*Magnetic Stars, 2011, pp. 468 – 469*

# Is *a* Centauri the Hottest Star with Lanthanides in Its Spectrum? ⋆

**Cowley C. R.**[1], **Hubrig S.**[2], **González J. F.**[3]

[1] Department of Astronomy, University of Michigan, Ann Arbor, USA
[2] Astrophysikalisches Institut Potsdam, Potsdam, Germany
[3] Instituto de Ciencias Astronómicas, de la Tierra y del Espacio, San Juan, Argentina

**Abstract.** The Ce III spectrum is clearly present in *a* Cen, making it a candidate for the hottest CP star with a lanthanide in its spectrum. Also present are Kr II, and interesting broad absorption features. Nd III is possibly present, but needs confirmation. Since a detailed description of this study is now accepted for publication, and already available as arXiv:1010.3355, we confine ourselves to a few remarks.

**Key words:** Stars: chemically peculiar – stars: variable – stars: individual (*a* Cen) – line: identification

## 1 New Identifications in the *a* Cen Spectrum

The helium variable *a* Cen is a bright and well–studied star. Nevertheless, a few interesting details were found by an old technique. We obtained accurate wavelengths for all discernible absorption lines and analyzed the data by wavelength coincidence statistics (WCS, Cowley & Hensberge, 1981). The measured spectrum was downloaded from the UVESPOP archive (Bagnulo et al., 2003). In addition of the confirmation of earlier work, we were able to make new identifications of Ce II and Kr II.

New identifications are now possible, even in well–studied stars, because of superior wavelength coverage of the new material as well as new atomic spectral data. In the case of Kr II, however, the initial WCS results were based on wavelengths from (De Bruin et al., 1933). Most modern stellar spectroscopists make identifications by spectral synthesis rather than the analysis of wavelengths. This is a powerful technique. But in the case of Kr II, oscillator strengths were not in the data bases commonly used for synthesis (VALD, Kupka et al., 1999; Kurucz, 2010), though some values were available from the NIST site (Ralchenko et al., 2010). Thus, the Kr II lines would most probably not have been synthesized even if a recent attempt had been made. Moreover, a modern synthesis of the *a* Cen spectrum would be a formidable task, due to the complexities of the stellar surface (Bohlender et al., 2010).

## 2 Broad Absorptions

One of the Kr II lines, $\lambda$ 4619.2, falls within a broad, shallow absorption feature that is present in a number of early B–type stars. We are unaware of a previous discussion of this particular feature, but its detection requires high–quality spectroscopic material. Underhill & Klinglesmith

⋆ Based on observations collected at the European Southern Observatory, Paranal, Chile (ESO programmes 65.L–0316(A), 073.D–0504(A), and 076.B–0055(A))

(1973) have discussed other broad absorption features. At least two of these features appear on our spectra. Identifications are not available at this time, though we suggest the one near 4619 Å may be due to C II.

## 3 Conclusions

The abundances of very heavy elements in early spectra are largely unknown.

**Acknowledgements.** Thanks are due to colleagues at NIST as well as M. Dimitrijević and M. Bautista for advice concerning the broad absorption feature near $\lambda$ 4619. This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France. Our calculations made extensive use of the VALD atomic data base (Kupka et al., 1999). We are grateful for the UVES public data archive.

## References

Bagnulo S., Jehin E., Ledoux C., Cabanac R., Melo C., Gilmozzi R., The ESO Paranal Science Operations Team, 2003, ESO Messenger, 114, 10 (http://www.sc.eso.org/santiago/uvespop)

Bohlender D. A., Rice J. B., Hechler P., 2010, A&A, 520, 44

Cowley C. R., Hensberge H., 1981, ApJ, 224, 252

De Bruin T. L., Humphreys C. J., Meggers W. F., 1933, J. Res. Nat. Bur. Stand. (US), 11, 409

Kurucz R. L., 2010, http://kurucz.harvard.edu/LINELISTS/GFALL/

Kupka F., Piskunov N. E., Ryabchikova T. A., Stempels H. C., Weiss W. W., 1999, A&AS, 138, 119

Ralchenko Yu., Kramida A. E., Reader J., NIST ASD Team, 2010, NIST Atomic Spectra Database [Online] (http://physics.nist.gov)

Underhill A. B., Klinglesmith D. A., 1973, A&A, 25, 405