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Decoupling of a giant planet from its disk in an inclined binary system

F. Marzari[1] and G.Picogna[2]

[1] Dipartimento di Fisica e Astronomia, Università di Padova, Vicolo dell'Osservatorio 3, 35122 Padova, Italy
[2] Institut fuer Astronomie und Astrophysik, Universitaet Tuebingen, Auf der Morgenstelle 10, 72076 Tuebingen, Germany

Abstract.

According to Triaud et al. (2010) and Albrecht et al. (2012) about 40% of hot Jupiters have orbits significantly tilted respect to the equatorial plane of the star. It has been suggested Batygin (2012) that the evolution of a protoplanetary disk under the perturbations of a binary companion may be responsible for the observed spin–orbit misalignment of these exoplanets. A fundamental requirement for this model to work is that the planet is kept within the disk during its precession. In this way the planet would continue its migration by tidal interaction with the disk and, at the same time, once the disk is dissipated it would maintain its inclination. Previous studies seem to suggest that indeed a giant planet is forced to evolve within the disks even in presence of strong perturbing forces as those induced by a companion star. By using two different SPH codes (VINE and phantom) we show that on the long term the planet definitively decouples from the disk evolution and its orbital plane significantly departs from that of the disk. For a detailed analysis an discussion we refer to Picogna and Marzari (2015).

References

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