PEAT-CORE ANALYSIS FOR TRACING THE PALEOCLIMATE-RELATED CHANGES IN AEOLIAN DUST DEPOSITION IN JAPAN

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INTRODUCTION

Asian dust deposited to Japan annually about 1~2 g m^{-2} yr^{-1} (Yoshinaga et al., 1998).

Well-Known contribution of aeolian dust on remote ecosystems

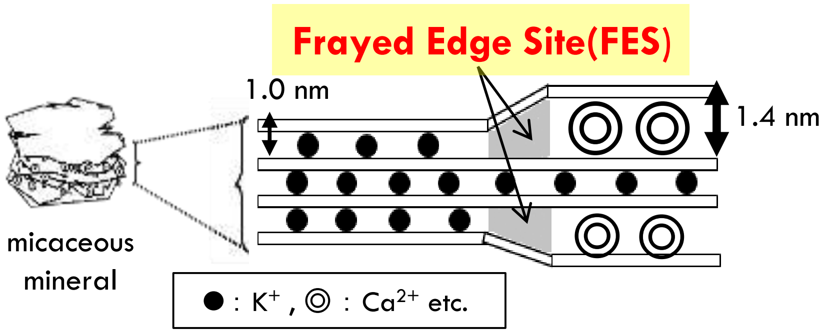
✓ as a source of bioavailable iron (Maher et al., 2010)

✓ bioavailable phosphorus (Chadwick et al., 1999)

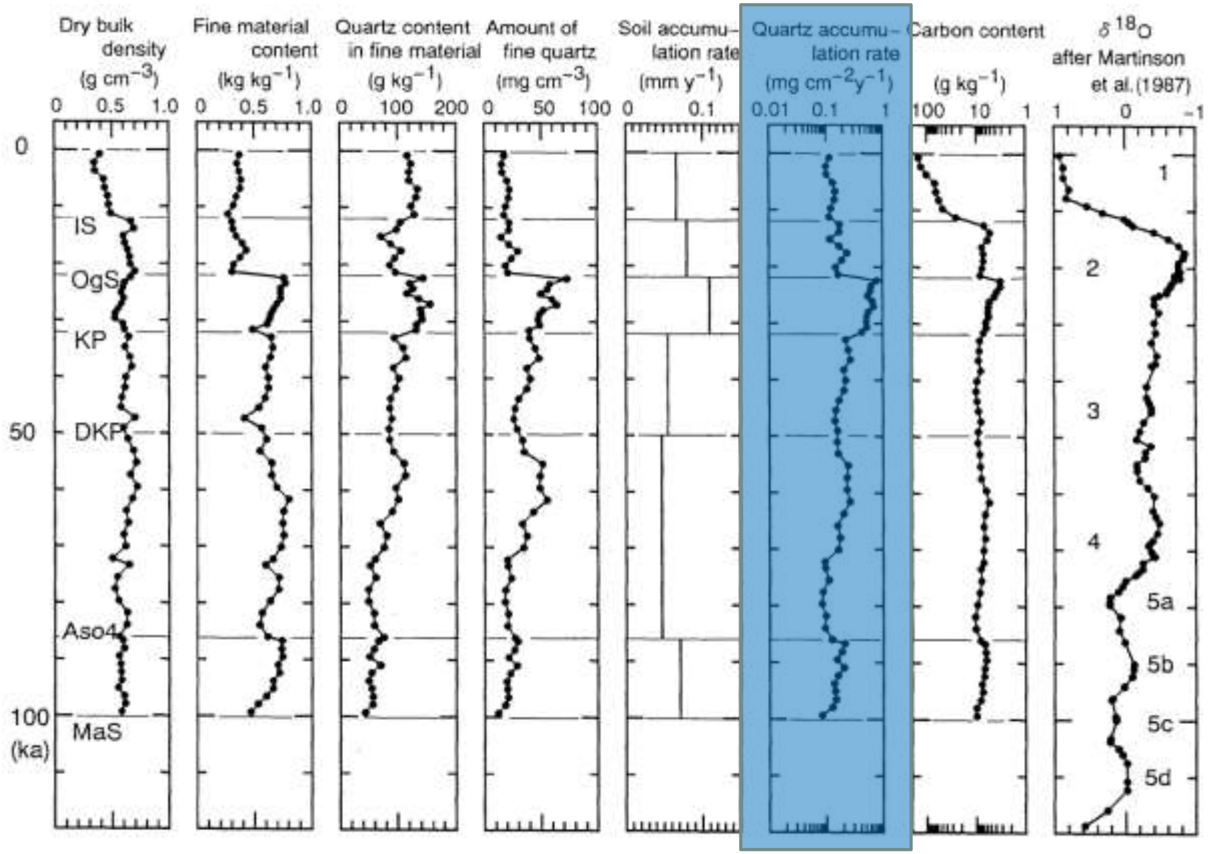
Recently known contribution of aeolian dust in soils in Japan

✓ Mica amendment to mica-deficient soils (e.g. volcanic-ash soils; Nakao et al., 2015, serpentine soils; Nakao et al., 2019), which largely increase soil ability to retain radiocesium.

