Studying and finding planets via star-planet interactions

Robert Kavanagh (ASTRON)

Low-mass stars are host to the bulk of all exoplanets in our galaxy. While the population of exoplanets discovered to date is dominated by those that are close-in, massive, and transit, such a population is not likely to be representative of the complete sample. M dwarfs, which are the most common type of star in the galaxy, are expected to favour hosting small rocky planets. Finding such planets however is very difficult through traditional methods, as their signatures are very weak, and can be drowned out by stellar activity. M dwarfs also often harbour very strong surface magnetic fields, which dominate the energetics of the surrounding plasma environment out to large distances. In this region, the motion of a planet through the star's large-scale magnetic field can produce Alfvén waves, which carry energy back to the star. Such a scenario is understood to power bright radio emission from the star itself, via the electron cyclotron maser (ECM) instability. Due to both the beamed nature of ECM emission, as well as geometrical considerations, it could be that such signatures are more favourable for detection from exoplanetary systems with architectures distinct from the currently known population. In this talk, I will discuss our recent work on utilising numerical models to study and predict signatures of such interactions occurring on nearby exoplanetary systems.