[JJ] Evening Poster | P (Space and Planetary Sciences) | P-CG Complex & General

[P-CG22]New Developments of Planetary Sciences with ALMA

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The Atacama Large Millimeter/Submillimeter Array (ALMA) starated its science operation in 2011, and long-baseline observations have become available since 2014. ALMA, with its high sensitivity and resolution, has provided us with qualitatively new information on star and planet formation and small bodies in our Solar System. For example, the discovery of narrow gap structures in the protoplanetary disks around young stars HL Tan and TW Hya enabled us to actually compare the long-standing theoretical models of planet formation with real observations. In our solar system, 60km pixel-scale non-uniform brightness distribution and the rotation of the asteroid Juno are detected. Spatially-resolved thermal mapping of Europa icy surface enables us to search for thermal anomaly in possible plume source regions. As of Cycle 4, Solar observations are available, enabling us, for example, to determine the physical parameters of plasmoid quantitatively. In this session, we overview the latest results of ALMA observations in the field of planetary sciences. We also accept any theoretical and experimental works that are closely related to the observations and discuss the impact on the planetary science community.

[PCG22-P14]Structure Formation in a Young Protoplanetary Disk by a Magnetic Disk Wind

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Recent observations with ALMA found that the ring-hole structure may be formed in protoplanetary disks even in the early stage of the disk evolution, when the disk is embedded n the envelope. The mechanisms of the gap formation in a young disk have not been investigated well. We present a one-dimensional model for the formation of a protoplanetary disk from a molecular cloud core and its subsequent long-term evolution within a single framework. Such long-term evolution has not been explored by numerical simulations due to the limitation of computational power. In our model, we calculate the time evolution of the surface density of the gas and the dust with the mass loss by MHD disk wind and the radial drift of the dust in the disk. We find that the MHD disk wind is a viable mechanism for the formation of ring-hole structure in young disks. We perform a parameter study of our model and derive condition of the formation of ring-hole structures within 6×10^5 years after the start of the collapse of the molecular cloud core. The final outcome of the disk shows five types of morphology and this can be understood by comparing the timescale of the viscous diffusion, the wind mass loss and the radial drift of the dust. We discuss the implication of the model for the WL 17 system, which is suspected to be an embedded, yet transitional, disk.