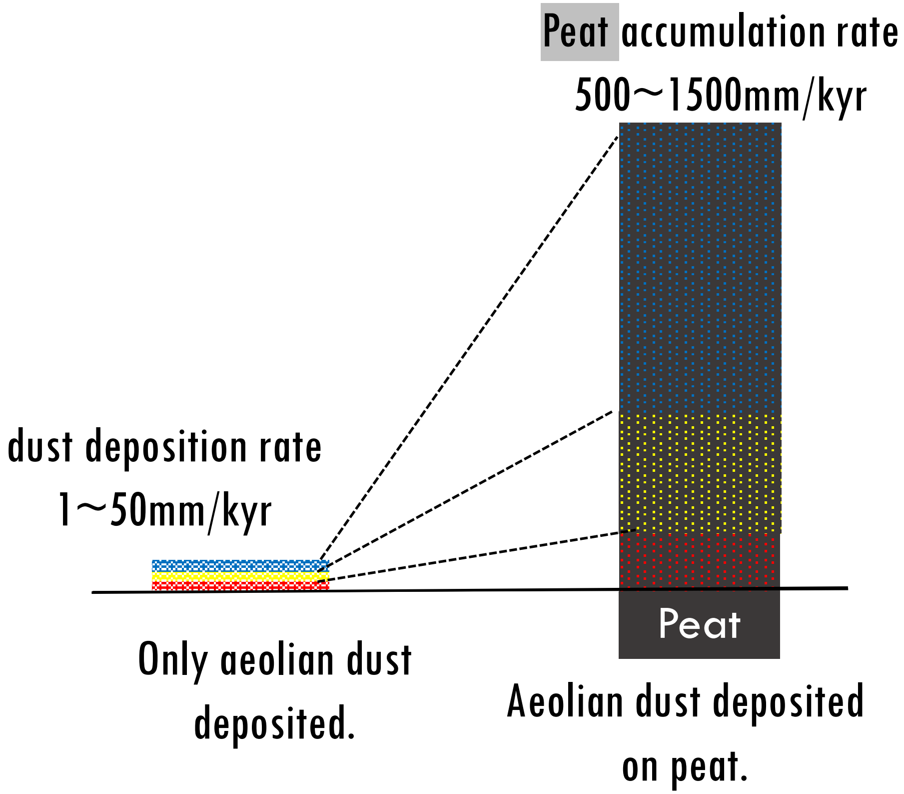
Mica has selective adsorption site for Cs.



PURPOSE OF THIS STUDY



Estimation of aeolian dust flux by using quartz content in volcanic ash layers (Yoshinaga et al., 1995)



Purpose

To estimate the aeolian dust flux during last glacier period by using mineral contents in peat core

