“III Congreso Latinoamericano de Astrobiología (2021)”
Revista Mexicana de Astronomía y Astrofísica Serie de Conferencias (RMxAC), **55**, 91–91 (2023)

https://doi.org/10.22201/ia.14052059p.2023.55.27

III Latin American Congress of Astrobiology (3CLA)(Virtual-Modality, August 3-6, 2021)
Editors: Leticia Carigi, Sandra I. Ramírez Jiménez, Miguel Chávez Dagostino, and Millarca Valenzuela - DOI: https://doi.org/10.22201/ia.14052059p.2023.55.27

A PECULIAR CHEMICAL PATTERN IN THE WASP-160 BINARY SYSTEM

E. Jofré[1,2,11], R. Petrucci[1,2,11], Y. Gómez Maqueo Chew[1], I. Ramírez[3], C. Saffe[4,5,11], E. Martioli[6,7], A. Buccino[8,9,11], Martin Mašek[10], L. García[2], E. Canul[1], and M. Gómez[2,11]

Observations suggest that the components of binary systems form coevally from the same molecular cloud and share the initial chemical composition (e.g., Hawkins et al. 2020). Hence, wide binary stars with similar components (difference in effective temperature $\lesssim$ 300 K and difference in surface gravity $\lesssim$ 0.2 dex.) hosting planets provide a unique opportunity for exploring the star-planet chemical link (e.g., Meléndez et al. 2009; Saffe et al. 2016, 2017). To date, only five wide binaries with planets around one component have been previously studied in the literature (see e.g., Ramírez et al. 2019, and references therein). Here we expand the small sample of well-studied planet-hosting binary stars by presenting the chemical abundance pattern of the WASP-160 binary system.

From high-quality Gemini-GRACES spectra, we derived precise stellar atmospheric parameters (effective temperature, surface gravity, metallicity) and chemical abundances of 20 elements using a strictly differential analysis as is detailed in Ramírez et al. (2015). In Figure 1 we show differential abundances Δ[X/H] (B relative to A) versus the 50% condensation temperatures (Tc) from Lodders (2003). We note that WASP-160B (which hosts a transiting gas-giant planet) is almost systematically depleted in volatiles (Tc $\lesssim$ 900 K) and enhanced in refractories (Tc > 900 K) relative to its stellar companion (WASP-160A; for which no planets have been detected to date). Interestingly, a similar anomalous chemical pattern has been previously reported only in the binary WASP-94AB, where each star hosts a hot Jupiter planet (Teske et al. 2016).

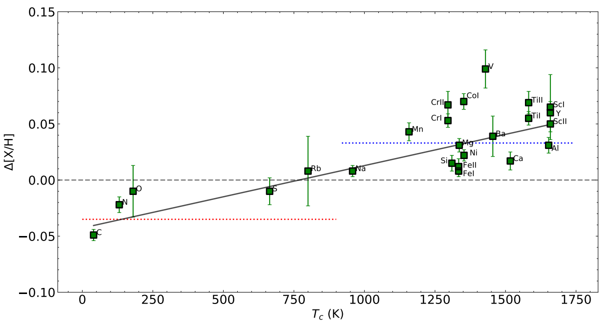

Fig. 1. Differential abundances of WASP-160B relative to WASP-160A versus Tc. The solid black lines is the weighted linear least-squares fit to all the elements. The horizontal dotted red and blue lines represent the weighted average of the volatile and refractory elements, respectively. The dashed line corresponds to identical composition.

The depletion of volatiles could be explained by the formation of the observed Saturn-mass planet around WASP-160B if we assume the present-day convective zone of the host star, but additional planets (~5-12 M_{Jup}) are required when adopting larger convective envelopes. On the other hand, the difference in refractories could be explained by *(i)* the formation of rocky bodies around WASP-160A or *(ii)* the late accretion of at least ~6 $M_{\oplus}$ of planet-like material by WASP-160B.

Acknowledgments: This work has been supported by UNAM-PAPIIT IG-101321. E. J. thanks DGAPA for his postdoctoral fellowship.

REFERENCES

Hawkins, K. et al. 2020, MNRAS, 492, 1164
Lodders K. 2003, ApJ, 591, 1220
Meléndez, J. et al. 2009, ApJ, 704, L66
Ramírez, I. et al. 2015, ApJ, 808, 13
Ramírez, I. et al. 2019, MNRAS, 490, 2448
Saffe, C. et al. 2016, A&A, 588, A81
Saffe, C. et al. 2017, A&A, 604, L4
Teske, J. et al. 2016, ApJ, 819, 19

[1]Instituto de Astronomía, Universidad Nacional Autónoma de México, Ciudad Universitaria, CDMX, C.P. 04510, México. (emiliano@astro.unam.mx).
[2]Observatorio Astronómico, Universidad Nacional de Córdoba, Córdoba, Argentina.
[3]Tacoma Community College, Tacoma, WA 98466, USA.
[4]Instituto de Ciencias Astronómicas, de la Tierra y del Espacio, San Juan, Argentina.
[5]Universidad Nacional de San Juan, Facultad de Ciencias Exactas, Físicas y Naturales, San Juan, Argentina.
[6]Institut d’Astrophysique de Paris, Paris, France.
[7]Laboratorio Nacional de Astrofísica, Itajubá, MG, Brazil.
[8]CONICET - Universidad de Buenos Aires, Instituto de Astronomía y Física del Espacio, Buenos Aires, Argentina.
[9]Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales, Buenos Aires, Argentina.
[10]FZU Institute of Physics of the Czech Academy of Sciences, Prague, Czech Republic.
[11]Consejo Nacional de Investigaciones Científicas y Técnicas, Argentina.