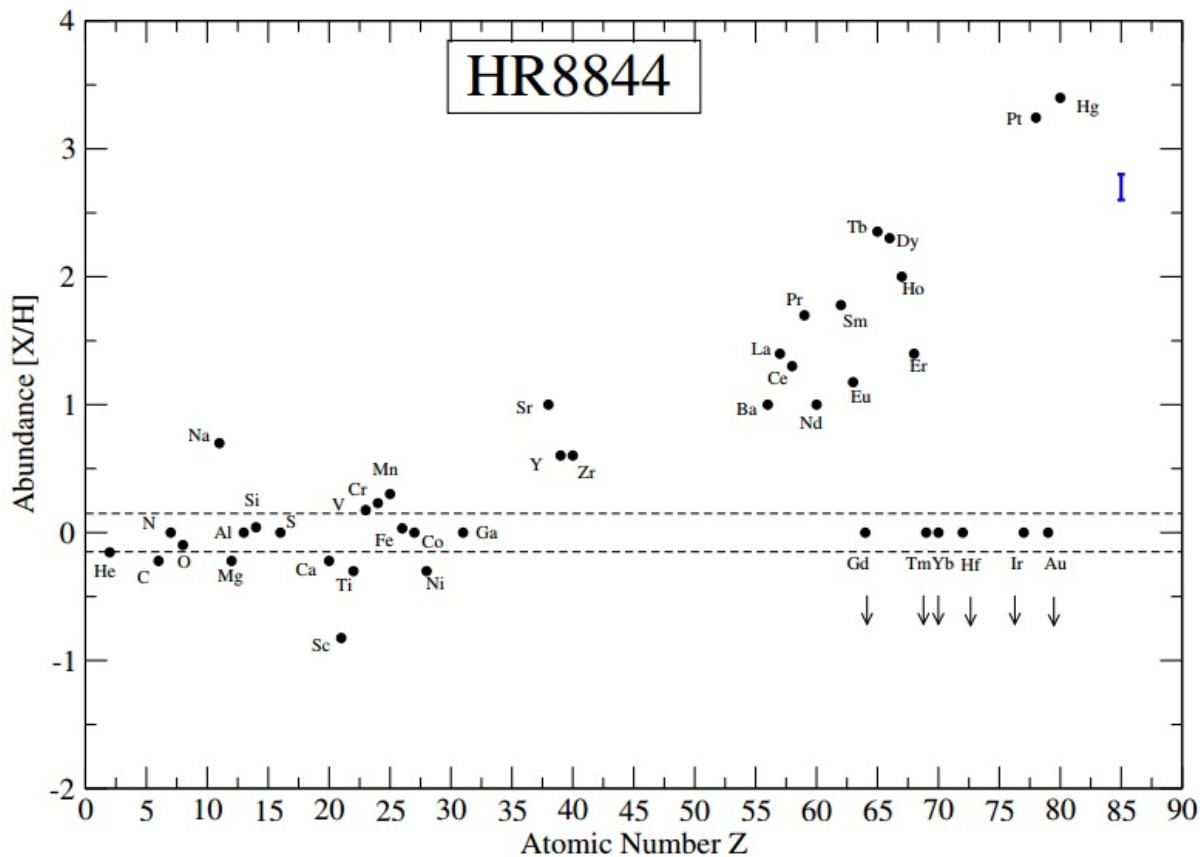


Chemically peculiar star HR8844 could be a hybrid object

September 21 2016, by Tomasz Nowakowski



The derived elemental abundances for HR8844. Credit: Monier et al., 2016.

(Phys.org)—Astronomers from the Paris Observatory in Meudon, France and the Notre Dame University – Louaize in Zouk Mosbeh,

Lebanon, report that an A-type main-sequence star HR8844, could be a hybrid object between two classes of chemically peculiar stars. The discovery was detailed in a paper published Sept. 16 on arXiv.org.

Previous studies described HR8844 as a slowly rotating, fairly bright ($V=5.89$), superficially normal A0V star. However, the latest research conducted by Richard Monier of the Paris Observatory and his colleagues sheds new light on the real nature of this star.

According to the paper, the model atmosphere and spectrum synthesis modeling of the spectrum of HR8844 reveals that most of the [light elements](#) are under-abundant, while the very [heavy elements](#) are overabundant. That means the star should be reclassified as a chemically peculiar star.

"The derived abundance pattern of HR8844 strongly departs from the solar composition, which definitely shows that HR8844 is not a superficially normal early A star, but is actually another new chemically peculiar star," the researchers wrote in the paper.

Chemically peculiar stars, like HR8844, are main-sequence A and B stars with unusually strong or weak lines for certain elements. Besides their chemical composition, they have magnetic fields and experience very slow rotation with an average velocity of 29 km/s, which leads to extremely sharp-lined spectra.

The new findings are based on data provided by the SOPHIE high-resolution echelle spectrograph installed on the 1.93m reflector telescope at the Haute-Provence Observatory in southeastern France. The team has analyzed the SOPHIE dataset and found that HR8844 has under-abundances of light elements like helium (He), carbon (C), nitrogen (N) and oxygen (O) and overabundances of the iron-peak elements and of the very heavy elements such as strontium (Sr), yttrium (Y), zirconium

(Zr) and mercury (Hg).

Taking into account a mild overabundance of manganese (Mn), the scientists concluded that HR8844 could be a hybrid object between the HgMn stars and the Am stars. HgMn stars are characterized by abnormal metal overabundances of Hg and Mn, together with under-abundances of light elements like He. When it comes to Am stars, their spectrum showcases strong absorption lines of metals such as Sr and Zr.

Thus, according to the team, HR8844 resembles both a very hot Am star and a very cool HgMn star. Therefore, the star was reclassified as a hybrid object intermediate between these two classes. "Most of the light elements are under-abundant, whereas the very heavy elements are overabundant in HR8844. This interesting new chemically peculiar star could be a hybrid object between the HgMn stars and the Am stars," the paper reads.

However, in order to precisely determine the class of HR8844, the researchers plan further observations of the star that would complement the recent study.

"We are currently planning more observations of HR8844 with SOPHIE in order to complement the abundances derived here and search for line variability. This will help us address the relationship of HR8844 to the two other hot Am stars, Sirius A and HD72660 and constrain the nature of this interesting new chemically peculiar star," the team wrote.

Lately, Monier's team was successful in redefining the status of HD 30963 star. [That research](#) and the new study are part of a broader project aiming to reclassify main-sequence [stars](#) in the northern hemisphere.

More information: HR8844: A new hot Am star? arXiv:1609.04915 [astro-ph.SR] arxiv.org/abs/1609.04915

Abstract

Using one archival high dispersion high quality spectrum of HR8844 (A0V) obtained with the echelle spectrograph SOPHIE at Observatoire de Haute Provence, we show that this star is not a superficially normal A0V star as hitherto thought. The model atmosphere and spectrum synthesis modeling of the spectrum of HR8844 reveals large departures of its abundances from the solar composition. We report here on our first determinations of the elemental abundances of 41 elements in the atmosphere of HR8844. Most of the light elements are underabundant whereas the very heavy elements are overabundant in HR8844. This interesting new chemically peculiar star could be a hybrid object between the HgMn stars and the Am stars.

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