MATERIALS

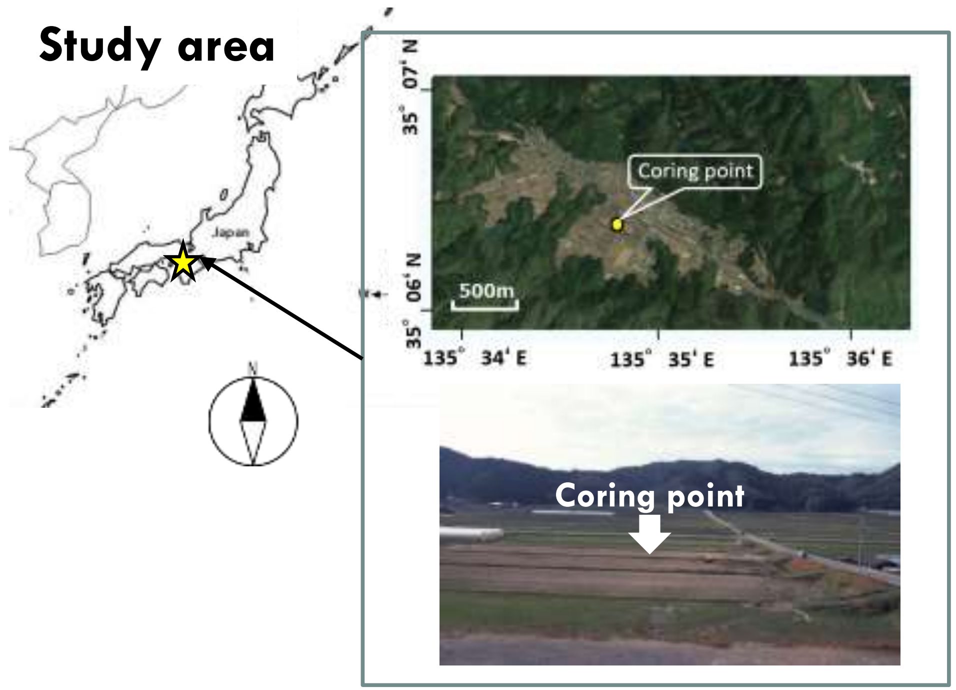


Fig. Coring point in Kamiyoshi basin

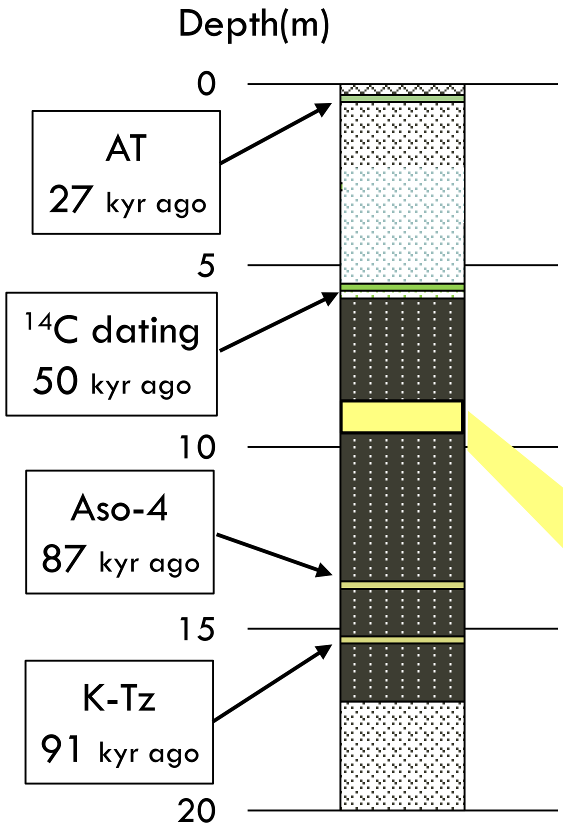
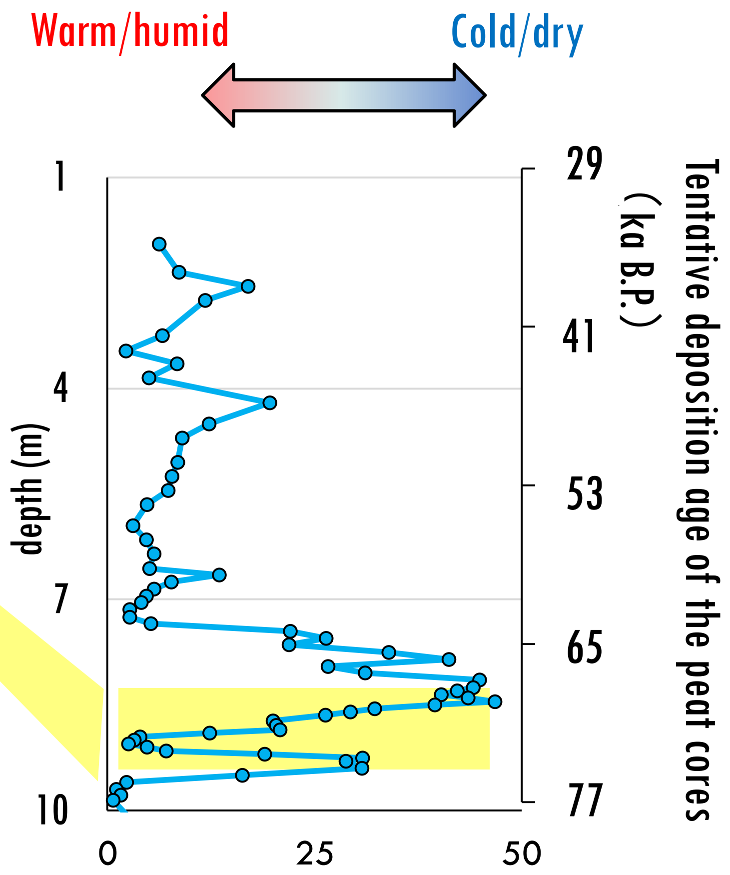


