

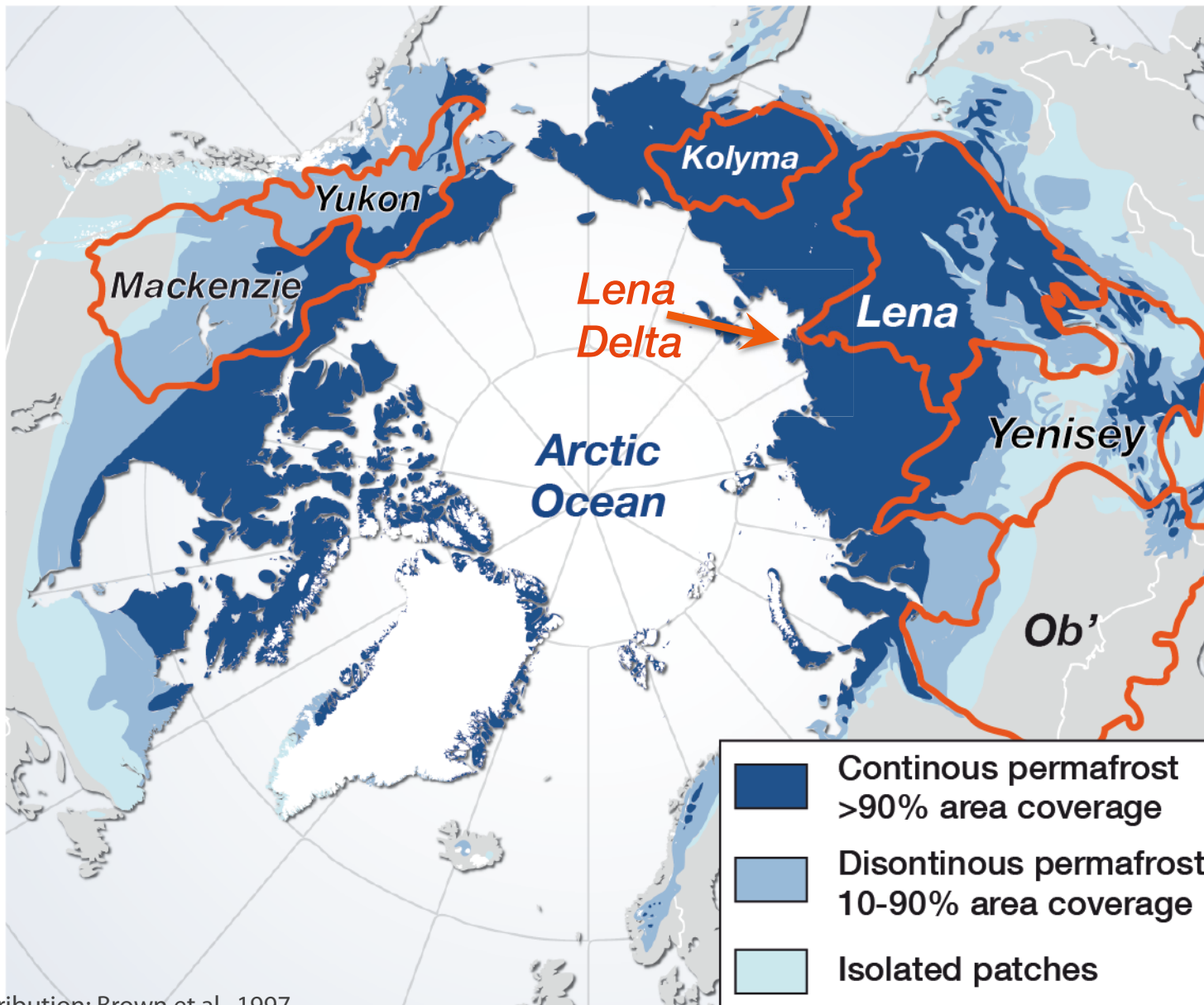
Characterization of **terr. organic matter** transported through the Lena River Delta (NE Siberia) to its adjacent nearshore zone using **lignin phenols**, $\delta^{13}\text{C}$, and $\Delta^{14}\text{C}$

Maria Winterfeld^{1,2}, Miguel Goñi³, Janna Just⁴, Jens Hefter²,
Pai Han¹ & Gesine Mollenhauer^{1,2}

¹Alfred Wegener Institute, Germany; ²University of Bremen, Germany;

