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On the lower limit of circumbinary disk fragmentation

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In recent years, many wide orbit circumbinary giant planets have been discovered. These may have formed by gravitational fragmentation of circumbinary disks. The aim of this work is to investigate the lower limit of circumbinary disc fragmentation and to compare it to the lower limit of circumstellar disc fragmentation. Using the smoothed particle hydrodynamics code SEREN with the Lombardi method of radiative transfer, we run a series of simulations varying the binary separation, mass ratio and eccentricity to see their effect on disk fragmentation and planet formation. For the circumstellar disk, we find a lowest disk-to-star mass ratio that allows for fragmentation to be ~0.3 which is in agreement with past studies. However, for the circumbinary disk case fragmentation is possible down to a mass ratio of 0.14 - 0.17. We conclude that disk fragmentation is easier around circumbinary disks, facilitating the formation of giant planets.

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