Fig1. Layer of KMY core

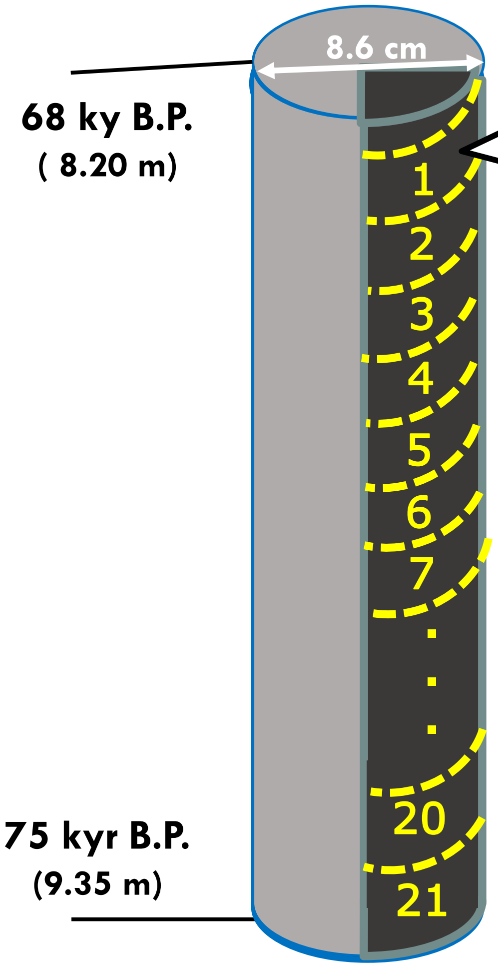


Pollen percentage of Pinaceous conifer (%)
(Hayashi et al., 2009)

Kamiyoshi (KMY) basin in Kyoto, Japan(35°06', 135°35')
characterized by **continuous peat layer** more than 91 kyr.
Samples(KMY) was collected by boring core method (Takahara 2001 and 2004).

This is the transisional period from MIS4 to MIS5 in which a drastic paleoclimate change was recorded.