³Oregon State University, USA; ⁴Marum, Germany

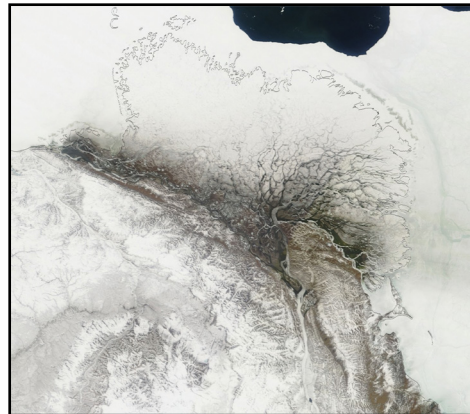
Permafrost distribution & Arctic watersheds



permafrost distribution: Brown et al., 1997

Lena River catchment

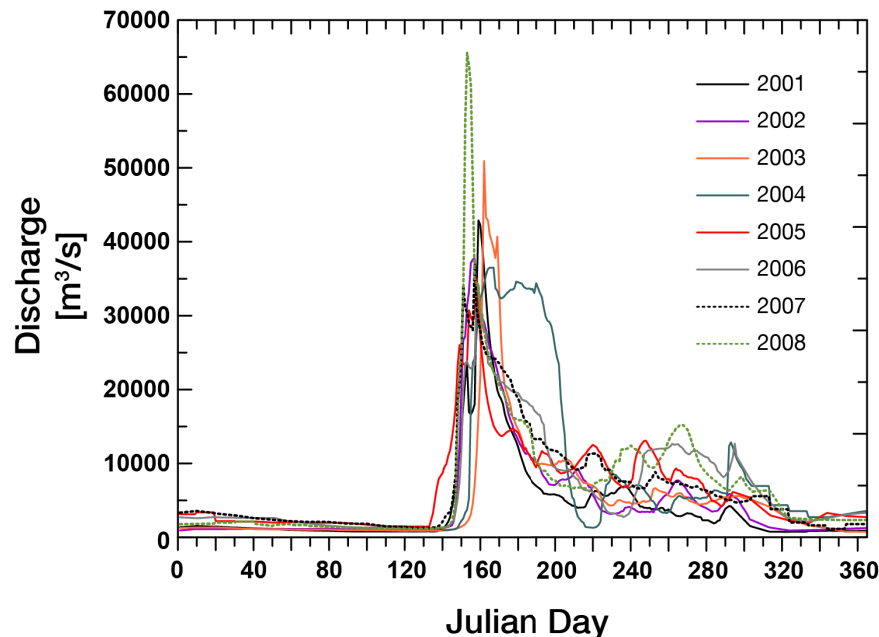
- strong seasonality of discharge → **flood** end of May/early June with ~50% of annual sediment, DOC, and POC export



22. Mai 2014
(NASA, LANCE-MODIS)



26. Aug 2002
(NASA, LANCE-MODIS)



Lena River

catchment size: $\sim 2.5 \times 10^6 \text{ km}^2$

water discharge: 588 km^3 (1999-2008)

