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A new global formation model for planets in S-type binaries

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The number of planets orbiting binary stars is increasing dramatically thanks to TESS and follow-up by direct imaging/Gaia. Understanding the origin and orbital architecture of these systems requires end-to-end planet formation models, which do not exist yet for planets orbiting only one of the two stars (S-type binaries). In this talk, I will introduce a new global planet formation model for S-type systems that we are developing at the University of Geneva. This model is an adaptation of the Bern Model of Planet Formation and Evolution (e.g. Emsenhuber et al. 2021), which includes -into a single framework- solid and gas accretion, migration and N-body interactions. In the model, we have modified the structure of the protoplanetary disc to model the truncation and heating stemming from the tidal interaction of the secondary star, as well as the gravitational interactions with the stellar companion. In this talk, I will show how incorporating both of these effects alters the planet formation picture compared to the single-star case. In particular, the formation of planets in very close binaries is extremely challenging due to the limited reservoir of material available, making these systems key laboratories to constrain planet formation models, and to understand planet formation theory in general. Additionally, I will present results from CHEOPS observations of TOI candidates in blended S-type binaries, aimed at identifying which of the two stars is the true planet host, and consequently refining planet radius estimates.

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