METHODS - PRETREATMENT-



Volume : about 55 cm^3
Weight (wet) : about 50 g

Organic matter removal
with H_2O_2 oxidation

Samples
(<20 μm)
Weight :
0.9～4.7 g

No.7

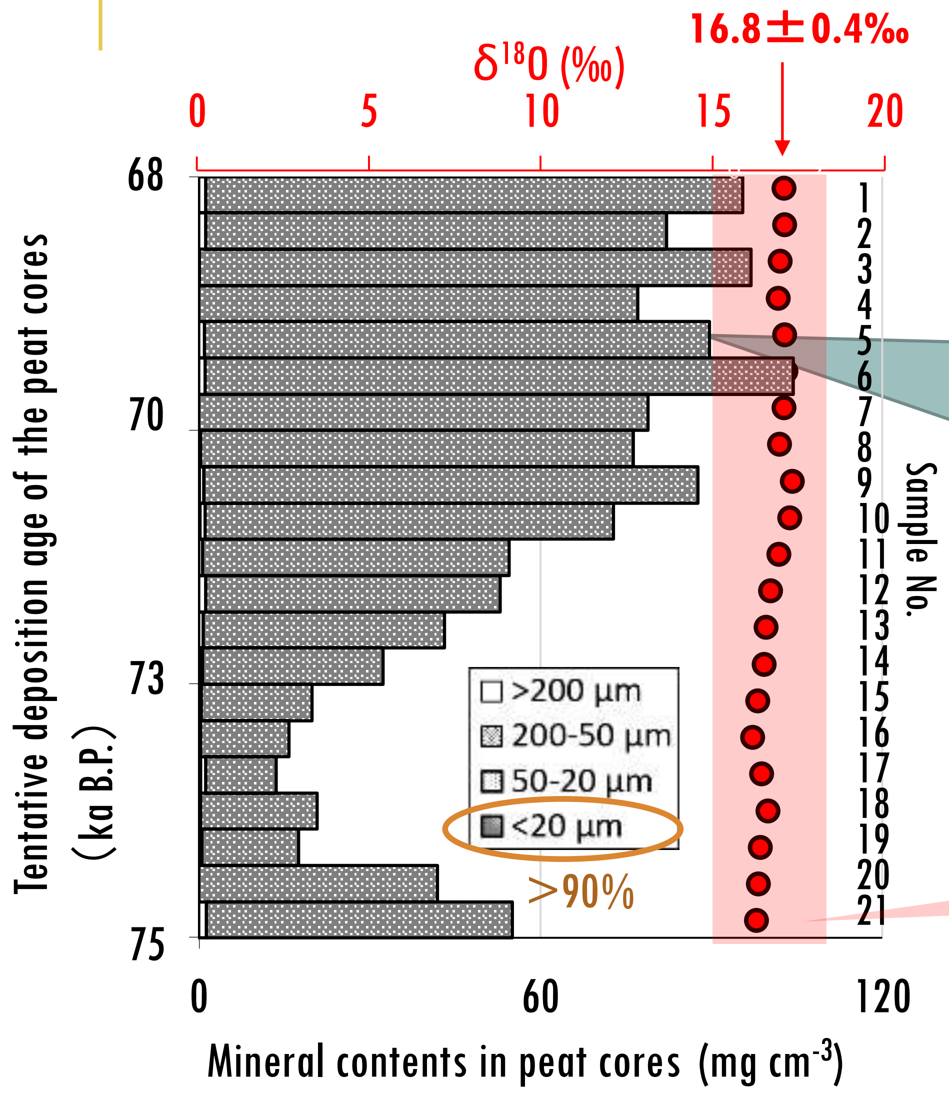
No.12

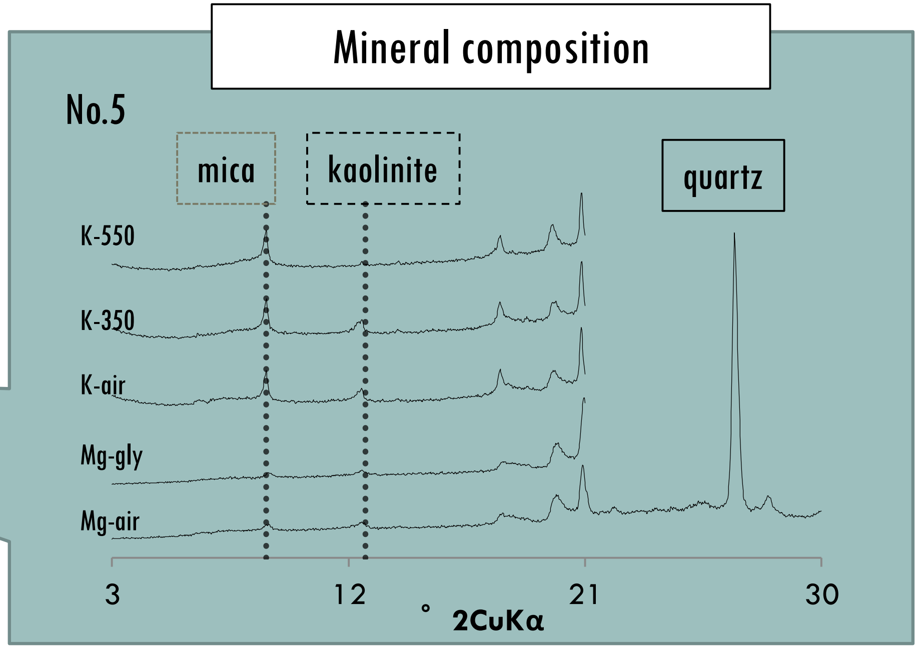
No.16

1. X-ray diffraction analysis
   Composition of minerals
2. Selective dissolution analysis
   - Determination of mica and quartz content
   - Isolation of quartz particle
3. Stable isotope analysis
   $\delta^{18}O$ value of the isolated quartz

$$\delta^{18}O = \left[\frac{(^{18}O/^{16}O)_{sample}}{(^{18}O/^{16}O)_{VSMOW}} - 1\right]$$

RESULTS 1.





