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Low-mass carbon-enhanced metal-poor thermally pulsating AGB star HD112869

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Introduction/Relevance

- Observations of metal-poor AGB stars are lacking
- The chemical abundances of carbon-enhanced metal-poor (CEMP) stars reflect the origin of CNO and neutron capture elements in the early Galaxy
- CEMP stars have a wide variety of elemental abundance patterns
- The majority of CEMP stars have enhanced s-process elements

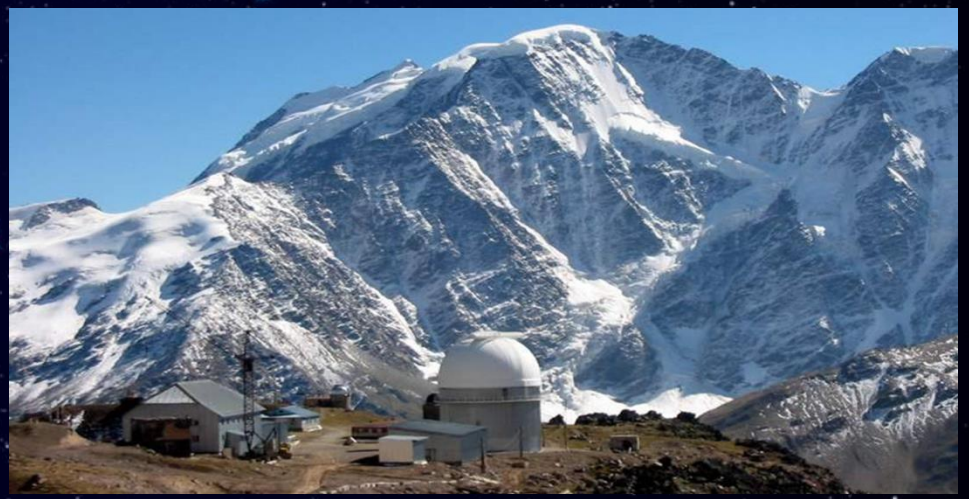
CEMP star HD112869

- Bright (M_{bol} = - 3.35, V = - 8.91), high-latitude (b = + 79°) extremely metal poor star classified as R type carbon star with enhanced CH bands;
- HD112869 has an extremely low intensity of molecular lines with isotopic ^{13}C
  - A high $^{12}C/^{13}C$ ratio is observed rarely among the CEMP stars
  - The majority of CEMP stars have enhanced s-process elements

Observations of HD112869

- Radial velocity monitoring (> 2500 days) - CORAVEL
- Simultaneous monitoring of the brightness (465 days)
- Parallel high-resolution spectroscopy (3600 – 9300 Å)

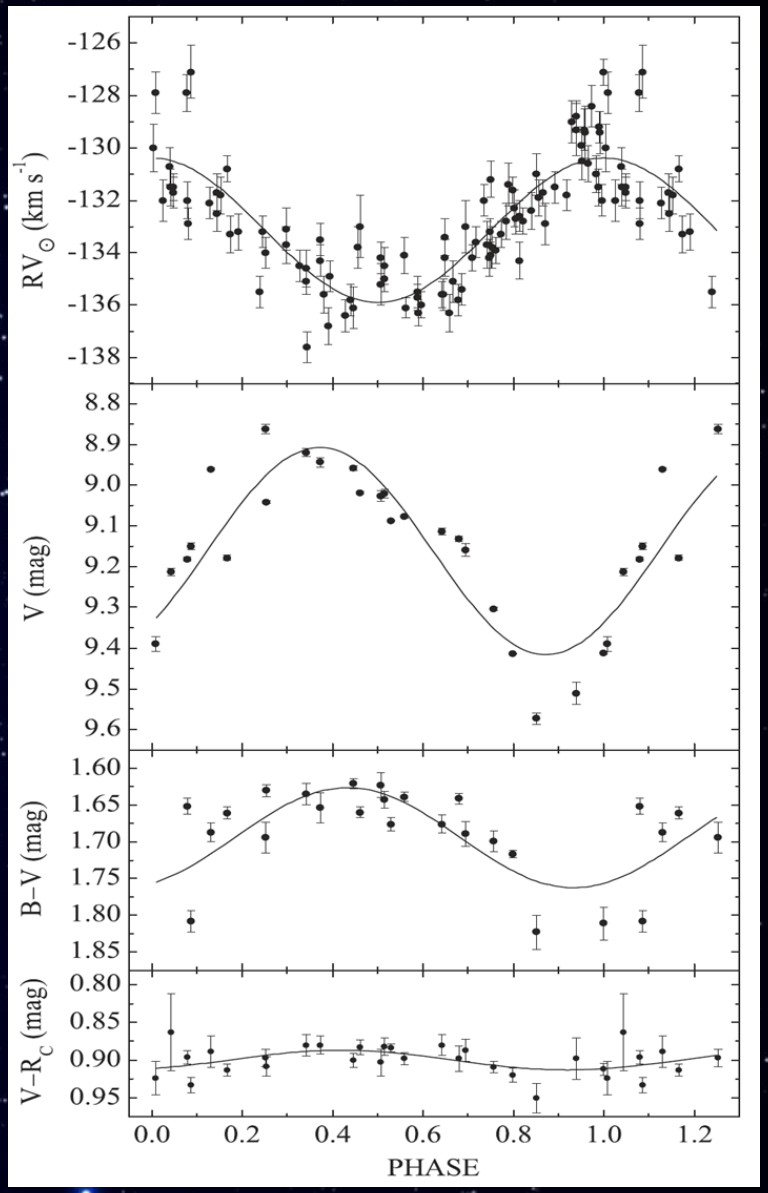
CORAVEL spectrometer installed on the 1.65-m telescope at the Molėtai Observatory (Lithuania)



