P203a Dust Grain Growth in the Protostellar Disk Surrounding a FU Orionis Type Star

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The dust grain growth within a protoplanetary disk is considered as the first step of the planet formation. The water-snow line defined as the sublimation front of the water ice within the disk is believed to play a crucial role in facilitating the rapid coagulation of ice-covered dust grains. During the quiescent period of a low mass young stellar object, the water-snow line is only a few au away from the star, which makes it hard to spatially resolve it with the current generation telescopes. V883 Ori is a Class I object and identified as a FU Orionis type star where the luminosity increases more than 10 times compared to the quiescent period. During the FU Orionis burst, the viscous heating is expected to push the water snow line out to 40 au away from the star, which will give us an opportunity to check the effect of the water-snow line on the dust grain growth.

In this study, we characterized the disk structure and dust grain size distribution for the disk of V883 Ori by applying multi band analysis using the ALMA Band 3, Band 4, Band 6, and Band 7 datasets retrieved from the ALMA Science Archive with the spatial resolution of ≈ 0.08", or ≈ 30 au. The continuum observations exhibit a smooth disk. Our results show the dust grain size is over 4.4 mm outside the water-snow line and below 600 μm inside the water-snow line. Such a large divergence in the radial distribution of the dust grain size may demonstrate the importance of the water-snow line for the dust grain growth. The results also suggest the dust grains in the disk of a Class I object have already reached mm size in its outer part, which means a planet forms earlier than the theory prediction which says the planet formation starts from the Class II object.