sediment export: 20.7 Tg/year

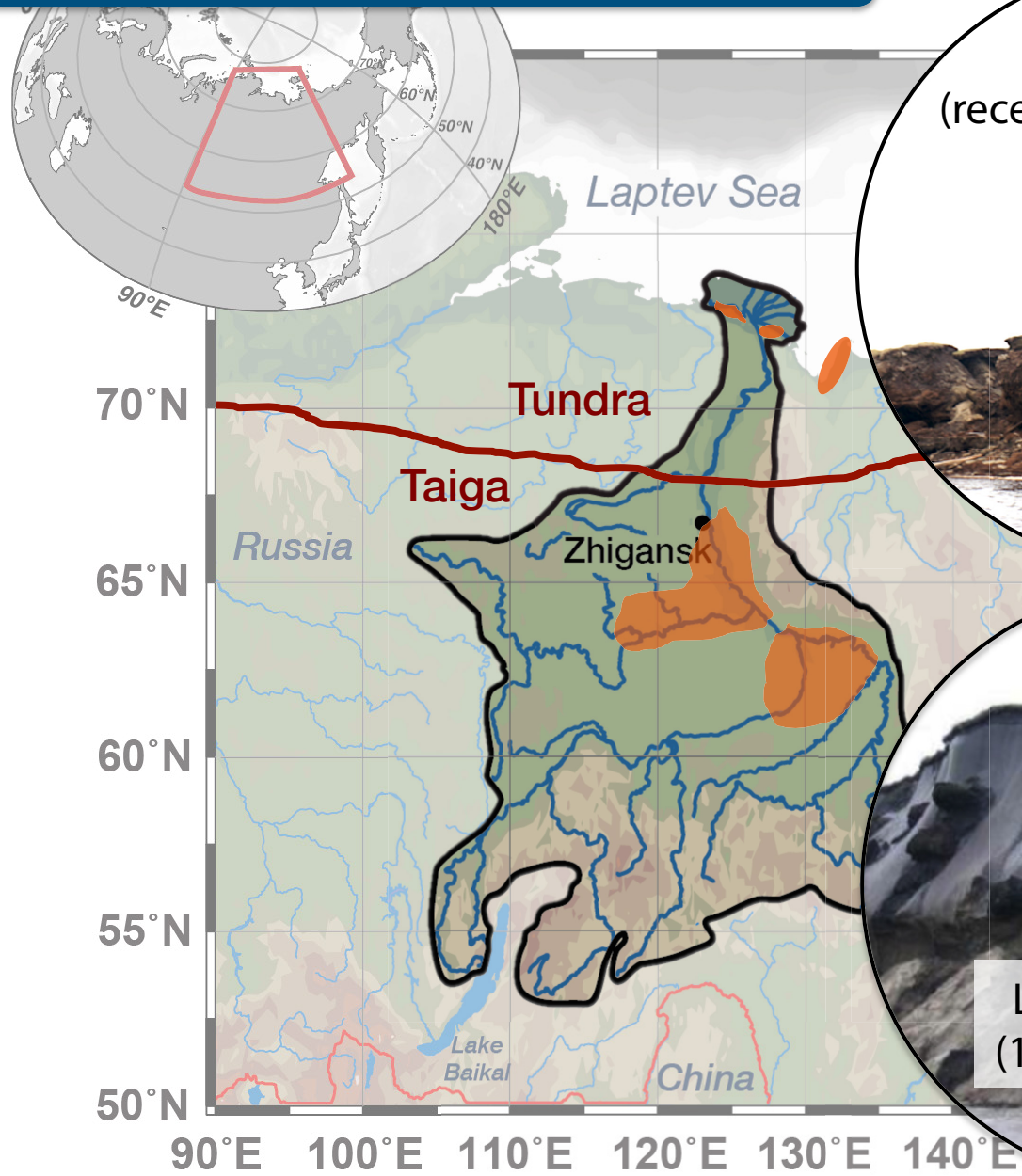
DOC export: 5.7 Tg/year

POC export: 1.2 Tg/year

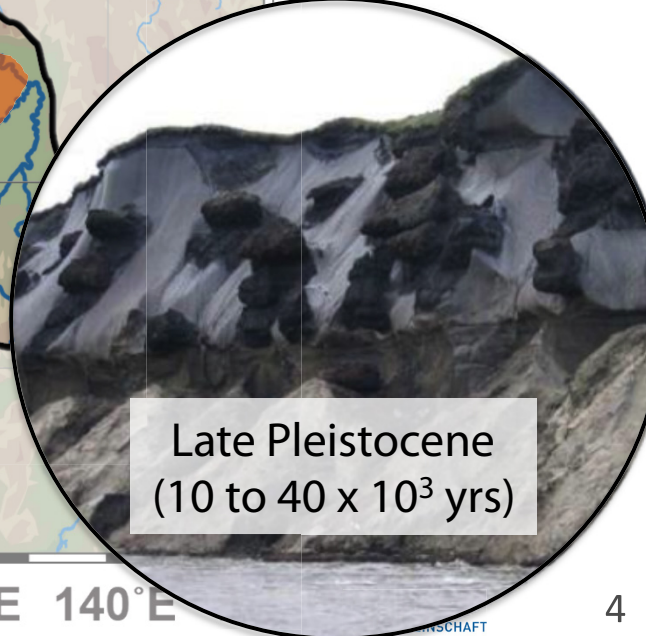
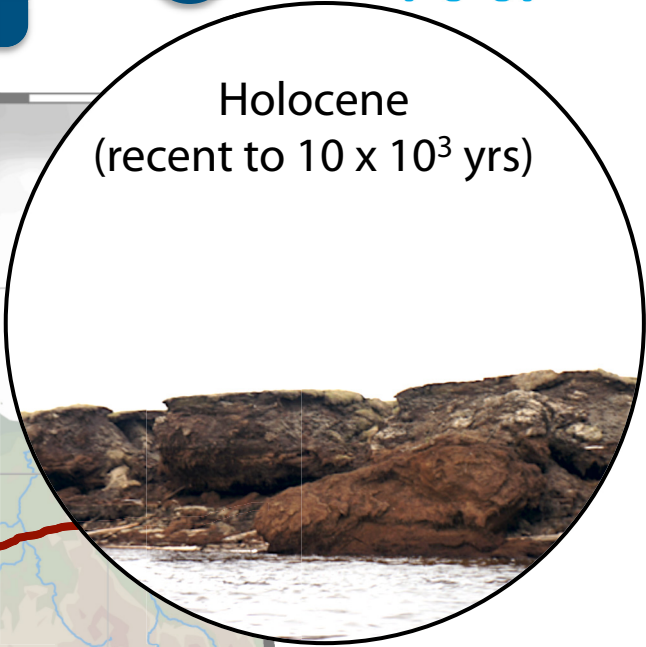
sources: Holmes et al. 2002, 2012;
Rachold & Hubberten 1999; ArcticRIMS (www.rims.unh.edu)

