Centennial- to millennial-scale monsoon changes since the last deglaciation linked to solar activities and North Atlantic cooling

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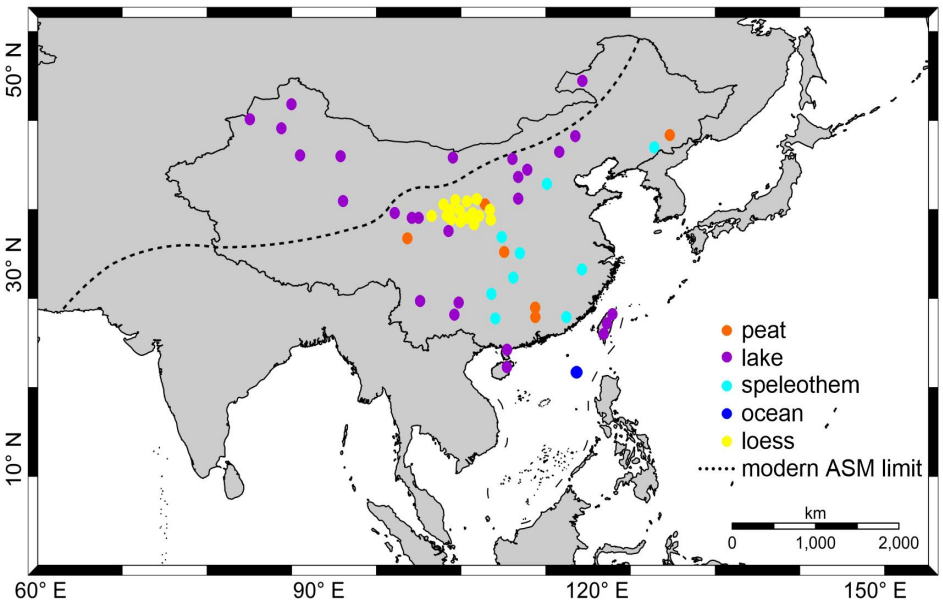
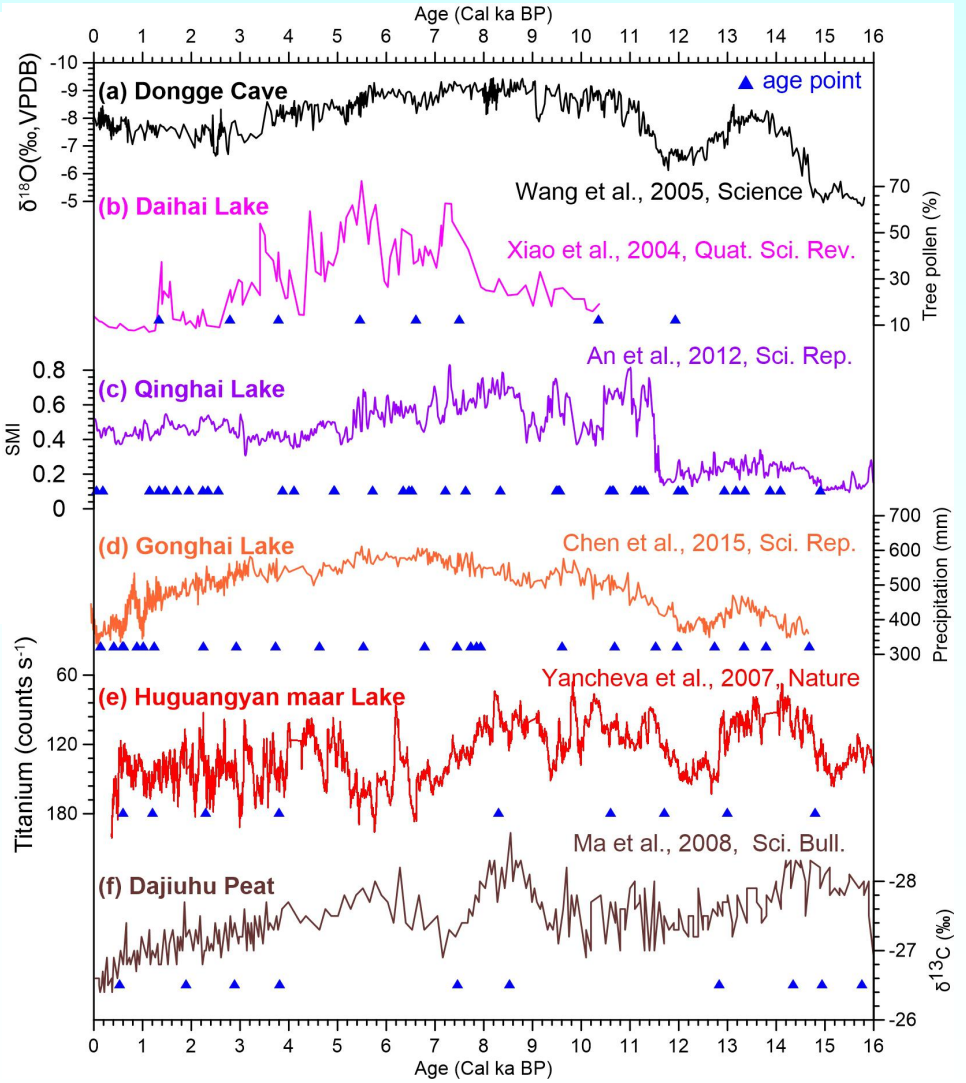
Abrupt Climate Changes: East Asia



