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Titre de la présentation :
Disc populations of free-floating planets in young nearby associations

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Abstract :

Free-floating planets (FFPs) are planetary-mass objects that do not orbit a star, but roam the galaxy isolated. They are some of the most challenging astrophysical objects to study: incapable of sustaining nuclear fusion, they are intrinsically faint and steadily cool and fade in time becoming very difficult to detect by direct methods. Nevertheless, the origin and the formation of these exotic objects is still largely an open question.

Similar to slightly more massive brown dwarfs, four main scenarios are considered to explain their existence: a) within a proto-planetary disc followed by ejection by dynamical scattering between planets; b) isolated, in a similar way to stars from the collapse and contraction of a tiny molecular clump; c) as aborted stellar embryos ejected from a stellar nursery before the hydrostatic cores could build up enough mass to become a star; d) through the photo-erosion of a pre-stellar core by stellar winds from a nearby OB star before it can accrete enough mass to become a star. However, the relative contribution of each mechanism remains unknown.

A major key diagnostic of FFP formation and evolution is the occurrence and properties of discs. The presence of discs around sub-stellar objects was initially thought to favor a star-like formation mechanism. However, the three main formation mechanisms proposed to date are expected to produce discs around sub-stellar and planetary mass objects, albeit with different disc fractions and properties. The distributions of disc frequency are therefore fundamental to test the predictions of the various mechanisms.

Conducting a robust detection of mid-infrared excess (WISE and Spitzer photometry) in the spectral energy distribution, which is indicative of the presence of a disc, enables us to derive the distribution of disc fractions among the members of the young nearby associations of Taurus and Upper Scorpius & Ophiuchus. These two regions harbor recently discovered rich populations of FFPs, allowing us to perform a statistically representative study of discs that extends in an unprecedented way down to the planetary mass regime.