[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-P11]The Synthetic ALMA Multiband Analysis of the Dust Properties of the TW Hya Protoplanetary Disk

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As one of the famous protoplanetary disks (PPDs), TW Hya shows clear dust gap structures by ALMA (e.g., Andrews et al. 2016; Tsukagoshi et al. 2016). Multi-band observations of dust continuum is a good tool to understand the physical and chemical properties of these structures. To get dust properties of TW Hya PPD, we had tried to derive the radial profiles of dust temperature T_d, optical depth τ$_{\ν}$, and opacity power-law index β using ALMA high spatial resolution data with the assumption of κ$_{\ν}$ ∝ ν$^{\β}$. As an example, we used ALMA Band 7, 6, and 4 archival data. However, this dataset was too sensitive to the observational error so that only 10% error in intensity makes the estimation ranges too broad, especially for T_d. Thus, we performed Synthetic ALMA Multi-band Analysis for finding the best ALMA dataset to constrain dust properties. Our result suggests that the best dataset is ALMA Band 10, 7, and 3. There are two conditions for good constraint on T_d, τ$_{\ν}$, and β; (1) the combination of one band from Band 9 or 10 and one band from Band 3 or 4 and (2) enough frequency intervals between the selected bands. Based on the analysis result, we derived the radial profile of T_d, τ$_{\ν}$, and β using Band 9, 6, and 4 ALMA archival data to check our analysis is consistent with real observation data. Although the result seems to be improved than the result of Band 7, 6, and 4 and consistent with our analysis, we need Band 9 high spatial resolution observation to make the valid consistency of Synthetic ALMA Multi-band Analysis.