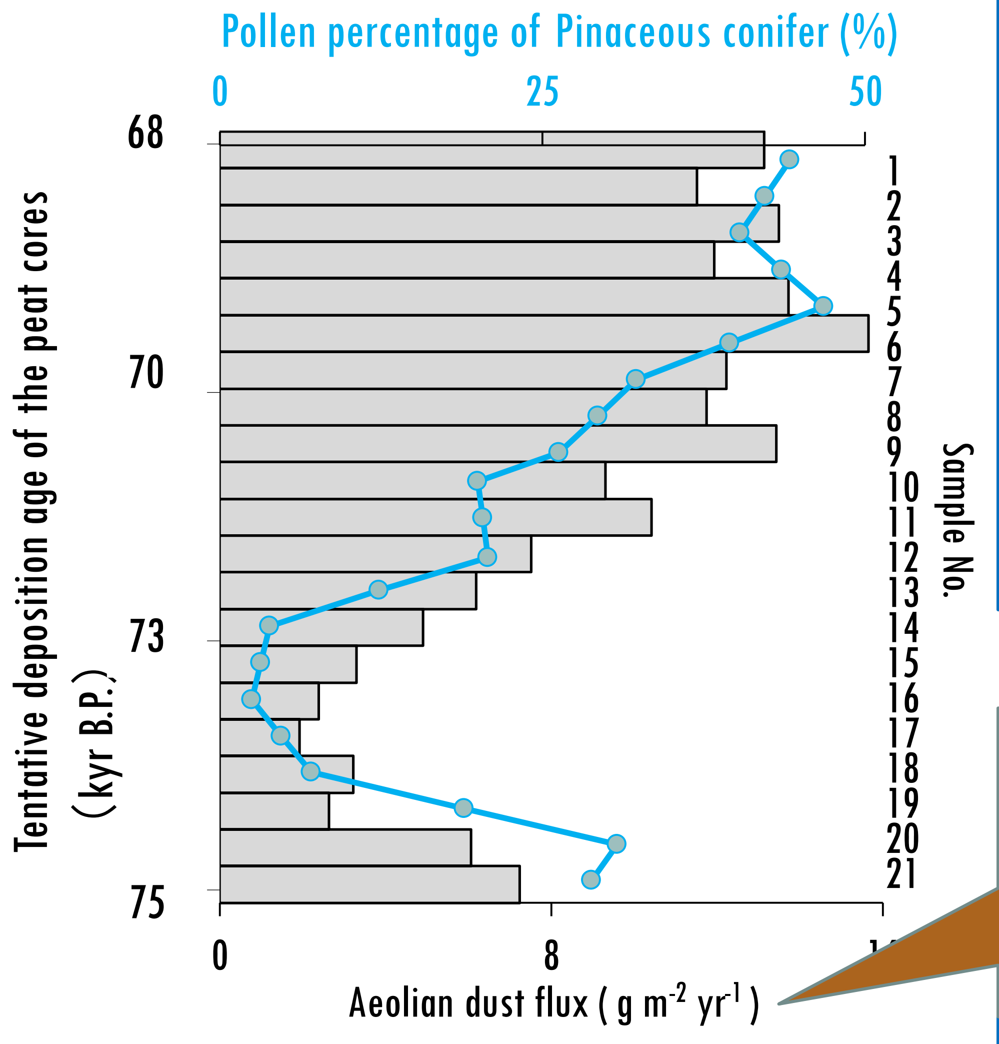
Quartz, mica, and kaolinite are the main components, similar to those of aeolian dust

$\delta^{18}O$

KMY(<20 μm) : 16.8±0.4‰

Same range of the $\delta^{18}O$ as those of quartz in the Chinese desert : 15.1～18.2‰ (Yan et al., 2014)

RESULTS 2.



Estimated on the assumption that <20μm particles in the cores were originated form aeolian dust.

Estimated dust flux

Range: 2.0∼16.0 g m^{-2} yr^{-1}

Average: 8.7±4.6 g m^{-2} yr^{-1}

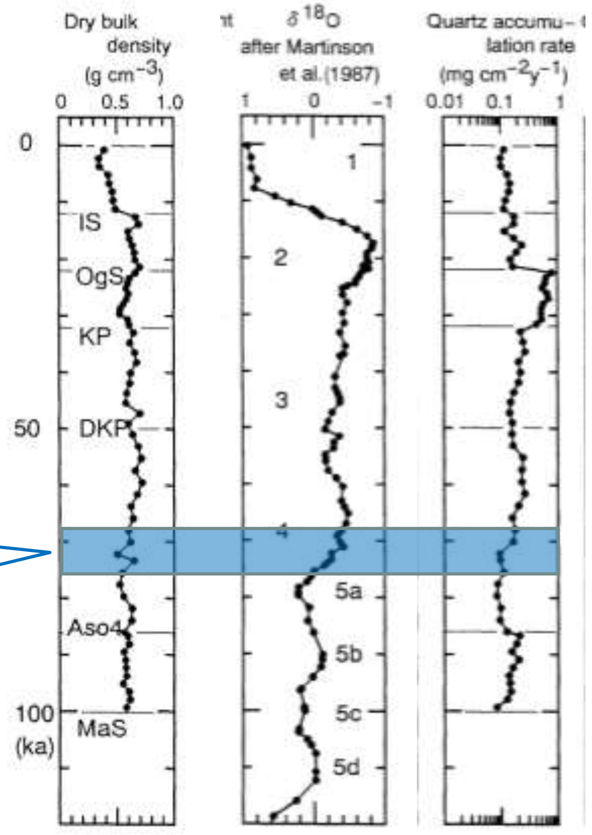
(12.9±1.7 g m^{-2} yr^{-1} during MIS4)

