

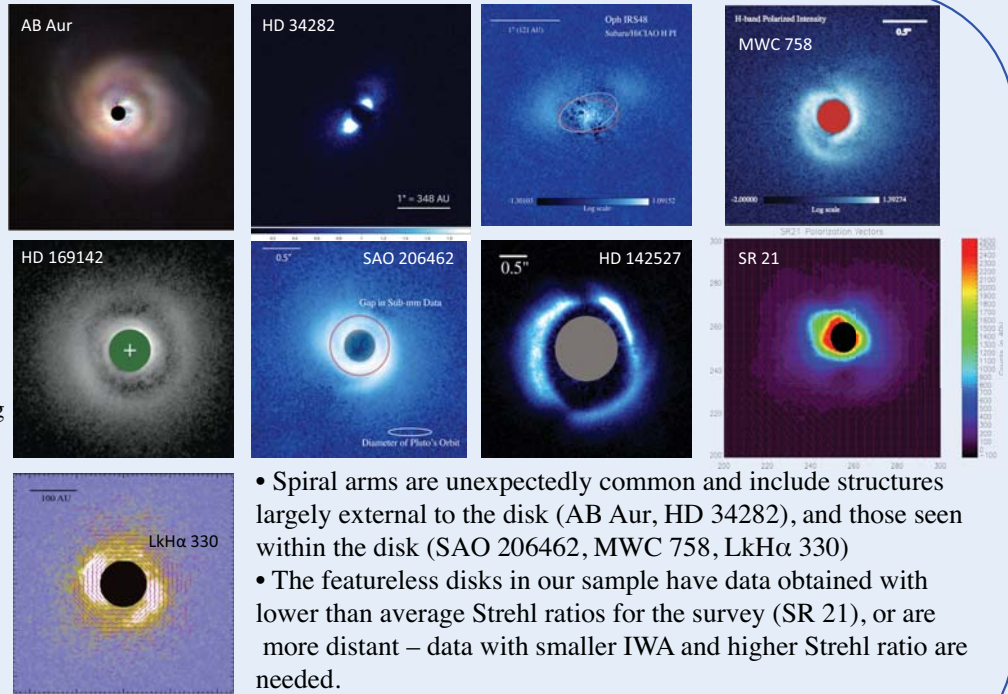
Transitional Disks Associated With Intermediate-mass Stars: Results of the SEEDS YSO survey

C. Grady (Eureka Scientific), M. Fukagawa, Y. Maruta, & Y. Ohta (Osaka U.), J. Wisniewski & J. Hashimoto (U. Oklahoma), Y. Okamoto and M. Momose (Ibaraki U.), T. Currie (U. Toronto), M. McElwain (NASA's GSFC), T. Muto (Kogakuin U.), T. Kotani & N. Kusakabe (NAOJ), K. Follette (U. Arizona), M. Bonnefoy & M. Feldt (MPIA-HD), M. Sitko (U. Cincinnati), M. Takami & J. Karr (ASIAA), M. Tamura (Tokyo U. & NAOJ) & the SEEDS consortium

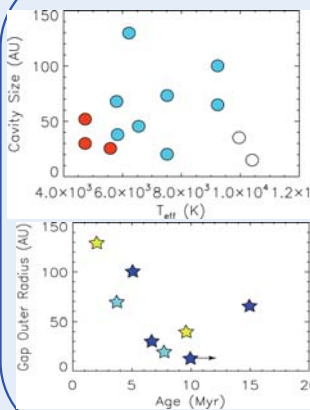
Abstract: As part of the *Strategic Exploration of Exoplanets and Disks with Subaru* YSO survey, we have surveyed a number of Herbig B-F stars at H-band using Polarimetric Differential Imaging+Angular differential imaging. Historically, Herbig stars have been sorted based on their IR SEDs into those with SEDs which can be fit by powerlaws over 1-200 μm (Meeus et al. 2001, group II), and those which can be interpreted as a powerlaw + a blackbody component (Meeus group I) or powerlaw+missing warm thermal emission, which is one of the criteria for identification of gapped or transitional disks. Meeus group II disks, when imaged with HiCIAO show featureless disks with depolarization along the projection of the disk semi-minor axis (Kusakabe et al. 2012). This is what we had expected to see for the Meeus group I disks, except for the addition of wide gaps or central cavities. Instead we find wild diversity, suggesting that transitional disks are highly perturbed compared to Meeus group II disks.

Survey currently includes 9 Meeus Group I Herbig Stars, plus 2 more stars in the early stages of analysis, as well as 2 with data from the literature.

- >92% of stars detected in scattered light.
- NIR gaps and cavities in 50% of objects (including literature data with smaller inner working angles)
- NIR gap size ranges from <36% to 100% of sub-mm cavity size
- eccentric gaps in 25% of sample.
- spiral arms in > 6 stars
- wide morphological diversity



- Spiral arms are unexpectedly common and include structures largely external to the disk (AB Aur, HD 34282), and those seen within the disk (SAO 206462, MWC 758, LkH α 330)
- The featureless disks in our sample have data obtained with lower than average Strehl ratios for the survey (SR 21), or are more distant – data with smaller IWA and higher Strehl ratio are needed.
- Structure in disk may be another defining characteristic of Transitional and pre-transitional disks.



- Photoevaporation models predict that the gap width should correlate with the stellar radiation field in the FUV or X-ray. For Herbig stars a correlation with T_{eff} would be expected and is not seen.
- No correlation with age
- Systems with eccentric gaps cannot be produced by the stellar radiation field –
- **Dynamical origin for the Structure is favored.**

The Future:

- Observations continue through S14A.
- Probing within the region occulted in the SEEDS survey requires extreme A/O systems such as SCExAO.
- ALMA data from Cycle 2 onward have spatial resolution comparable to the SEEDS data, and are needed to a) establish whether structure seen in the NIR is also present in gas or sub-millimeter dust, b) To measure the density contrast of spiral arms, and c) test predictions of dust trap models.

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