

The Gaia-ESO Survey: revisiting the Li-rich giant problem

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Abstract

The discovery of lithium-rich giants contradicts expectations from canonical stellar evolution. Here we report on the serendipitous discovery of 20 Li-rich giants observed during the Gaia-ESO Survey, which includes the first nine Li-rich giant stars known towards the CoRoT fields. Most of our Li-rich giants have near-solar metallicities and stellar parameters consistent with being before the luminosity bump. This is difficult to reconcile with deep mixing models proposed to explain lithium enrichment, because these models can only operate at later evolutionary stages: at or past the luminosity bump. In an effort to shed light on the Li-rich phenomenon, we highlight recent evidence of the tidal destruction of close-in hot Jupiters at the sub-giant phase. We note that when coupled with models of planet accretion, the observed destruction of hot Jupiters actually predicts the existence of Li-rich giant stars, and suggests that Li-rich stars should be found early on the giant branch and occur more frequently with increasing metallicity. A comprehensive review of all known Li-rich giant stars reveals that this scenario is consistent with the data. However, more evolved or metal-poor stars are less likely to host close-in giant planets, implying that their Li-rich origin requires an alternative explanation, likely related to mixing scenarios rather than external phenomena.

Keywords

Stars: abundances.