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Three-Dimensional Radiative Transfer in Disks with Planets

In the quest to understand the origins of planetary systems, protoplanetary disks provide key clues. Bigger telescopes, adaptive optics, and sophisticated image processing techniques allow resolved imaging of more and more protoplanetary disks. These disks are proving to be quite complex, with indications of structures such as cleared inner holes, spiral arms, and annular gaps. However, to conclude that these structures result from planet formation requires an understanding of how planet formation shapes the disk. I will present radiative transfer modeling of disks perturbed by active planet formation, showing how density and thermal structure feedback on each other as a planet shapes the disk. I will present simulated images of disks with gaps opened by planets, and show how these images vary at different wavelengths ranging from the visible to the radio. These models are currently being used to provide constraints on the masses of planets that may be responsible for large-scale structure seen in protoplanetary disks.