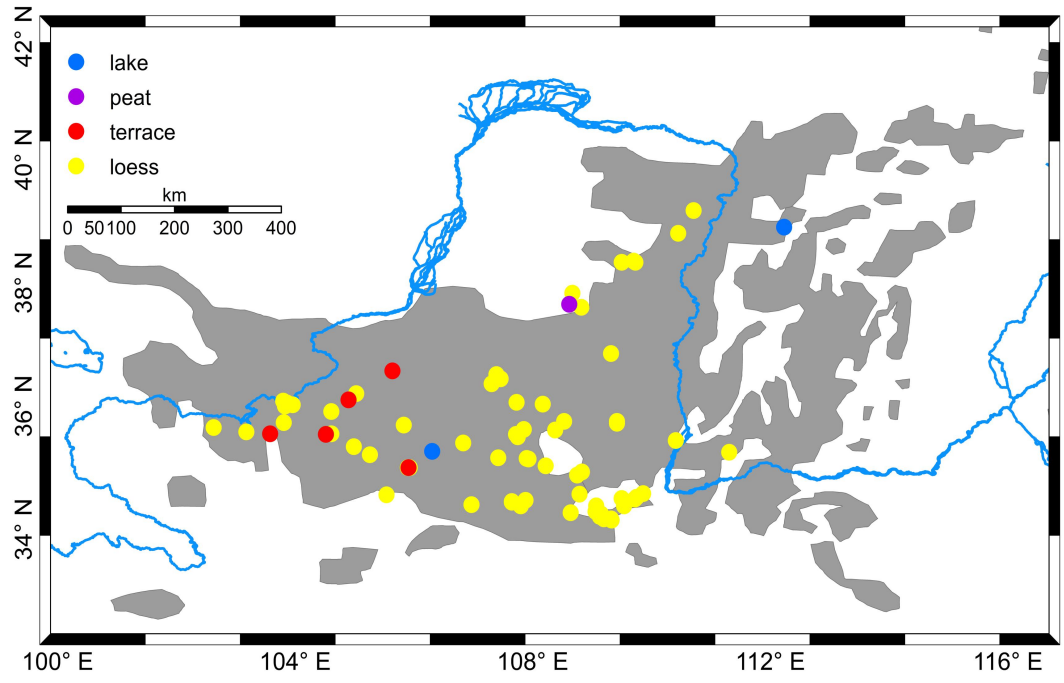
Palaeoclimate records since the last deglaciation in East Asia

