Contribution ID: **36** Type: **Oral contribution**

Asteroseismology and high-resolution spectroscopy of halo stars

Thursday 12 September 2019 15:00 (20 minutes)

We derive stellar masses and precise chemical abundances for 26 halo red giants, among which 5 and 17 turned out to be [Fe/H]<-2 and <-1, respectively, by combining high-resolution spectroscopy and asteroseismology. We selected the 26 stars in the Kepler field based on radial velocity and metallicity estimated from spectroscopic surveys and confirmed that they show halo-like kinematics using the Gaia DR2. The stellar masses are estimated through the scaling relations of asteroseismology with a theoretical correction factor and with updated spectroscopic parameters, temperature and metallicity. The typical estimated mass is around 1.0 Msun with 10% relative uncertainty, suggesting that asteroseismology systematically overestimates masses for low metallicity stars even with the correction factor. We find no correlation between mass and chemical abundance; the chemical abundance of halo stars might not be a clear indicator of stellar age.

Although our sample is the largest sample of halo stars that have asteroseimic information and precise chemical abundances, it is still small and does not contain any CEMP stars. I will present future prospects on the use of asteroseismology to study halo stars, including CEMP stars.

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Session Classification: FUTURE PERSPECTIVES, CHEMICAL EVOLUTION, LARGE SURVEYS