Sources in the Lena River catchment

1



2



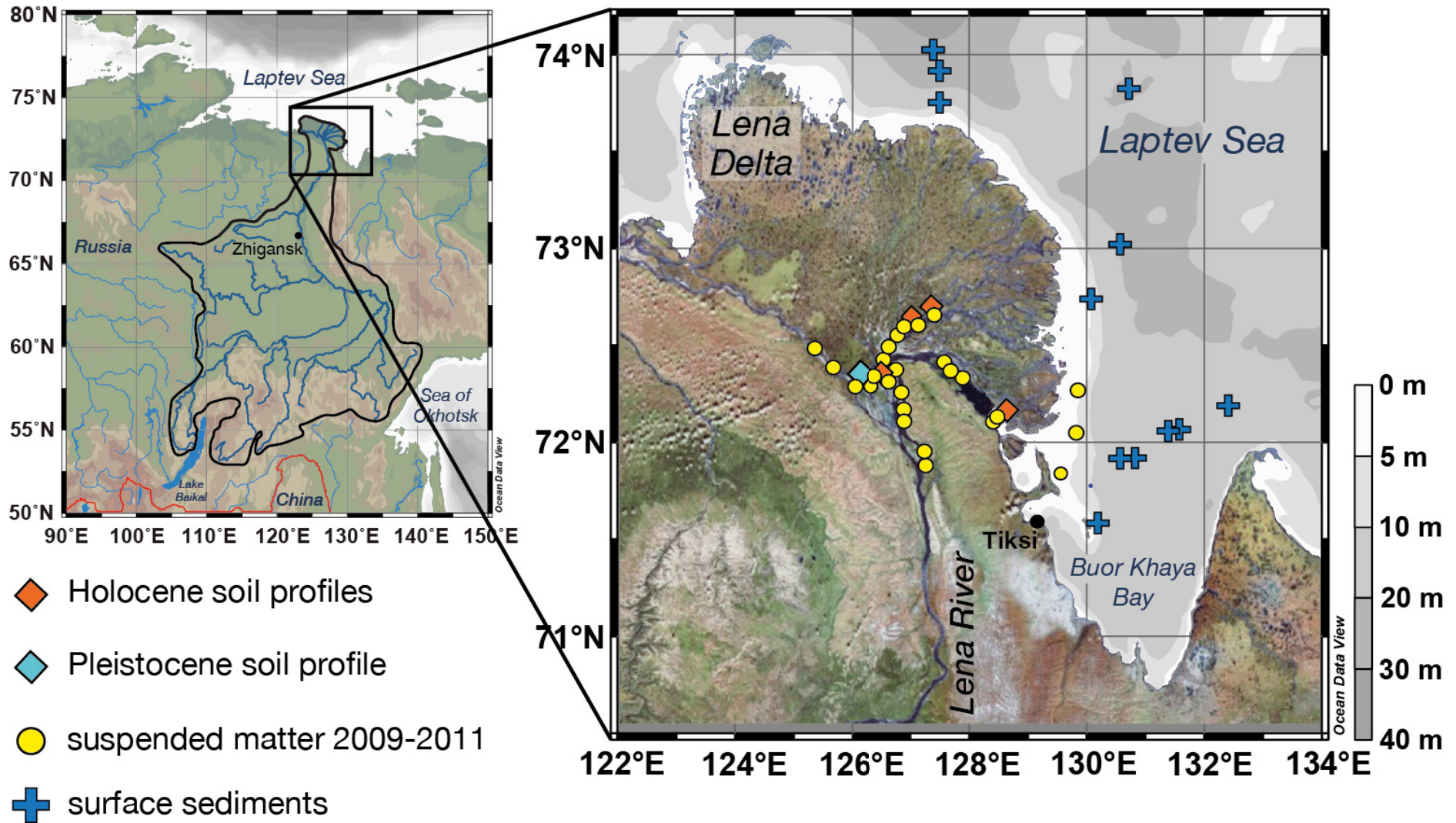
1 plant-derived lignin phenols

- Does the POM exported to Laptev Sea shelf reflect a watershed integrated signal?
- How big is the contribution from taiga (gymnosperms) versus tundra (angiosperms) in exported POM? Affected by degradation?

