DISK PROPERTIES ACROSS THE STELLAR/SUBSTELLAR BOUNDARY AND IMPLICATIONS FOR PLANET FORMATION AND DETECTION OF PLANETS AROUND M-STARS. J. Patience[1], K. Ward-Duong[1], J. Bulger[2], G. van der Plas[3,4,5] F. Menard[5], C. Pinte[5], A. P. Jackson[6], G. Bryden[7], N. J. Turner[7], P. Harvey[8], A. Hales[9,10] and R. J. De Rosa[11]

[1]*School of Earth and Space Exploration, Arizona State University, P.O. Box 871404, Tempe, AZ 85287, USA*, [2]*Institute for Astronomy Maui, University of Hawaii, 34 Ohia Ku St., Pukalani, HI, 96768, USA*, [3]*DAS, Universidad de Chile, Santiago, Chile*, [4]*Millennium Nucleus, "Protoplanetary Disks", El Observatorio 1515, Las Condes, Santiago, Chile*, [5]*Univ. Grenoble Alpes, Institut de Plane ́tologie et d'Astrophysique de Grenoble (IPAG, UMR 5274), 38000 Grenoble, France*, [6]*Centre for Planetary Sciences, University of Toronto, 1265 Military Trail, Toronto, Ontario, M1C 1A4, Canada*, [7]*Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109-8099, USA*, [8]*Univ. of Texas at Austin, Austin, TX 78712, USA*, [9]*Atacama Large Millimeter/Submillimeter Array, Joint ALMA Observatory, Alonso de Co ́rdova 3107, Vitacura 763-0355, Santiago, Chile*, [10]*National Radio Astronomy Observatory, 520 Edgemont Road, Charlottesville, Virginia, 22903-2475, USA*, [11]*Astronomy Department, University of California, Berkeley, CA 94720, USA*

Introduction: With a combination of submm/mm observations, we are investigating the properties of disks around low mass M-stars and brown dwarfs in the Taurus star-forming region. Disk masses, sizes and multi-wavelength spectral slopes are important properties to assess the viability of planet formation in the disks and scenarios for grain growth in disks and formation of brown dwarfs. M-stars have a central role in current, planned, and possible future exoplanet search and characterization programs and understanding their environments informs detection experiments. Highlighting the importance of characterizing M-star environments are the large population of M-stars (e.g. ~75% of the field; Henry et al. 2006) and recent discoveries of intriguing systems of low mass planets orbiting M-stars such as Proxima Centauri (Anglada-Escude et al. 2016), LHS 1140 (Dittmann et al. 2017) and TRAPPIST-1 with seven planets around this M8 star near the brown dwarf limit (Gillon et al. 2017).

Sample and Observations: A sample of 24 Class II Taurus members with spectral types from M4-M7.75 were observed with ALMA at 885μm (Ward-Duong et al. 2017) and a subset of these targets were observed at ~3mm with PdBI or ALMA. The 24 targets represent half of the Class II members in this spectral type range with *Herschel*detections and span the full range of PACS 70μm fluxes rather than a subset of the brightest members. This pilot study includes 7 transition disks and 1 truncated disk, and the non-detections are both transition disks. The 885μm ALMA maps have a typical 1-sigma sensitivity level of ~0.13mJy/beam and a beam size of approximately 0.3arcseconds.

Results: All 24 targets are detected in either continuum or CO, with 20 detected in both. In continuum, 22 systems are detected at levels ranging from 1.0 mJy to 55.6 mJy (Ward-Duong et al. 2017). The two continuum non-detections are transition disks, though other transition disks in the sample are detected. Converting the ALMA continuum measurements to masses using standard scaling laws and radiative transfer modeling yields dust mass estimates ranging from ~0.3M⊕ to ~ 20M⊕ . The dust mass shows a declining trend with the mass of the central object when combined with results from submillimeter surveys of more massive Taurus members. The substellar disks appear as part of a continuous sequence and not a distinct population. Compared to older Upper Sco members with similar masses across the substellar limit, the Taurus disks are brighter and more massive. The disks around the early M-type stars in Taurus typically contain more mass in small solid particles than the average for heavy elements in the planetary systems found with *Kepler* on short-period orbits around M-dwarf stars (Mulders et al. 2015). Assuming a gas:dust ratio of 100:1, only a small number of the low-mass stars and brown dwarfs have a total disk mass amenable to giant planet formation, consistent with the low frequency of giant planets orbiting M-dwarfs. Several dust disks are spatially resolved, though more compact than disks around more massive stars. Compared to the dust disks, the gas disks are typically larger, with many spatially resolved and showing Keplerian velocity maps.

References: [1] Henry et al. 2006, AJ, 132, 2360. [2] Anglada-Escude et al. 2016, Nature, 536, 437. [3] Dittmann et al. 2017, Nature, 544, 333. [4] Gillon et al. 2017, Nature, 542, 456. [5] Ward-Duong et al. 2017, AJ, submitted. [6] Mulders et al. 2015, ApJ, 814, 130.

Additional Information: Funding acknowledged from NASA NExSS, NRAO, JPL, NSF, FONDECYT of Chile, ANR of France.