High resolution records of organic carbon and its isotopes in Core MD01-2421 off central Japan, NW Pacific, during the last 145,000 years

TOSHINORI UESHIMA[1], MASANOBU YAMAMOTO[1], TADAMICHI OBA[1] , TOSHIKATSU KURAMOTO[1], MASAO MINAGAWA[1], AND TOMOHISA IRINO[1]

[1]Graduate School of Environmental Earth Science, Hokkaido University, Sapporo myama@ees.hokudai.ac.jp

A giant piston core MD01-2421 (45.82m long) was taken from off coast of the central Japan (36°02'N, 141°47'E, 2246 meter deep), NW Pacific, during IMAGES VII-WEPAMA Leg 2 in 2001. We have generated the late Quaternary records of total organic carbon content (TOC), $\delta^{13}C$ of bulk organic matter, C/N weight ratio, marine and terrestrial organic carbon contents, and their accumulation rates, in order to understand the responses of marine productivity to the latitudinal displacement of the subarctic boundary.

TOC ranged from 0.10 to 2.13%, with an average of 1.18%. C/N weight ratio ranged between 7.5 and 9.7, averaged at 8.8. $\delta^{13}C$ of bulk organic matter ranged from –23.0 to –20.7 permil with an average of –21.5 permil. TOC has a positive correlation with biogenic opal content (Narita, in prep.) and a negative correlation with detrital matter content (Irino, in prep.).

The fractions of marine and terrestrial organic carbons were calculated from the $\delta^{13}C$ of bulk organic matter, assuming that the endmember values of $\delta^{13}C$ are –20.5 permil and –26.5 permil for marine and terrestrial organic matters, respectively (Wada et al., 1984; 1990; Nakatsuka et al., 1997). The fraction of terrestrial oragnic carbon ranged between 3 and 42% with an average of 17%, and it tends to be higher in low sea-level stand periods.

From MIS-1 to MIS-4, TOC variation showed a precession cycle. TOC was higher when subarctic boundary shifted southward, which was demonstrated by the precession-controlled changes of Tn, Tp and Td values (Aizawa et al., submitted; Niimura and Oba, in prep.; Koizumi, in prep.). This suggests that marine productivity was enhanced when subarctic boundary was displaced southward. In contrast, the amplitude of TOC variation was relatively low during MIS-5.

Accumulation rates of total and marine organic carbons show maxmal peaks in late MIS-5a, early MIS-5b and late MIS-5e, which reflect higher linear sedimentation rates in these intervals. The accumulation rate of terrestrial organic carbon shows two additional maximal peaks in MIS-1/2 and 5/6 boundaries. This suggests that the influx of terrigenous organic matter increased with the rapid sea level rise during deglaciations.

Evidence against the Nebular Shock Model of Chondrule Formation

[1]M. UESUGI, [2]T. AKAKI, [3]M. SEKIYA, AND [4]T. NAKAMURA

[1]Department of Earth Planet Sci., Kyushu University, Japan (uesugi@geo.kyushu-u.ac.jp)
[2]Department of Earth Planet Sci., Kyushu University, Japan (akaki@geo.kyushu-u.ac.jp)
[3]Department of Earth Planet Sci., Kyushu University, Japan (sekiya@geo.kyushu-u.ac.jp)
[4]Department of Earth Planet Sci., Kyushu University, Japan (tomoki@geo.kyushu-u.ac.jp)

We examined validity of the shock wave model from a viewpoint of iron sphere inclusions of chondrules. Recently, Uesugi et al. (2003) have shown that strong apparent gravitational force (~40G, G: gravitational acceleration on the earth's surface) acts on the molten chondrule precursor due to the drag deceleration by the shocked nebular gas. They have also shown that high speed internal rotational flow (~10cm s^{-1}) is driven by tangential component of momentum flux of the shocked nebular gas flow after total melting of the chondrule precursor (Fig. 1a). Based on these results, we calculated the trajectories of molten iron sphere in the chondrule precursor. The results show that the molten iron spheres are quickly (<3 s) ejected from inside to surface of the chondrule precursor due to the apparent gravitational force and centrifugal force of the rotational flow. The time scale is quite short compared to duration of chondrule precursor melting in the shock wave (~20 s). Figure 1b shows cross section of the chondrule precursor sphere and trajectories of the molten iron spheres whose radii are 0.1 times that of the chondrule precursor.

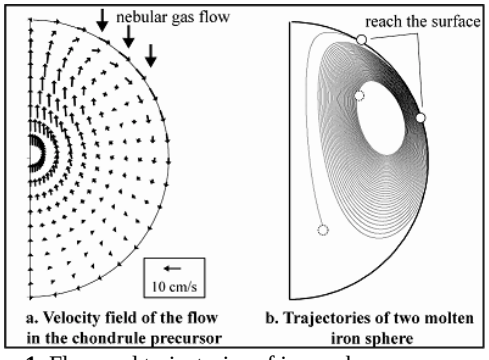

Figure. 1. Flow and trajectories of iron spheres

None of the tendency of the iron sphere distribution obtained from the calculations found from the observations. These results indicate the shock wave heating could not be responsible for chondrule formation.

References

Uesugi M., Sekiya M. and Nakamoto T., (2003), *Earth Planets Space*, (submitted).