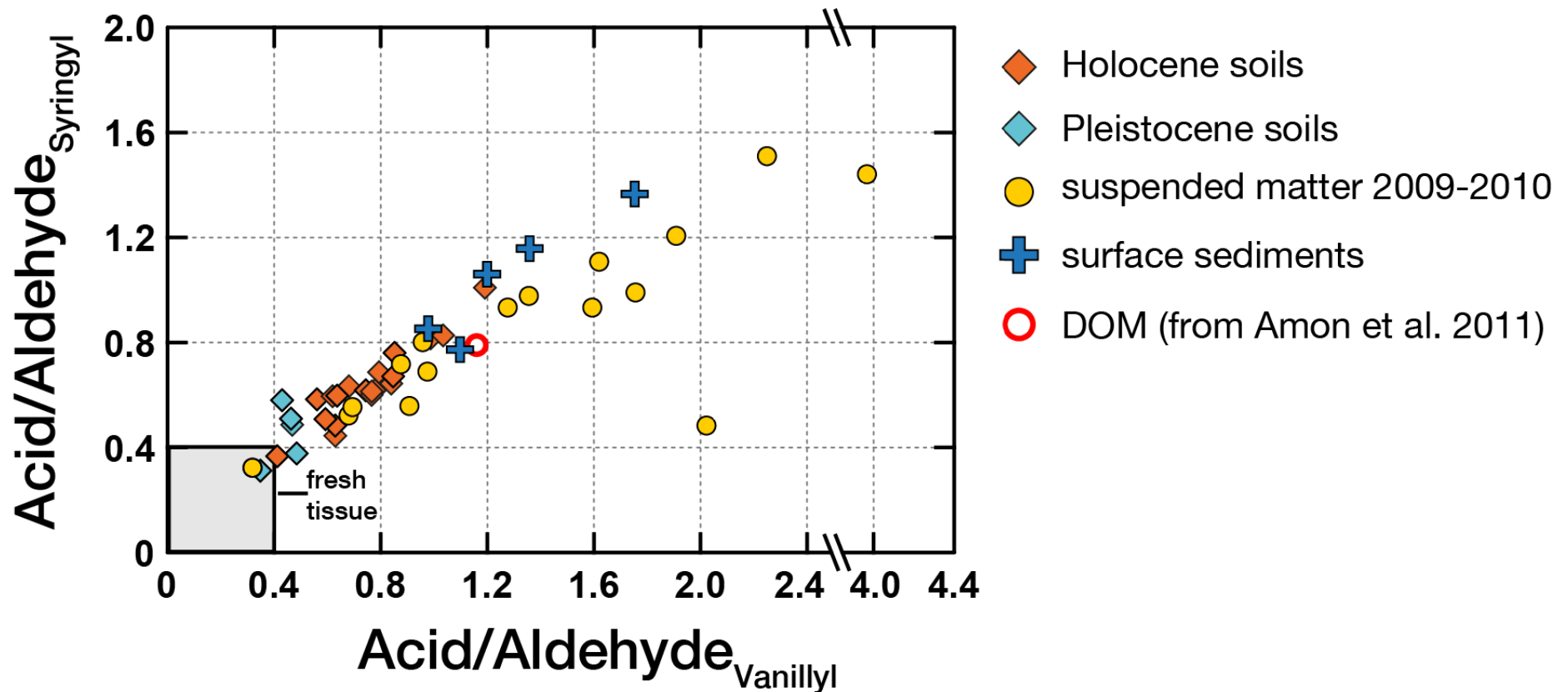
2 POM $\delta^{13}\text{C}$ & $\Delta^{14}\text{C}$

- Can we use bulk POM ^{14}C analysis to characterize soil-derived POM from the watershed?
- What is the soil-derived ^{14}C signature from the Lena catchment?