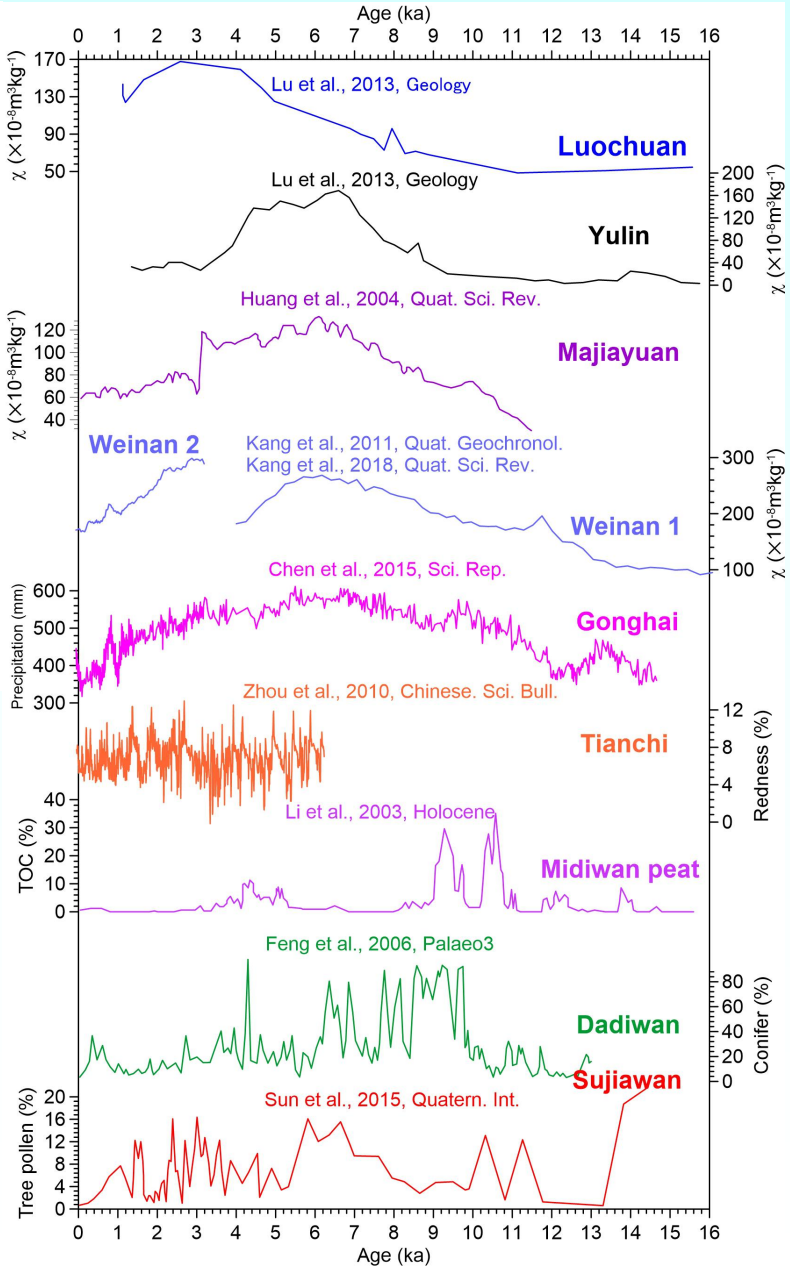
Well dated cave, lake, peat and loess deposits
Different orbital trend and shift timing
Different features of Abrupt monsoon changes



Comparison of East Asia palaeoclimate records since 16 ka

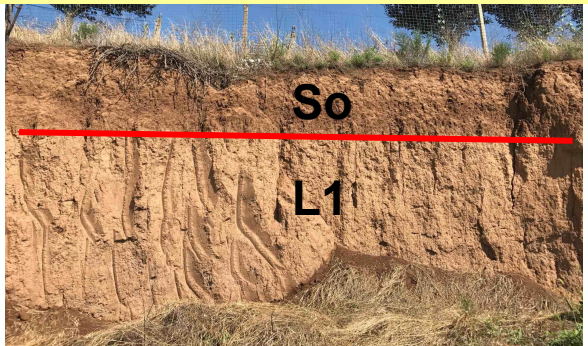
Abrupt Climate Changes: Chinese Loess Plateau