↑

Ten times higher than current deposition rate (Yoshinaga et al., 1998)

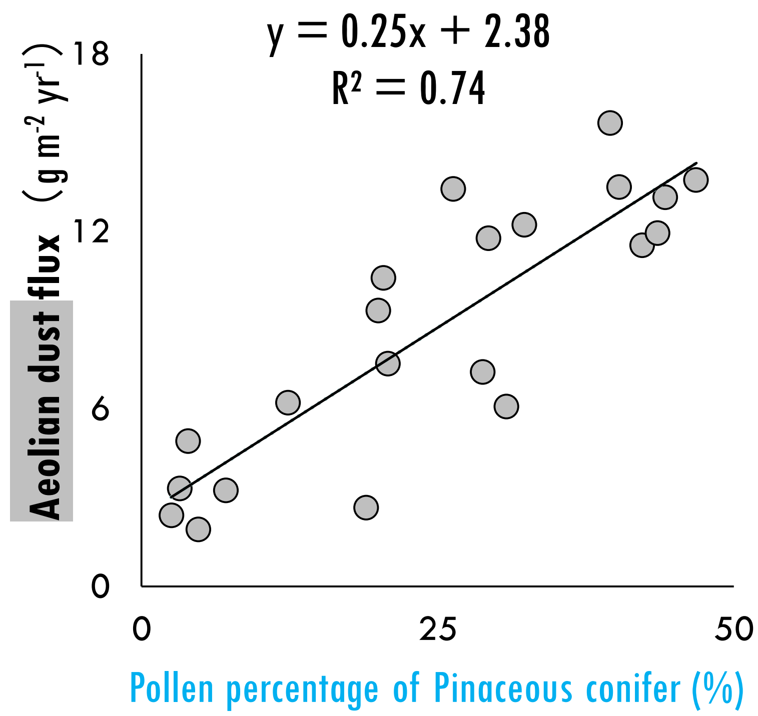
Estimated dust flux fluctuations in the same pediod

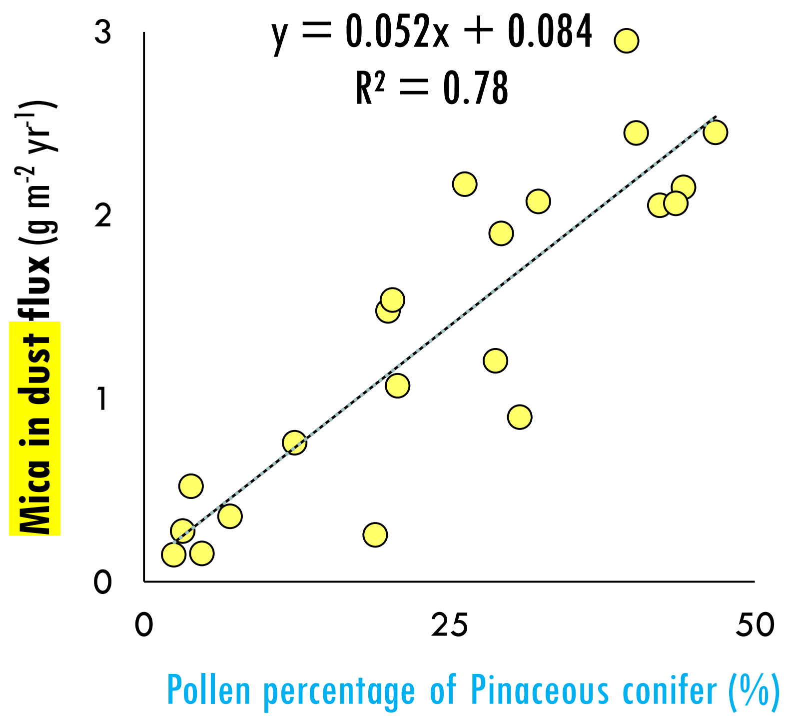
(Yoshinaga et al., 1996)



Same trend but much higher time-resolution!