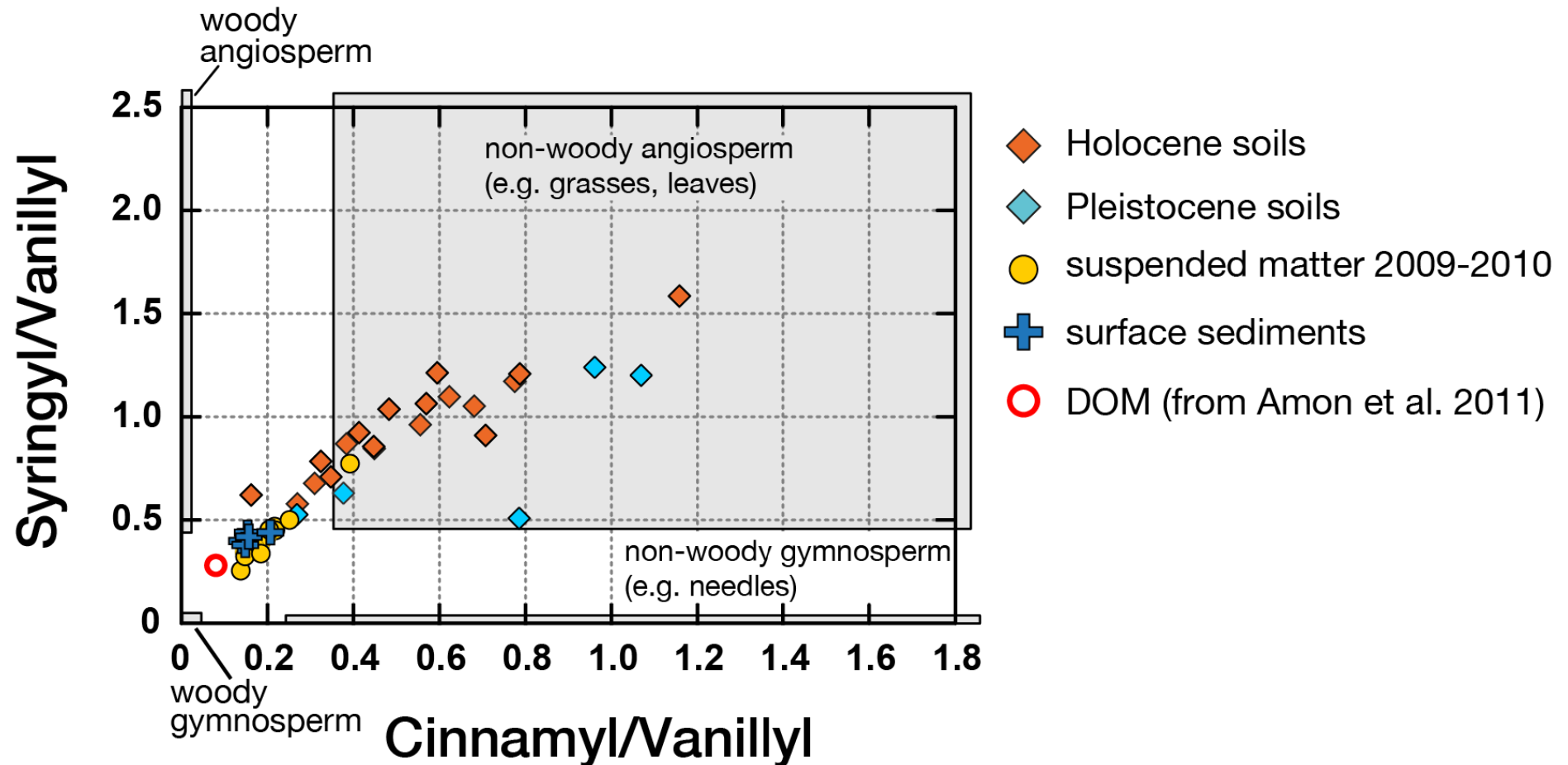
Sampling locations



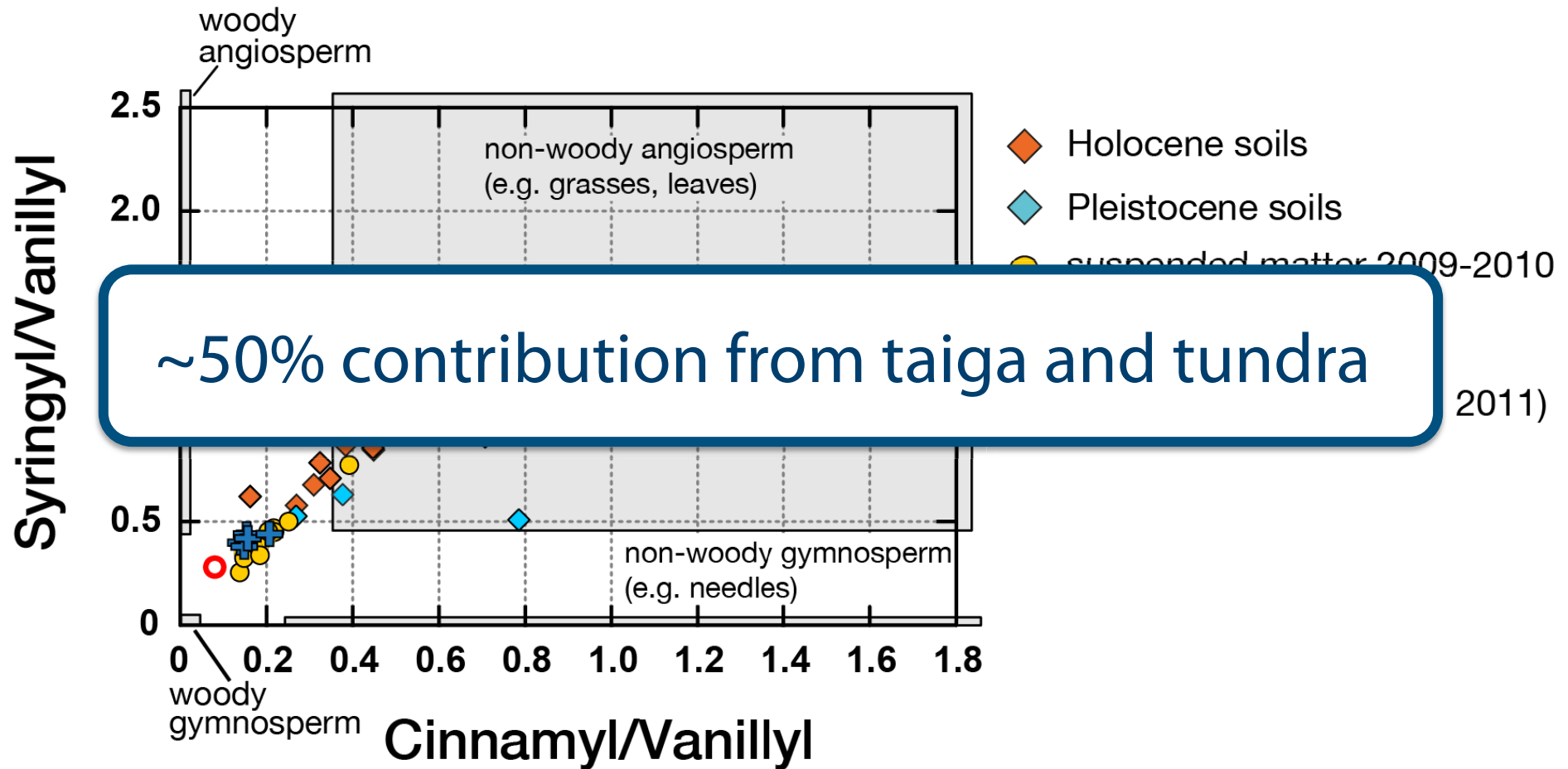
Lignin-phenols – degradation of POM



Lignin phenols – sources of POM