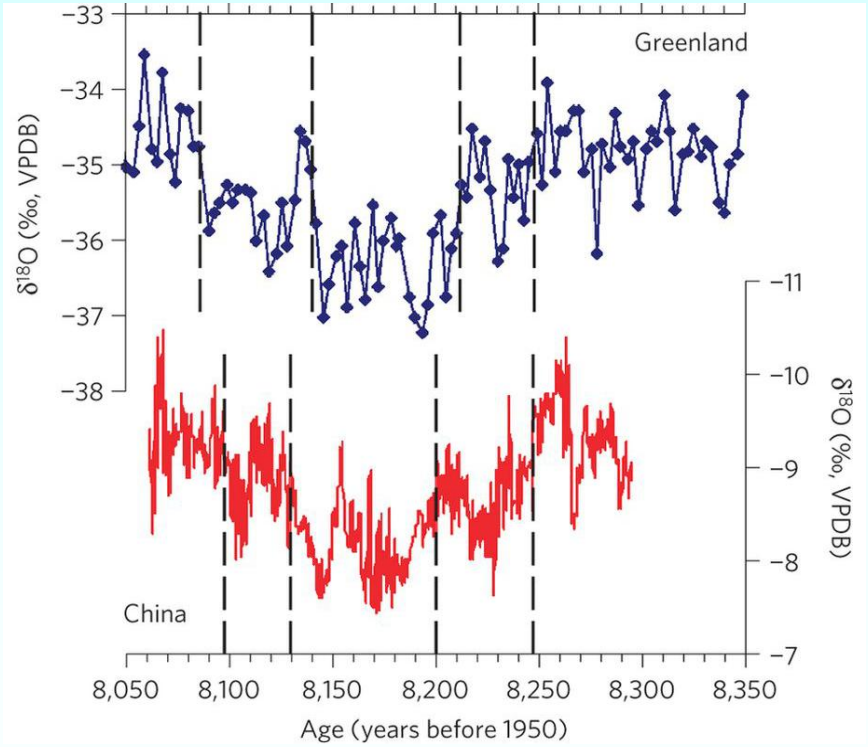
Palaeoclimate records since the last deglaciation on the CLP

Holocene soil: low SR, less sensitivity
Lake/Peat: relatively few
River terraces: high accumulation rate



Dynamics of Abrupt monsoon changes

Triggered by high-latitude cooling

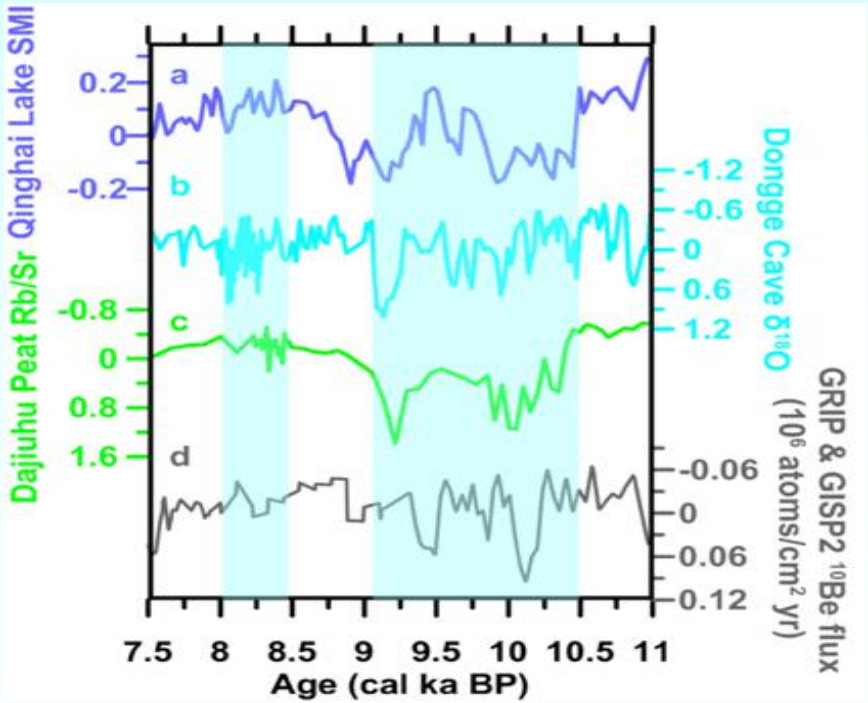


The 8.2 ka event in Greenland and Central China

Liu et al., 2013, Nat. Geosci.

