Title

Large dust grains and H II regions in circumbinary post-AGB disks

Abstract

Forming non-spherical planetary nebulae and pre-planetary nebulae requires binary or multiple star systems and rotating disks. However, observing these rotating structures is challenging, except for a specific type of post-AGB binary systems. These systems exhibit a significant NIR-excess and narrow CO line profiles, due to the presence of circumbinary disks composed of gas and dust in Keplerian rotation. The properties of these post-AGB disks are relatively well-known on large scales, thanks to interferometric and single-dish observations at 43 to 345GHz; the properties of the central systems are known through optical monitoring. However, two aspects of these objects are barely known: A) The presence of centimetre-sized dust grains forming a thin disk component (millimetre-sized dust grains have already been detected in the Red Rectangle). If this component exists, it will be extended and detectable at > 3 sigma. The discovery of centimetre-sized grains would significantly advance the understanding of second-generation planet formation in these environments. B) The detection of bipolar jets produced by the companion star, which accretes material from the post-AGB star or the inner disk regions. Such outflows have been observed in the optical in many systems and at 0.87mm in the Red Rectangle, suggesting we will detect them with the proposed observations too. As a pathfinder project, we propose continuum S-band MeerKAT observations of the most promising binary post-AGB sources, based on their estimated intensities at 3GHz, to detect the bipolar jets at cm-wavelengths and the presence of gravel-size solid particles, setting the stage for future SKA observations.