Lignin phenols – sources of POM



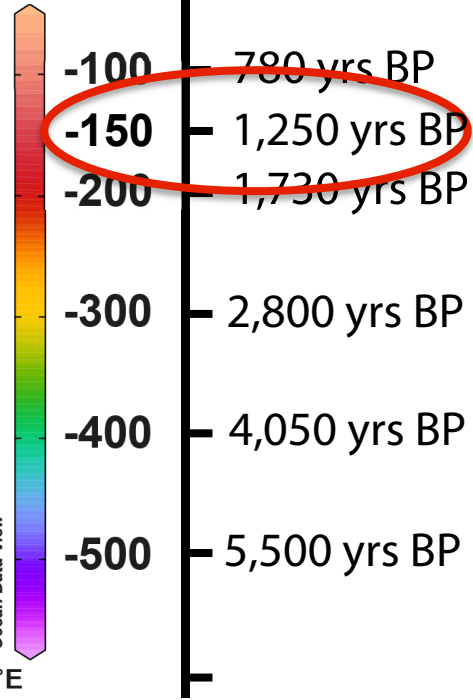
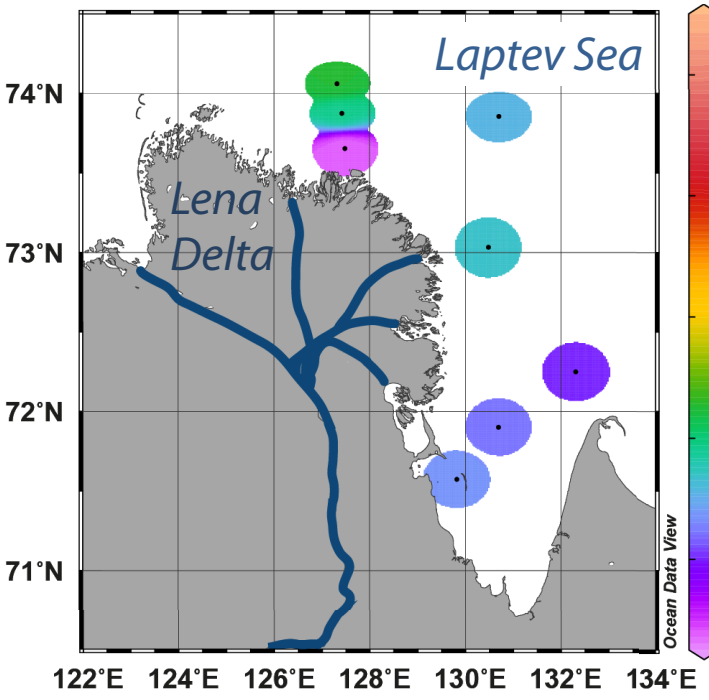
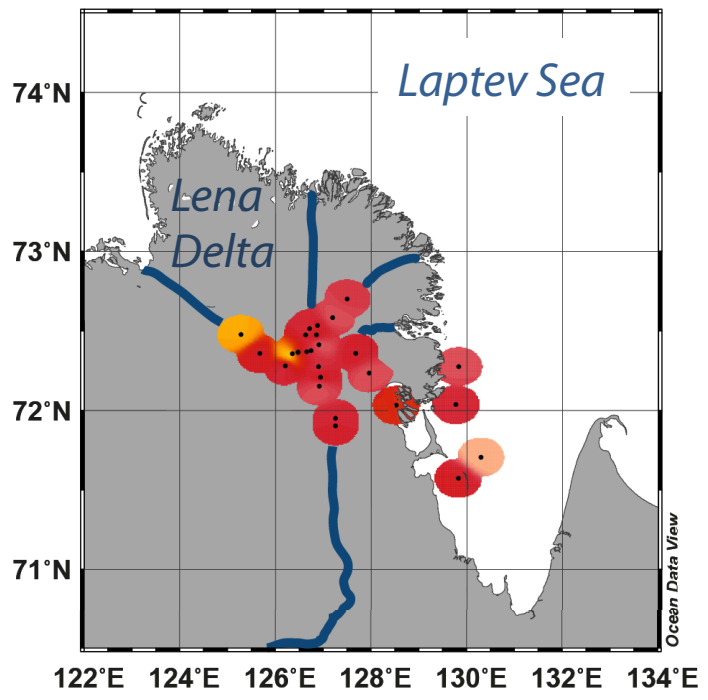
POM $\Delta^{14}\text{C}$



