

## Polar Alignment and Vortices in Circumbinary Disks

Ian Rabago(1,2), Zhaohuan Zhu(1,2), Rebecca Martin(1,2), and Steve Lubow(3)

(1) University of Nevada, Las Vegas

(2) Nevada Center for Astrophysics

(3) Space Telescope Science Institute

Binary stars are frequent outcomes of star formation, and circumbinary disks have been observed around many binaries to date, including “polar” disks which are aligned perpendicular to their binary orbital plane. We study the evolution of an inclined disk around an eccentric binary using the grid-based code ATHENA++, which allows us to simulate polar disks at lower viscosities than have previously been studied. We find that the disk aligns to a polar orientation while exhibiting strong warping and sometimes breaking into separate rings. At low viscosities, anticyclonic vortices are observed along the inner edge of the disk which are long lived and generate overdensity features and spiral arms. These disks may give rise to a class of polar aligned circumbinary planets, which have yet to be observed in the current exoplanet catalog.