Northern Hemisphere cooling
Southward migration of the ITCZ
weakening of the monsoon

Triggered by solar activity (low-latitude processes)

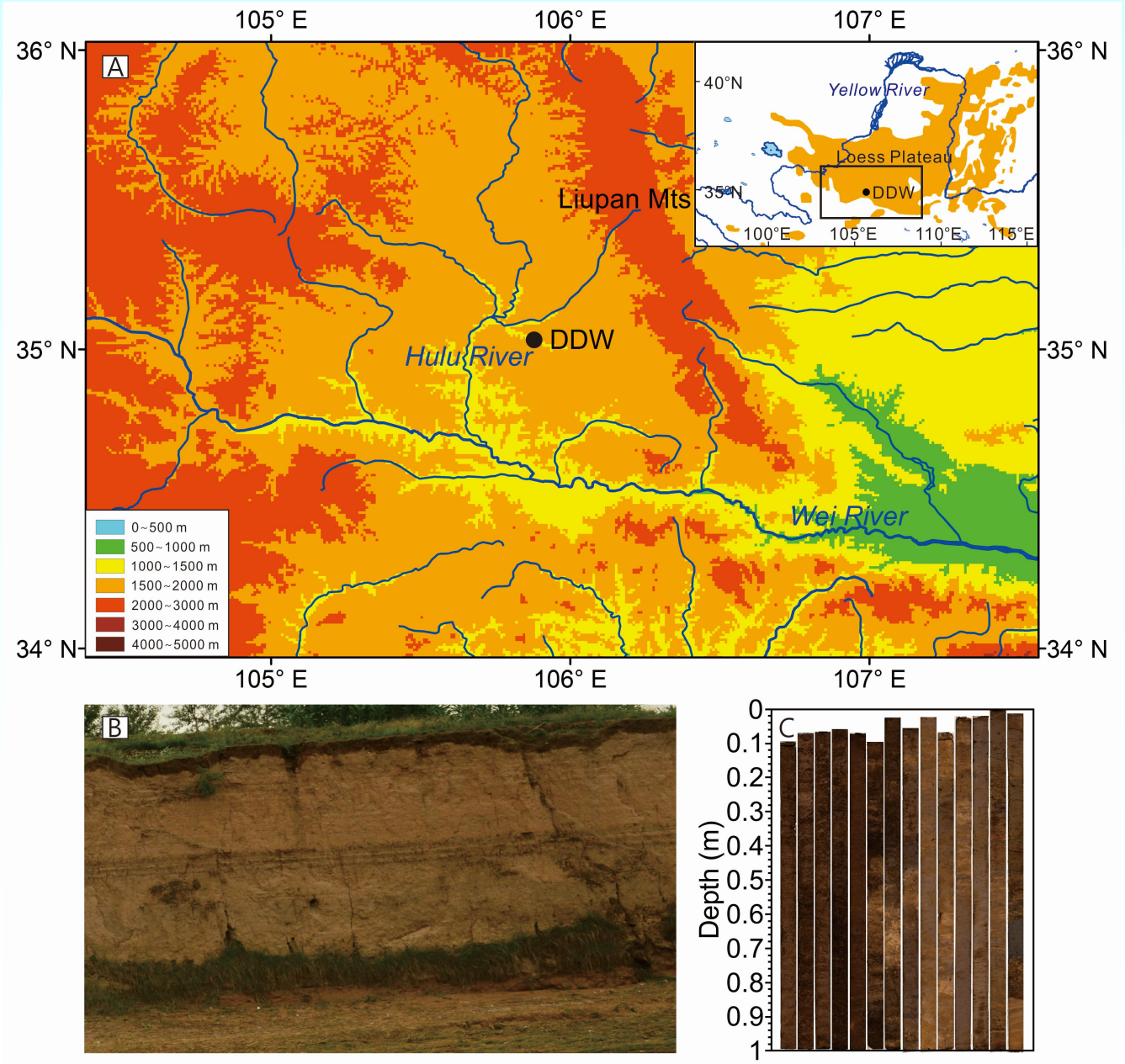


The 9.2 ka event of weakened summer monsoon