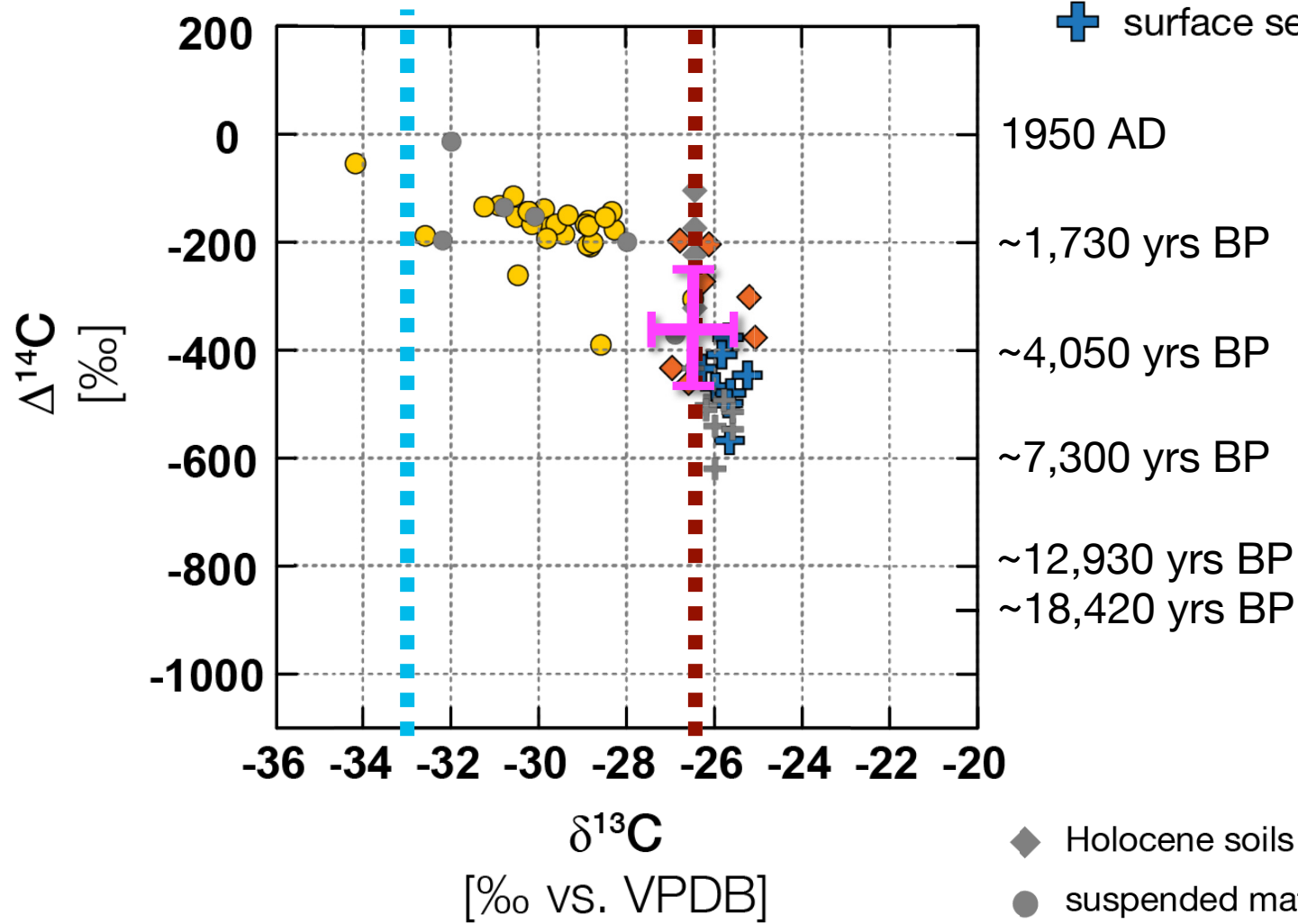
surface water
particulate organic matter

surface sediment
particulate organic matter

$\Delta^{14}\text{C}$ [‰] ^{14}C age [years BP]



POM $\Delta^{14}\text{C}$



- ◆ Holocene soils
- suspended matter 2009-2010
- ⊕ surface sediments

1950 AD

~1,730 yrs BP

~4,050 yrs BP

~7,300 yrs BP

~12,930 yrs BP

~18,420 yrs BP

- ◆ Holocene soils (Höfle et al. 2012)
 - suspended matter
 - ⊕ surface sediments
- Karlsson et al. 2011

1 plant-derived lignin phenols

- degradation in suspended matter & surface sediments > soils
→ degradation of during thawing and/or transport or finer fraction of POM
- **~50% contribution** from gymnosperm & angiosperm → despite tundra area only ~12% of catchment area

2 POM $\delta^{13}\text{C}$ & $\Delta^{14}\text{C}$

- estimated $\Delta^{14}\text{C}$ of soil derived POM between -190 to -700‰ (1640 to 9720 ^{14}C years BP)
→ reflects heterogeneity and age range of catchment soils
more accurate than bulk POM ^{14}C