Abstract Submitted
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Effects of Radiative Cooling on Nonaxisymmetric Instabilities in Self-Gravitating Disks JAMES IMAMURA, WILLIAM DUMAS, University of Oregon, KATHRYN HADLEY, University of Oreogn, ERIK KEEVER, REBECKA TUMBLIN, University of Oregon — We study the effects radiative cooling has on fragmentation in massive disks. We consider systems studied earlier without cooling by Hadley *et al.* (2015). Hadley *et al.* looked at disks dominated by shear-driven instabilities (P modes), gravity-driven instabilities (J modes), and modes intermediate between P and J modes (I modes). We include radiation using a cooling function defined so that the local cooling time scale τ is constant in the disk. Cooling does not qualitatively alter the early development of disk modes for cooling times on the order or longer than the modal growth rates. It can change outcomes of nonlinear simulations by modifying the disk before instability can grow. This may change the type of mode which dominates the evolution. This is important as we find that fragmentation is most likely in disks dominated by J modes. Disks dominated by I and P modes we study, do not fragment even for strong cooling. This is at odds with current fragmentation criteria which say that disks fragment when the Toomre Q-parameter < 1.6-1.7, somewhere in the disk, and τ is shorter than the local disk rotation period. In our disks, Q is always < 1.6 somewhere and we consider efficient cooling. The type of mode excited must play a role in disk fragmentation.

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