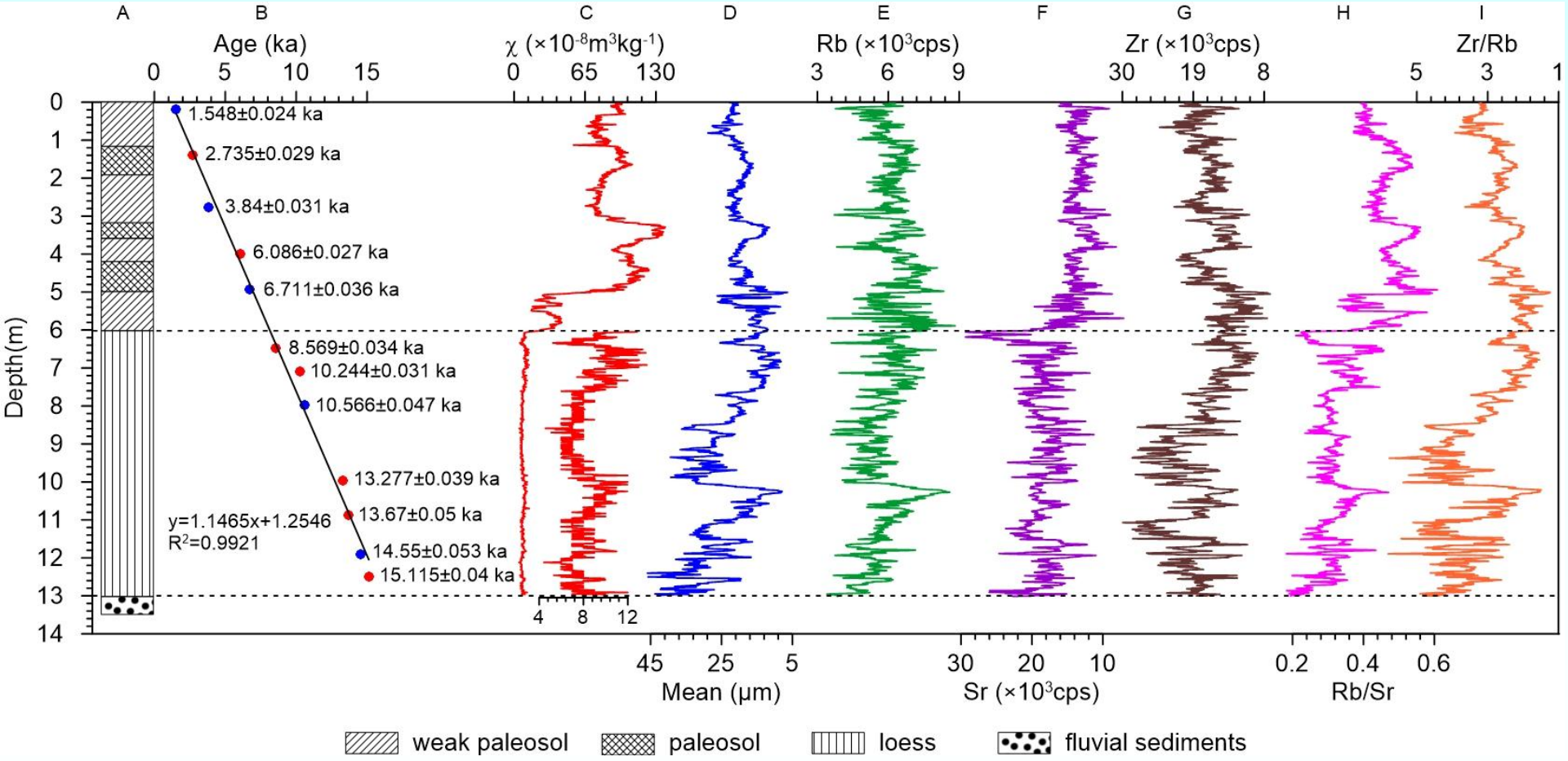
Zhang et al., 2017, Clim. Dyn.

Decreased solar irradiance
Reduce land-ocean thermal contrast
Decline monsoon moisture transport
less precipitation in the ASM area

Terrace deposit at Dadiwan (DDW)



