

Discovery of an Inner Disk Component around HD 141569 A

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Planets are considered to form in protoplanetary disks during star formation process. Protoplanetary disks and planets interact with each other. Thus, detail understanding of disk structures is important in order to elucidate star and planet evolution. Disks have been imaged recently, and it has become clear that they have complex structures.

This work [1] is focused on a disk around HD 141569 A (spectral type: B9.5, age: 5 Myr). This is a young debris disk, containing various complex structures that have been imaged in the optical and near-infrared (e.g., [2,3,4]). The disk has a double-ring structure (inner and outer ring) with spiral structures, and a cavity inside the inner ring (< 175 AU). In addition, emission from dust and CO gas has been detected inside the inner ring using mid-infrared (e.g., [5]) and CO emission lines (e.g., [6]). We obtained disk images in the optical, using Space Telescope Imaging Spectrograph (STIS) aboard on Hubble Space Telescope (HST) as a part of general observer program (GO 13786). The scattered light from an inner disk component within the known inner ring was firstly detected, after adopting suitable analysis in that the scattered light from the disk and star light were divided. The inner disk component extends from $0''.4$ (46 AU) to $1''.0$ (120 AU) in deprojected stellocentric distance, with no gaps or a cavity. A spiral was detected at 130 AU. A pericenter offset of 6 AU may exist towards the north. An unseen planet would trigger such spiral and gap structures between the inner disk component and the inner ring. However, our data indicate that there is no point source heavier than $9 M_J$ in the gap. On the other hand, the mass of the planet that could create such gap is $< 1 M_J$, as estimated by the dynamical model [7]. Thus, we cannot reject the possibility that an unseen planet creates the gap.

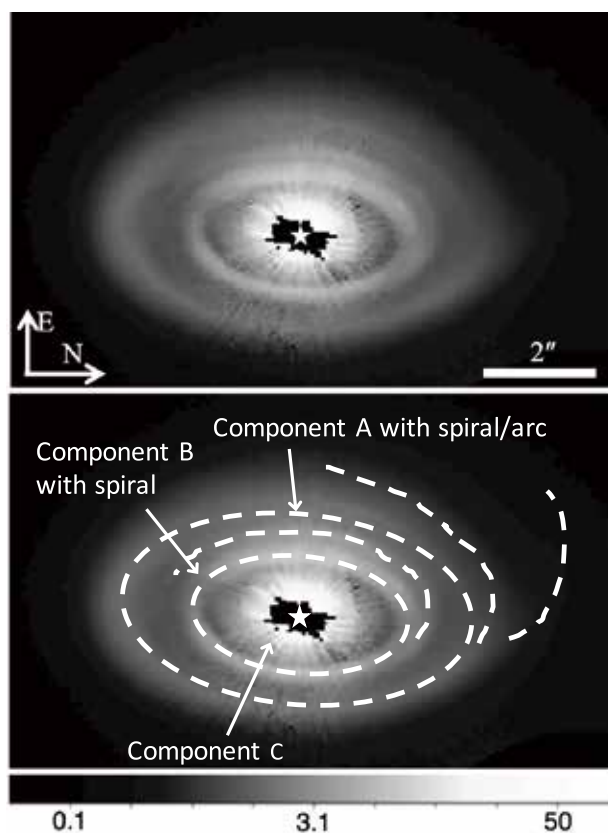


Figure 1: HD 141569 A disk image (see [1]). Nomenclature is annotated on the lower panel that is the same image as the upper panel. Star mark indicates the HD 141569 A position. Component C is the inner disk component that we discovered.

References

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