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Rapid-response mode VLT/UVES spectroscopy of GRB 060418

Conclusive evidence for UV pumping from the time evolution of Fe II and Ni II excited- and metastable-level populations

(*Corrigendum*)

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We have recently realized that, in Eq. (3) in Vreeswijk et al. (2007), the flux $F_\nu(\tau_0)$ should be divided by $4\,\pi$. The relation should therefore read as follows:

$$\frac{\mathrm{d}N_\mathrm{u}}{\mathrm{d}t} = N_\mathrm{l} B_\mathrm{lu} \frac{F_\nu(\tau_0)}{4\,\pi} - N_\mathrm{u} \left[A_\mathrm{ul} + B_\mathrm{ul} \frac{F_\nu(\tau_0)}{4\,\pi} \right]. \quad (3)$$

Using this relation, our excitation program is now fully consistent with the PopRatio code (Silva & Viegas 2002, see also Sect. 5.2) when neglecting collisional excitation, and in the optically thin regime as PopRatio assumes all transitions are optically thin. The consequence is that excitation is a factor of $4\,\pi$ less effective than we had previously assumed, resulting in a decreased distance estimate by a factor of $\sqrt{4\,\pi} \sim 3.5$. Therefore, the distance of GRB 060418 to the neutral absorbing material – previously $d = 1.7 \pm 0.2$ kpc – needs to be revised to $d = 0.48 \pm 0.06$ kpc, under the same model assumptions. The main conclusion of the paper, that the neutral absorbing gas is not in the immediate environment of GRB 060418, remains the same.

Since we applied the same excitation analysis in Sect. 4.1.3 of Fox et al. (2008) and in Sect. 2.3 of Ledoux et al. (2009), the distance estimates therein should also be scaled down by a factor of $\sqrt{4\,\pi}$. The main conclusions of these two papers are not affected by this change either.

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