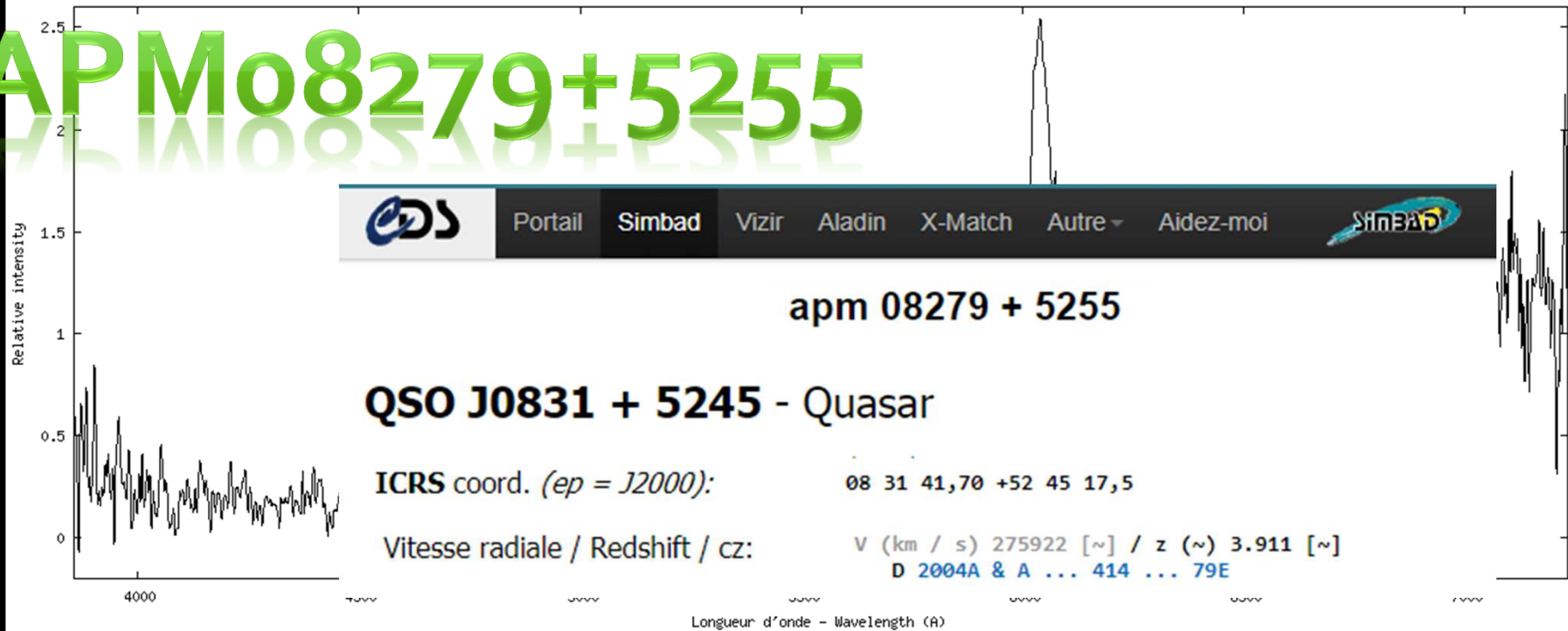


FIG. 1.—Optical spectra of APM 08279+5255 taken with the 2.5 m Isaac Newton Telescope. Features typical of high-redshift quasars, namely, strong N v and C iv emission lines, are clearly visible. The emission lines are seen to possess broad absorption troughs consistent with high-velocity bulk outflows associated with the quasar. It is interesting to note that Ly $\alpha$  emission is extremely weak, probably due to self-absorption by neutral gas along the line of sight but within the quasar. Also apparent is absorption beyond the Lyman limit and in the Ly $\alpha$  forest. Coupled with this, a damped Ly $\alpha$  system is visible at  $z = 3.07$ , as well as Mg II doublets of equivalent widths 10.3  $\text{\AA}$  and 2.8  $\text{\AA}$ , consistent with galactic systems at  $z = 1.18$  and  $z = 1.81$ , respectively.





# APM08279+5255



Raies	I	II	III	IV	V	Moyenne	Incertitude	Valeur au repos	Calcul Vr en Km/s
N V	6040.5649	6040.0437	6040.023	6039.0838	6039.8795	6039.919	0.478	1240	275 542.99

$$V_{r_{Rel}} = c \frac{\left(\frac{\lambda_1}{\lambda_0}\right)^2 - 1}{\left(\frac{\lambda_1}{\lambda_0}\right)^2 + 1}$$

Incertitude 5 mesures en km/s	Incertitude rms en km/s	Somme incertitude en Km/s
23.73	18.67	30.20

$$z = \frac{\lambda_0 - \lambda_e}{\lambda_e}$$

z 3.87

Distance en Mpc	Distance en AL
3749.9	12 224 688 848

APM 08279 + 5255: ULTRALUMINOUS BAL QUASAR AT  $z = 3.87$

CONCLUSIONS

bolometric luminosity  $\gtrsim 5 \times 10^{15} L_{\odot}$  redshift of 3.87

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