"Rapidly" Rotating Lithium-Rich Giants Observed by *Kepler*

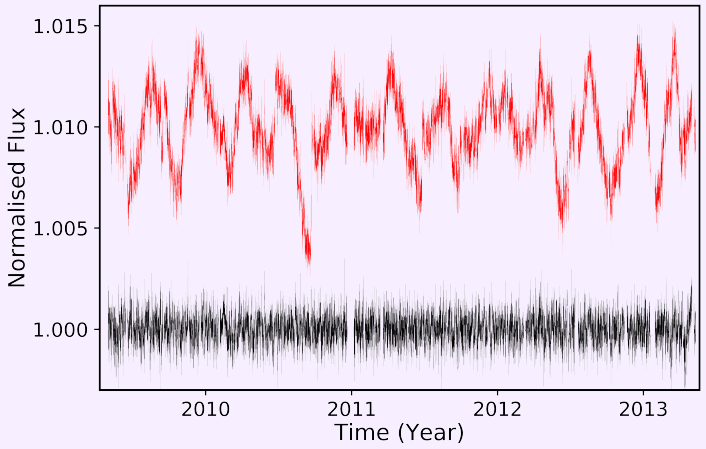
Benjamin Montet (UNSW Sydney) and Melissa Ness (Columbia)

What's going on?

The *Kepler* data analysis pipeline is designed to find planets. When feasible, it preserves stellar variability, but not at the expense of the detectability of small planets.

There are significant systematics in *Kepler* data on ~90 day and slower timescales. These are very effectively removed by the data processing pipeline, but astrophysical variability on the same timescale is also removed.

We have developed a re-reduction of *Kepler* data designed to preserve long-term variability rather than small planets. It seems to work pretty well!



(Top) Light curve for KIC 8212479, a red giant observed by Kepler. *With our data reduction scheme, a 120-day rotational signal is observed.*

(Bottom) Kepler *pipeline processed data for the same star. Astrophysical variability on long timescales is effectively removed, and there is no detectable rotational modulation.*

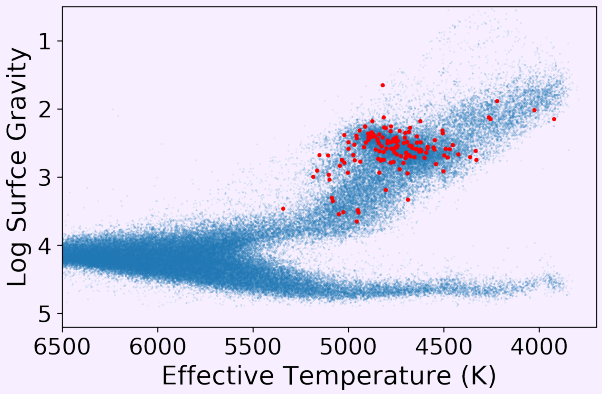
What can we learn?

Theories of lithium enhancement of red giants predict a distribution of rapidly rotating stars compared to the field red giant population.

In a control sample of lithium-normal giants, 3-4% of stars have measurable rotation periods.

In our sample, ~40% of our stars have measurable rotation periods, mostly in the range 80-150 days (equatorial velocity 5-10 km/s).

We can compare the distribution of rotation periods as a function of lithium enrichment and evolutionary state, comparing RBG stars to red clump stars. Stay tuned!



Stars observed by the Kepler *telescope in blue, with our sample of lithium-rich red giants highlighted in red.*

Why do I care?

This work will help us understand the mechanisms that drive lithium-rich giant formation, and if those observed at different stellar evolutionary states could plausibly be produced by the same mechanism.

The methods developed here are not just applicable to red giants. If you have a set of stars that might be slowly rotating in *Kepler* that you are investigating, let's talk! If your star has a rotation period longer than 40-50 days, it might have been affected or removed entirely by the *Kepler* processing pipeline but recoverable with different data processing.

If you're looking for a postdoctoral position and want to collaborate on *Kepler*/*TESS* data analysis, UNSW Sydney has openings for three Research Associates in Data Science.

UNSW SYDNEY

NEWTS
NEarby Worlds and Their Stars