Name:	Savita Mathur
Email:	smathur@spacescience.org
Institution:	Space Science Institute
Title:	Investigating magnetic activity of F stars with the Kepler mission
Type:	Contributed Talk
Session:	Stellar Activity, Rotation, Ages, Metallicity

Abstract:

The dynamo process is believed to drive the magnetic activity of stars like the Sun that have an outer convection zone. In these stars, magnetic activity cycles result from the interaction between rotation (in particular latitudinal differential rotation), convection and magnetic field. Unfortunately, the detailed mechanism of this process is not completely understood as can be shown by the inaccurately predicted solar cycles.

Large spectroscopic surveys such as the one led at the Mount Wilson in CaHK have already allowed us to study magnetic activity of other stars. In particular, they showed that there is a relation between the rotation periods and the cycle periods. But this relation depends on the knowledge of the structure of the star (such as the depth of the convection zone), which is not accessible with spectroscopic observations. Seismology intervenes here as this powerful tool enables us to study the internal structure and dynamics (rotation profile) of the stars, which are crucially needed to understand stellar dynamos. Different works (e.g. Baliunas et al. 1995, Lovis et al. 2011) showed that different manifestations of magnetic activity variability can be observed: either a regular cycle, a non-regular variability or a flat behaviour. Our work aims at looking for these different behaviours among our star sample.

Asteroseismology has gone through important breakthroughs thanks to the CoRoT and Kepler missions. With more than 3.5 years of continuous data obtained by the mission, we have a great opportunity to go further in the investigation of magnetic activity cycles in other stars. Since we expect that fast rotators would present shorter magnetic activity cycles, we have gathered a sample of fast rotating solar-like stars to study their magnetic activity based on their light curves.

We will present the analysis of oscillating F stars observed for more than 3 months by Kepler and that have surface rotation periods shorter than 12 days. We defined magnetic indicators and proxies based on photometric observations to help characterise the activity levels of the stars. With the Kepler data, we will investigate the existence of stars with cycles (regular or not), stars with a modulation that could be related to magnetic activity, and stars that seem to show a flat behaviour. We will present some very promising candidates for magnetic activity studies. We have also started some preliminary 3D dynamo models of a few stars opening the path to our understanding of the dynamics of the stars.