Chronology and Proxy variations

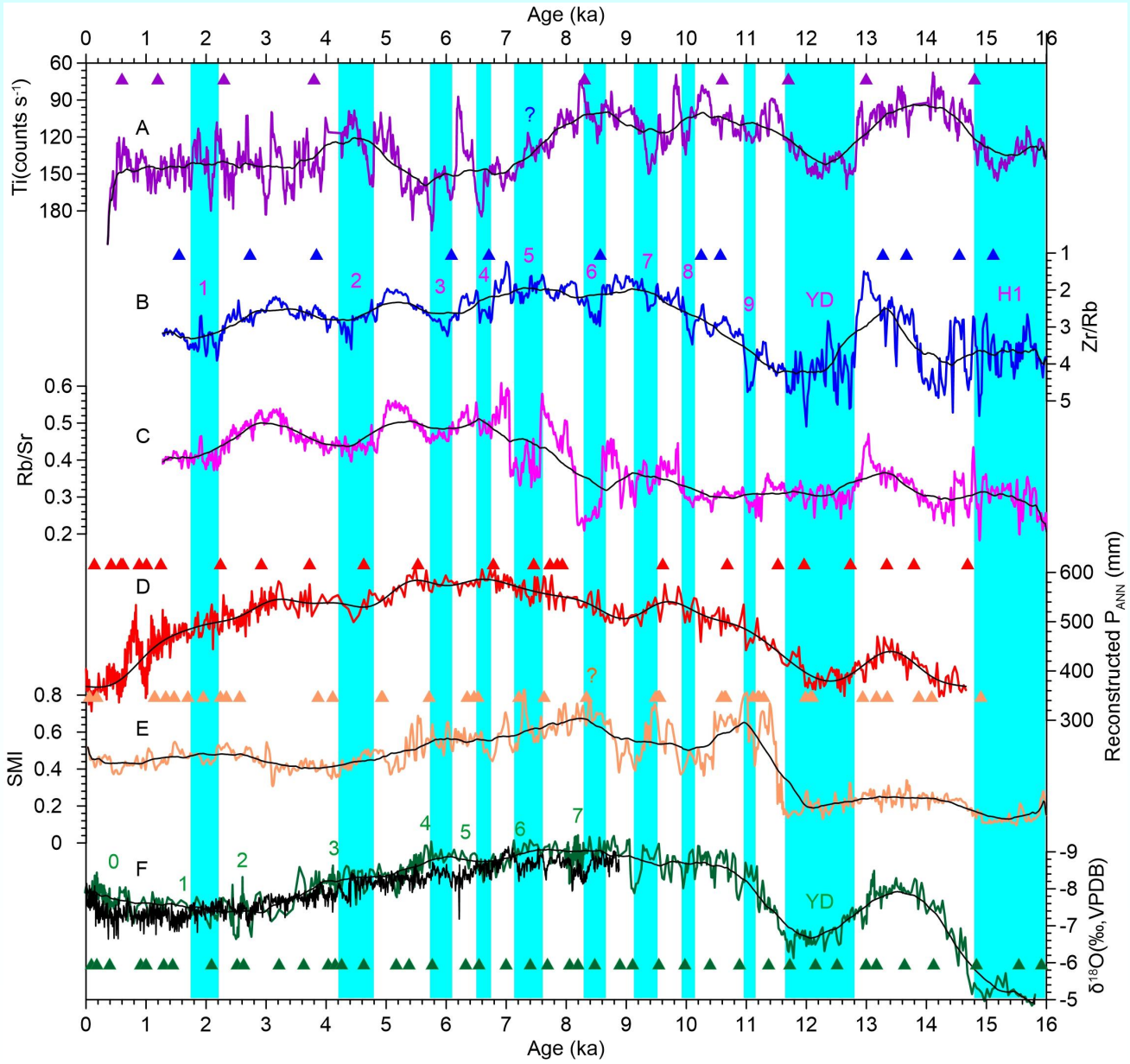


Chronology: Linear interpolation of 12 ^{14}C dates

EASM proxies: Magnetic susceptibility, Rb/Sr

EAWM proxies: Mean, Zr/Rb

Correlation of Abrupt Monsoon Changes



Lake Huguang Maar
(Yancheva et al., 2007)

