**Time and Space Variation of the Organic Particles in the Proto-Solar Disk**

M. Numata,[1] and H. Nagahara[1]

[1]*Department of Earth and Planetary Science, The University of Tokyo, Japan*

It is one of the critical problems of planetary science whether organic materials formed in molecular cloud were the origin of the organic materials of the planets and small objects. Nakano et al. (2003) suggested that organic materials in meteorite parent bodies were not derived from molecular clouds, because the compositional variation of the C and N contents of heated organic analogs does not agree with that of carbonaceous chondrites. On the other hand, organic grains must have experienced temperatures change according to the radial transport in the protoplanetary disk, which would have been resulted in compositional change and mixing of various organics in the protoplanetary disk.

In this study, we investigate the temporal and spatial change of distribution and chemical composition of organic particles in the proto-solar disk by taking the experimental results by Nakano et al. (2003) into consideration. We calculate the viscous disk evolution of the model by Ciesla (2010a) and location of individual particles position simultaneously. The temperature that each particle experienced is estimated on the basis of radial temperature distribution and the chemical composition of individual particles is obtained by applying the results of heating experiments on analog organic materials by Nakano et al. (2003).

The temporal change of organic particle distribution is shown in Fig. 1, which shows that particles initially located in the outer region drift inward with logarithmic decay, and that organic particles were stably present in the inner region after $10^6$ year. Figure2 shows the C contents of the particles corresponding to Figure1, where the vertical value of ~40 wt% represents the initial value at the molecular cloud. The composition of organics changes with time and space, and the total amount of C decreases with distance. On the other hand, due to the radial transport, the inner region tends to be occupied with primitive organics with time. Planetesimals formed at 2-3 AU at the early stage of the disk evolution would have contained organics that were thermally processed to various degrees, whereas, those formed at the later stage would have contained organics that retained primitive chemical composition originated from the molecular cloud.

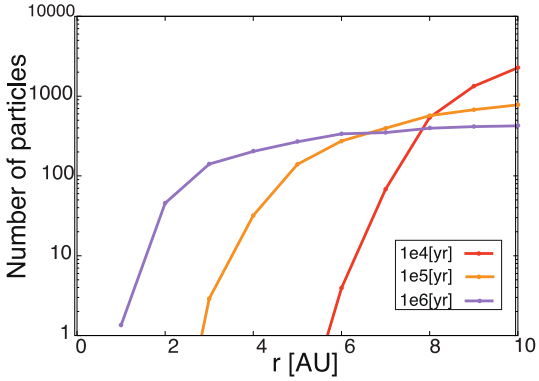


Figure 1: Time-space variation of organic matterr distribution

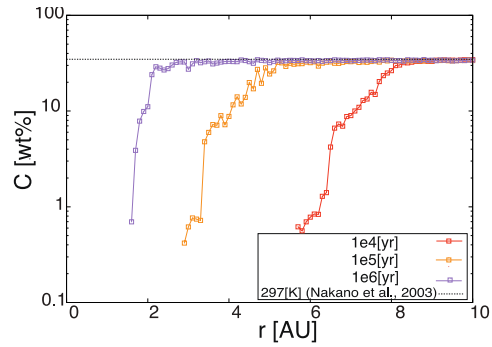


Figure 2: Time-space variation of composition of organic material

## References

F. Ciesla, 2010a, Icarus 208, 455; F. Ciesla, 2010b, ApJ 723, 514; F. Ciesla, 2011, ApJ 740, 1; Nakano et al., 2003 ApJ 592, 1252