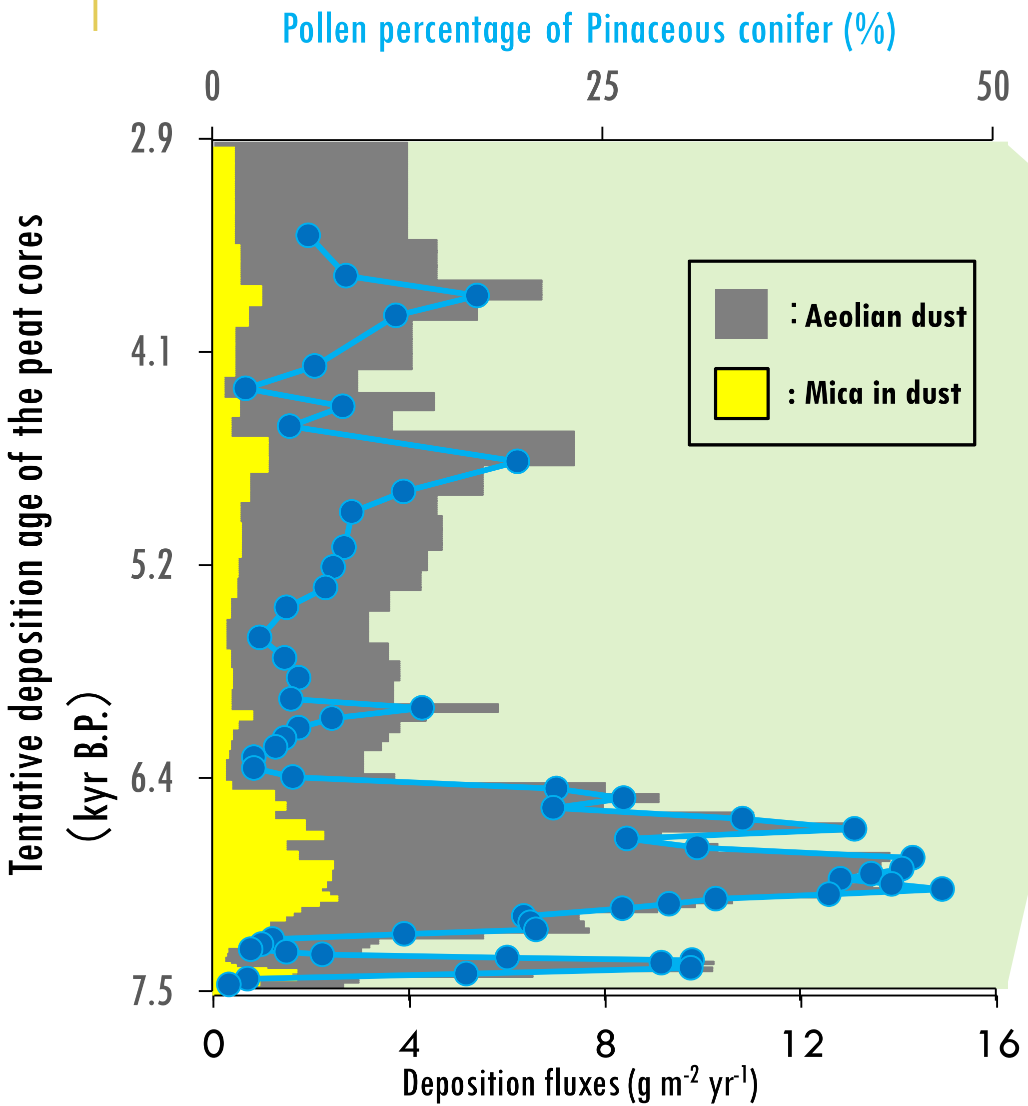
RESULTS 3.





Linear relationship between aeolian dust (or mica in dust) flux and Pollen percentage of Pinaceous conifer

DISCUSSION



Depositon ages (kyr)	Total amount of deposition (kg m^{-2})	
	Aeolian dust	Mica
4.6	**254**	**34 (13%)**

Comparative to soil formation rate
(23～460 kg m^{-2})
(Stockmann et al., 2014)

MIS4 (59-71 ka) is the important period to accumulate aeolian dust in Japan.

CONCLUSION

- ✓ The higher aeolian dust flux was observed at colder and drier paleoclimate as indicated by the higher proportion of pinaceous conifer pollen.
- ✓ The associative analysis of mineral and pollen record in the peat-core can be a promising method to trace the long-term deposition pattern of aeolian dust in terrestrial ecosystems in Japan.

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Thank you for your attention!