DDW EAWM proxy

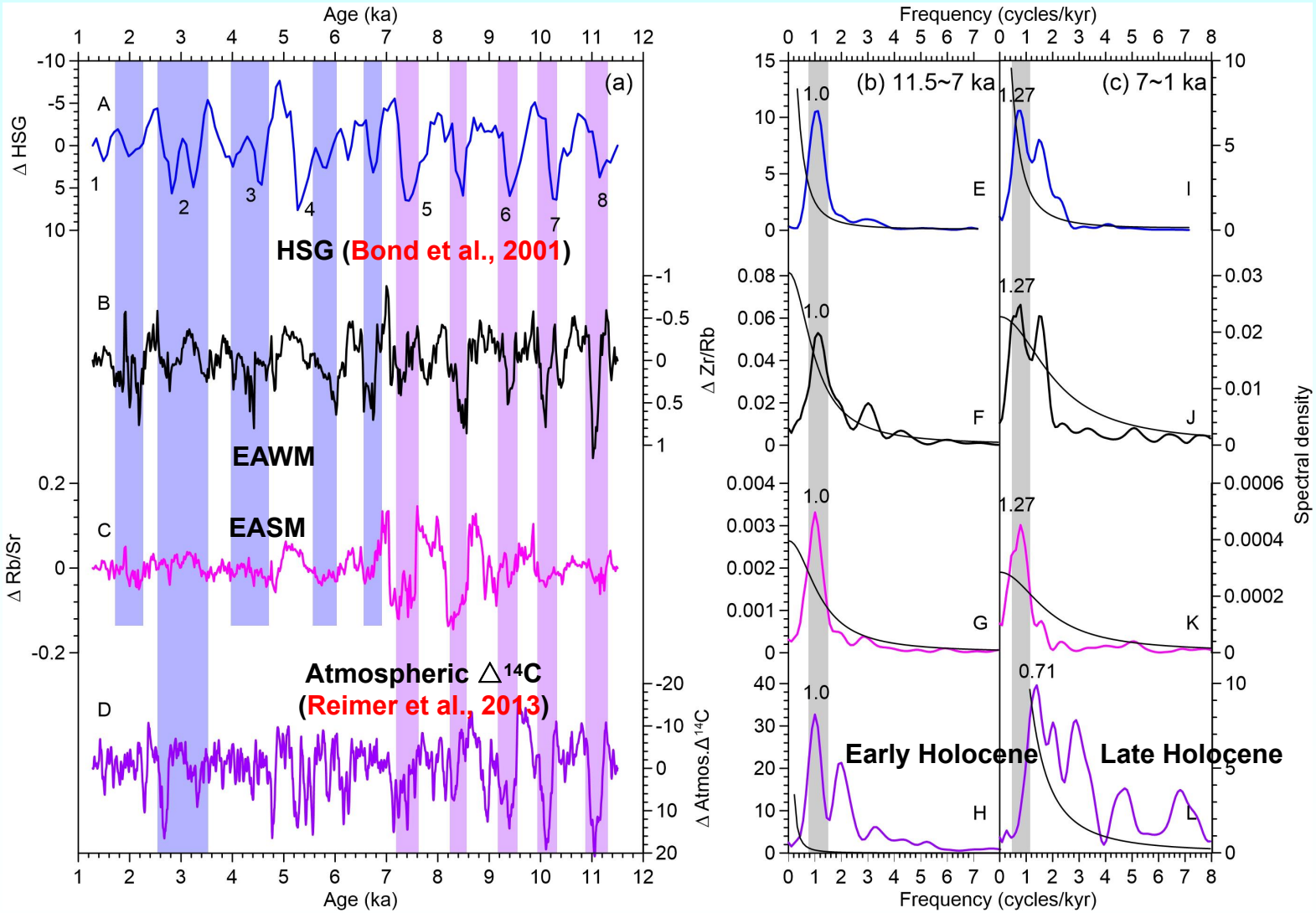
DDW EASM proxy

Lake Gonghai
(Chen et al., 2015)

Lake Qinghai
(An et al., 2012)

Dongge Cave
(Dykoski et al., 2005; Wang et al., 2005)

Dynamical links to Solar and IRD forcing



Comparison of abrupt monsoon changes HSG and atmospheric △14C record and their corresponding spectral results during the early and late Holocene

Conclusion and Prospect

- **Proxies of high-resolution terrace sequences are sensitive to abrupt monsoon changes since the last glaciation.**

- **Amplitude and frequency of abrupt monsoon changes are different between Early and Late Holocene.**

- **The North Atlantic cooling has persistent impact during the Holocene, while the solar forcing is more significant in the early Holocene. (Liu et al., 2020, Climate of the Past)**

Future research should focus on high-resolution integration of proxies with modeling results to offer a better dynamical understanding of high- and low-latitude impacts on abrupt monsoon changes.

Thanks !