

Circumstellar disk fragmentation and the origin of brown dwarf binaries in the Galactic field

M.B.N. (Thijs) Kouwenhoven¹

¹*Xian Jiaotong Liverpool University (XJTLU)*

Most of the Sun's nearest neighbors are M-type stars or brown dwarfs. Constraining the origin of such systems, in particular of the nearby brown dwarf binaries, remains a challenge. Here, we present circumstellar disk fragmentation as a possible mechanism for such systems, based on numerical simulations. Circumstellar disk fragmentation results in the formation of multiple companions of varying mass (from super-Jupiters to low-mass stars) in wide and highly unstable orbits. The decay of these systems results in the ejection of massive planets, brown dwarfs and brown dwarf binaries, and in frequent physical collisions. Billions of years after formation, the host stars are often left with none, one, or two companions, with a large variety of configurations, including two types of hierarchical triples with predictable (and measurable) orbital configurations. Despite the unknown frequency of occurrence, circumstellar disk fragmentation is able to predict many of the challenging stellar and substellar systems in the solar neighborhood, and provides easily measurable predictions for hierarchical systems containing brown dwarfs.