

## Two step expansion of C4 plants in northwestern India at 10 Ma and 7.5 Ma: Evidence of leaf wax carbon isotopes in IODP Site U1457 sediments

Kenta Suzuki<sup>2</sup>, \*Masanobu Yamamoto<sup>1,2</sup>, Osamu Seki<sup>2,3</sup>

1. Faculty of Environmental Earth Science, Hokkaido University, 2. Graduate School of Environmental Science, Hokkaido University, 3. Institute of Low Temperature Science, Hokkaido University

Earlier studies indicated that C4 plants started to expand globally around 8 Ma (e.g., Cerling et al., 1997). This phenomenon is attributed to the decrease of atmospheric CO<sub>2</sub> (Cerling et al., 1997), cooling (Zhang et al., 2003) and aridification (Huang et al., 2001).

In this study, we generated a record of the stable carbon isotope ( $\delta^{13}\text{C}$ ) of higher plants during the last 10.6 m.y. Long-chain fatty acids (>26 carbons) were analyzed for 90 samples between 0 to 1000 m in Site U1457, Laxmi Basin, Arabian Sea.

The  $\delta^{13}\text{C}$  of C<sub>26,28,30</sub> fatty acids was -29 ‰ at 10.5 Ma, dropped at 10 Ma to -34 ‰, recovered to -28 ‰ by 9 Ma, dropped again at 8 Ma to -33 ‰, abruptly increased to -26 ‰ at 7.5 Ma, gradually increased to -23 ‰ by ~6 Ma, and constantly high after 6 Ma. This result indicates that the proportion of C4 plants around 10 Ma and 8 Ma was significantly low, and C4 plants expanded two times at 10 Ma and 7.5 Ma. The first retreat of C4 plants around 10 Ma corresponded to a wet period in eastern Europe (Böhme et al., 2007), suggesting that higher precipitation increased C3 plants. The second retreat of C4 plants around 8 Ma is unexplained, but the recovery of C4 plants at 7.5 Ma coincided with global cooling, suggesting a drastic decrease of atmospheric carbon dioxide concentration may have induced C4 plant expansion.

Keywords: C-4 plants, Miocene, India