Gravitational Influence on Planet Formation

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The formation of planets out of gas and dust grains in protoplanetary disks is still a puzzling process. Observations of exoplanets - for example the detection of gas giants nearby their central star - clearly show that our ideas of the evolution of planetary systems are inaccurate. One open question among others deals with the influence of gravity on young planetary systems. We developed a dynamical n-body simulation that reaches a complexity of O(n log n) with which we can model planetary systems at different phases of their evolution. This way, we are able to acquire further knowledge about the origin of not only extrasolar systems, but also our own solar system. Our simulations firstly include testing scenarios such as the solar system or the restricted three-body problem to assess the accuracy of our software. We then proceeded to simulate the ring structured protoplanetary disk HL Tauri and the binary star system HK Tauri in different variations. Through our simulations we observed many current suggestions made by researchers studying planetary development. Furthermore, we discovered that gravity only starts to play a role on planet formation after planetesimals have already formed.

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