Spectral evolution and calcium white dwarfs in J-PLUS

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We complement the *Gaia*-based catalog presented in Gentile Fusillo et al. 2021 with the optical photometry from the Javalambre Photometric Local Universe Survey (J-PLUS) DR2, covering $2\,176$ deg^2 with 12 passbands ($ugriz$ + 7 medium bands). We define a common sample of $5\,926$ white dwarfs with $r < 19.5$ mag and derive their effective temperature ($T_{\rm eff}$), surface gravity, mass (M), and atmospheric composition (H- *versus* He-dominated). We also estimate the presence of polluting metals with the $J0395$ filter in J-PLUS, sensitive to the calcium H+K absorption.

We find that (i) the fraction of white dwarfs with He-dominated atmospheres ($f_{\rm He}$) has a minimum of $8 \pm 2\%$ at $T_{\rm eff} > 20\,000$ K. Then, $f_{\rm He}$ increases by $21 \pm 3\%$ between $T_{\rm eff} \sim 20\,000$ K and $T_{\rm eff} \sim 5\,000$ K. (ii) The mass distribution at $d < 100$ pc for H-dominated white dwarfs agrees with previous work, presenting a dominant $M = 0.59\,M_\odot$ peak and an excess at $M \sim 0.8\,M_\odot$. This high-mass excess is absent in the He-dominated distribution, which presents a single peak. (iii) The fraction of white dwarfs with calcium H+K absorption increases from nearly zero at $T_{\rm eff} \sim 14\,000$ K to 15% at $T_{\rm eff} \sim 6\,000$ K. This trend reflects the dependence of the calcium absorption intensity on both the temperature and the [Ca/He] abundance. (iv) We defined a sample of 39 white dwarfs with high probability ($> 99\%$) of having polluting metals. 20 sources are already classified as DZs in the literature, and we confirmed 6 more as DZs with new OSIRIS/GTC spectroscopy.

The medium bands from J-PLUS complement the *Gaia* data to derive atmospheric compositions and spot the presence of polluting metals. These analysis will be improved thanks to J-PAS, that with 56 medium bands of 145 nm spaced by 10 nm to cover the optical range will provide low-resolution ($R \sim 50$) data down to $r = 21.5$ mag.