Burst occurrence in young massive stellar objects

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Episodic accretion-driven outbursts are an extreme manifestation of accretion variability. It has been proposed that the development of gravitational instabilities in the proto-circumstellar medium of massive young stellar objects (MYSOs) can lead to such luminous bursts, when clumps of fragmented accretion discs migrate onto the star. We simulate the early evolution of MYSOs formed by the gravitational collapse of rotating 100 M pre-stellar cores and analyze the characteristics of the bursts that episodically accompany their strongly time-variable protostellar lightcurve. We predict that MYSOs spend â‰ˆ 10 3 yr (â‰ˆ 1.7% their modelled early 60 kyr experiencing eruptive phases, during which the peak luminosity exceeds the quiescent pre-burst values by factors from 2.5 to more than 40. Throughout these short time periods, they can acquire a substential fraction (up to â‰ˆ 50 %) of their zero-age-main sequence mass. Our findings show that fainter bursts are more common than brighter ones. We discuss our results in the context of the known bursting MYSOs, e.g. NGC6334I-MM1 and S255IR-NIRS3, and propose that these monitored bursts are part of a long-time ongoing series of eruptions, which might, in the future, be followed by other luminous flares.

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