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On the role of orbital migration in the early phases of the evolution of planetary systems

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Past, present and forthcoming space missions (e.g. Kepler/K2, TESS, CHEOPS, JWST, PLATO, ARIEL) and ground-based observational facilities (e.g. VLT, VLTI, ALMA) were, are and will be the sources of the high quality data necessary to unveil the properties of the planetary systems. Thanks to them the recent enormous increase in number of known planets gives a unique opportunity to study the processes responsible for planet formation and evolution in more detail. The observed properties of numerous planets allow for the robust constraints to be put on planet formation models. Both ground and space-based surveys have derived distributions of fundamental planetary properties like the frequency of planets in the mass-distance and radius-distance planes, the planetary mass function, the eccentricity distribution, or the planetary mass-radius relation. Now it is possible to compare the theoretical predictions with the observed properties of the planet population as a whole. The technique used for this comparison is known as the planet population synthesis [1-4]. One of the assumptions in this method is the migration rate of the planets. At the early stages of the evolution, when planets are still embedded in a gaseous disc, the tidal interactions between the disc and planets cause the planetary orbital migration. The orbital migration may play an important role in shaping stable planetary configurations. The outcome of the simulation depends strongly on the way in which the planets migrate. An understanding of this stage of the evolution will provide insight on the most frequently formed architectures, which in turn are relevant for determining the planet habitability.

There has been recently an important development in the understanding of the orbital migration of planets which are able to open a partial gap in the protoplanetary disc (e.g. [5], [6], and references therein). It has been shown that such planets migrate differently than it has been assumed till now [7]. This subject is now at the leading edge of the studies of the dynamical interactions that occur in newly formed planetary systems. Here, we are going to present our most recent results on the two super-Earths migrating in a gaseous protoplanetary disc.

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