Coudé échelle spectrometer MAESTRO on the 2 m telescope at the Observatory on the Terskol Peak

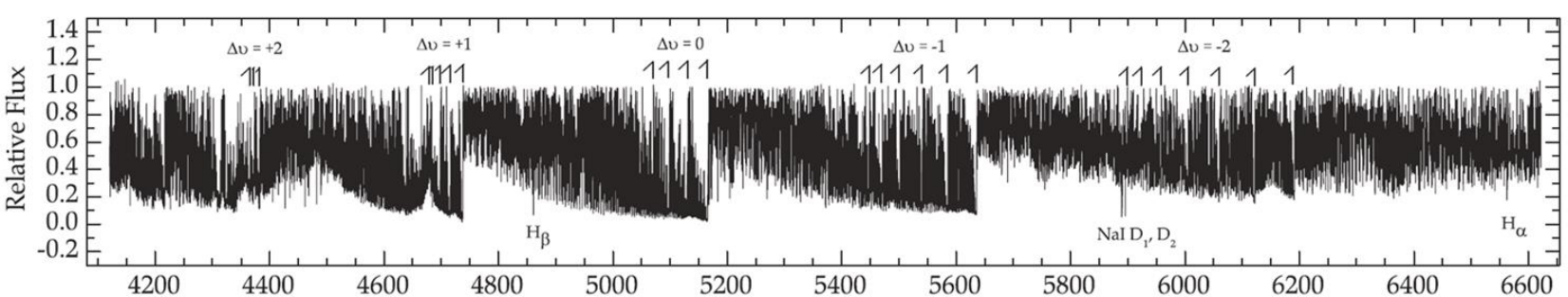
Conclusions

- Radial velocity ~ 114.9 days
  - Peak-to-peak amplitude 10 km s^{-1}
- Light and colour variations are shifted in phase relative to the velocity curve
  - typical for pulsating evolved stars

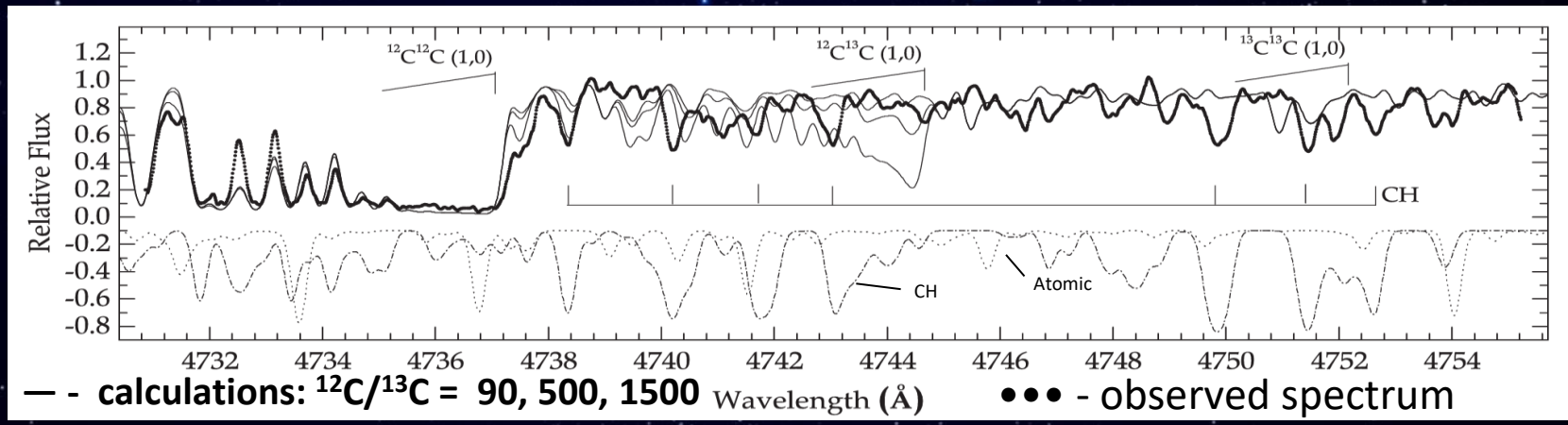


CORAVEL radial velocities (top panel) and photometry

- The lower limit of isotopic ratio was found to be extremely high, $^{12}C/^{13}C \geq 1500$



Normalized high resolution spectrum



— - **calculations: $^{12}C/^{13}C$ = 90, 500, 1500** ●●● - observed spectrum

Observed spectrum of HD112869, along with synthesized C_2 spectra for the final carbon abundance: **log ε(C) = 8.3 dex**, and atmospheric model parameters: **T_{eff} = 3900 K, log g = 0.4 (cgs), ζ_t = 4.0 km s $^{-1}$**

- The abundance of s-process elements Y, Sr and Ba is not enhanced:
  - [Y/Fe II] ≤ 0.0 dex; [Sr/Fe II] ≤ -1.7 dex; [Ba/Fe II] ≤ -0.3 dex
- But Nd, La and Sm is overabundant:
  - [Nd/Fe II] ≤ +0.7 dex; [La/Fe II] ≤ +0.8 dex; [Sm/Fe II] ≤ +0.5 dex
- A strong enhancement of r-process was denied for atmosphere of HD 112869, [Eu/Fe] ≤ 0.8 dex
- According the evolutionary models, HD112869 is a single metal-poor low-mass thermally pulsating AGB star