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Li-enriched low mass giants: Single star evolution vs binary interaction

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Li, being susceptible to high temperature, expected to deplete below 1.5 dex in low mass (M < 2 solar mass) evolved stars. Still 1% of red giants are discovered with Li abundance 4-5 order more than expected value. To understand this anomaly, we used data from LAMOST spectroscopic survey, photometric survey of Kepler space telescope, and Gaia astrometry. Our work discovered several red clump super-Li rich giants and all in the red clump phase determined unambiguously based on asteroseismology. Another key result that emerged from this study is the location of the Li enrichment site during the He-flash, the transition phase between the evolution of stars from the end of RGB tip to the quiescent He-core burning at red clump. Based on the analysis of the spectroscopic and photometric data and comparison with stellar models, we provided first-of-its-kind evidence in the form of a correlation between lithium abundance in giants and period spacing of g-mode oscillations derived using asteroseismology. The evidence being that all the super Li-rich giants are almost exclusively young red clump giants compared to Li - poor red clump giants suggesting the direct connection between the He-flash occurrence and the presence of Li in red clump giants. Some of the super-Li-rich giants has active atmosphere revealed in the form of flares, IR excess and high rotation. These observational signature suggest physical mechanism connected with rotation for Li-production in the low mass stars. Further I will present our recent work on discovery of excess Li in the binary merger stars.

Primary author: SINGH, Raghubar (National Astronomical Observatories of China, Beijing)

Co-author: Prof. ZHAO, Gang (NAOC)

Presenter: SINGH, Raghubar (National Astronomical Observatories of China, Beijing)

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