Laboratory Astrophysics: from Observations to Interpretation
Proceedings IAU Symposium No. 350, 2019
F. Salama & H. Linnartz, eds.
doi:10.1017/S1743921320000046

The Belgian Repository of fundamental Atomic data and Stellar Spectra (BRASS)

M. Laverick[1,2], A. Lobel[2], P. Royer[1], T. Merle[3], C. Martayan[4], P. van Hoof[2], M. Van der Swaelmen[3], M. David[5], H. Hensberge[2] and E. Thienpont[6]

[1]Instituut voor Sterrenkunde, KU Leuven, Celestijnenlaan 200D, box 2401, 3001 Leuven, Belgium

[2]Royal Observatory of Belgium, Ringlaan 3, B-1180 Brussels, Belgium
email: mikelaverick@btinternet.com

[3]Institut d'Astronomie et d'Astrophysique, Université Libre de Bruxelles, Av. Franklin Roosevelt 50, CP 226, 1050 Brussels, Belgium

[4]European Organisation for Astronomical Research in the Southern Hemisphere, Alonso de Córdova 3107, Vitacura, 19001 Casilla, Santiago de Chile, Chile

[5]Onderzoeksgroep Toegepaste Wiskunde, Universiteit Antwerpen, Middelheimlaan 1, 2020 Antwerp, Belgium

[6]Vereniging voor Sterrenkunde, Kapellebaan 56, 2811 Leest, Belgium

Abstract. The Belgian Repository of fundamental Atomic data and Stellar Spectra (BRASS) aims to provide one of the largest systematic and homogeneous quality assessment to date of literature atomic data required for stellar spectroscopy. By comparing state-of-the-art synthetic spectrum calculations with extremely high-quality observed benchmark spectra, we have critically evaluated fundamental atomic data, such as line wavelengths and oscillator strengths, for thousands of astrophysically-relevant transitions found in the literature and across several major atomic data repositories. These proceedings provide a short overview of the BRASS project to date, highlighting our recent efforts to investigate and quality-assess the atomic literature data pertaining to over a thousand atomic transitions present in FGK-type stellar spectra. BRASS provides all quality assessed data, theoretical spectra, and observed spectra in a new interactive database under development at brass.sdf.org.

Keywords. atomic data, line: profiles, Astronomical databases: miscellaneous

1. What is BRASS?

BRASS is an international research project to create a new on-line interactive public database which provides high quality benchmark stellar spectra coupled with atomic transition data. Originally outlined in Lobel *et al.* (2017), the main scientific goal of the BRASS project is to critically evaluate the available atomic data literature required for quantitative stellar spectroscopy, in order to help constrain and reduce the propagation of systematic uncertainties in stellar spectroscopy arising from adopted input atomic data. In addition to quality-assessed atomic data, BRASS shall also provide a number of extremely high-quality stellar spectra, spanning B-,A-,F-,G-, and K- spectral types, alongside the quality-assessed literature atomic data, through a new online interactive database currently under development at brass.sdf.org.

2. What does BRASS provide?

To date BRASS has successfully retrieved and cross-matched almost 500,000 atomic data entries, corresponding to ∼82,000 unique atomic transitions in the optical wavelength range 4200-6800Å, from a number of atomic databases such as VALD (Ryabchikova *et al.* (2015)), NIST (Kramida *et al.* (2018)), and providers within the VAMDC (Dubernet *et al.* (2016)). The details of our retrieval and cross-match work, as well as comparisons between literature oscillator strengths for the unique spectral lines, are discussed in Laverick *et al.* (2018).

More recently, BRASS has completed its first quality assessment investigation of the available atomic data, such as rest wavelengths and oscillator strengths, for over a thousand atomic transitions present in FGK-type stellar spectra, spanning more than a hundred atomic literature works. In addition we provide the first several benchmark stellar spectra of FGK-type stars, taken using the Mercator-HERMES spectrograph at a resolution of R∼85,000 and with signal-to-noise ratios of S/N∼1000 (Raskin *et al.* (2011)). The details of our benchmark spectra, quality assessment investigation, and our findings, are explored in Laverick *et al.* (2019).

BRASS shall soon expand our benchmark spectra sample to around ∼20 objects, spanning late B-type stars down to K-type stars. An additional ∼100 BAFGK-type spectra, taken using both the Mercator-HERMES and VLT-UVES spectrographs (Dekker *et al.* (2000)) and with signal-to-noise ratios of S/N∼300, will also be made available via the BRASS website. Finally, BRASS shall soon publish new radial velocity standard stars for hot B- and A- type stars (Lobel *et al.* in prep).

3. How can I find the BRASS data?

All our spectra, retrieved atomic data, and quality assessment results can be found at the BRASS project website (brass.sdf.org) due for official release in late 2019. Our quality assessment results can also be found in the appendices of Laverick *et al.* (2019), and in digital form via the corresponding CDS links. Additionally, each of the 1091 investigated spectral lines has a dedicated HTML page (hyperlinks presented in the aforementioned appendix tables and via the interactive spectrum viewer of the BRASS website) which consolidate all intermediate and final results of our FGK quality assessment work into one page, including interactive line profile plots.

References

Dubernet, M. L., Antony, B. K., Ba, Y. A., *et al.* 2016, *J. phys. B: At. Mol. Opt. Phys.*, 49, 074003

Dekker, H. *et al.* 2000, *SPIE*, 4008, 534

Kramida, A., Ralchenko, Y., Reader, J., & NIST ASD Team 2018. NIST Atomic Spectra Database (version 5.6.1) [Online]. Available: http://physics.nist.gov/asd

Lobel, A., Royer, P., Martayan, C., *et al.* 2017, *Can. J. Phys.* 2017, 95, 833

Laverick, M., Lobel, A., Merle, T., *et al.* 2018, *A&A*, 612, A60

Laverick, M., Lobel, A., Royer, P., *et al.* 2019, *A&A*, 624, A60

Raskin, G., Van Winckel, H., Hensberge, H., *et al.* 2011, *A&A*, 526, A69

Ryabchikova, T., Piskunov, N., Kurucz, R., *et al.* 2015, *PhysS.*, 90, 5

https://doi.org/10.1017/S1743921320000046 Published online by Cambridge University Press