

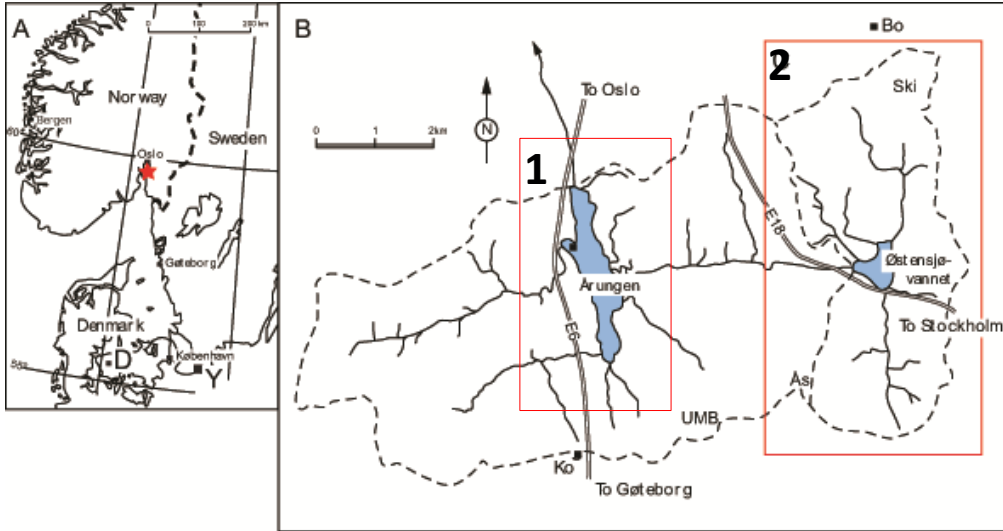
*Holosen variasjon i sedimentasjonsrater,
i **to innsjøer**, beliggende under marin grense.*



Innhold:

- **Mer om lokalitetene – Årungens nedbørfelt, og litt fra noen tjern i søndre Vestfold og sørøstre Telemark.**
- **Beregning av sedimentasjonsrater:**
'Inn/ut' budsjett – oppholdstid.
Kronologi (C14 – pollenanalyse – andre metoder).
- **Prosesser som kontrollerer sedimentasjonen:**
'Naturlige' forhold / menneskeskapte ?

Holosen variasjon i sedimentasjonsrater,



1. Årungen

(Abrahamsen et al. 1995).

(Nybakken 1985)

(Skogheim & Erlandsen 1984)

2. Østensjøvann

Prosjektstart 2003 --

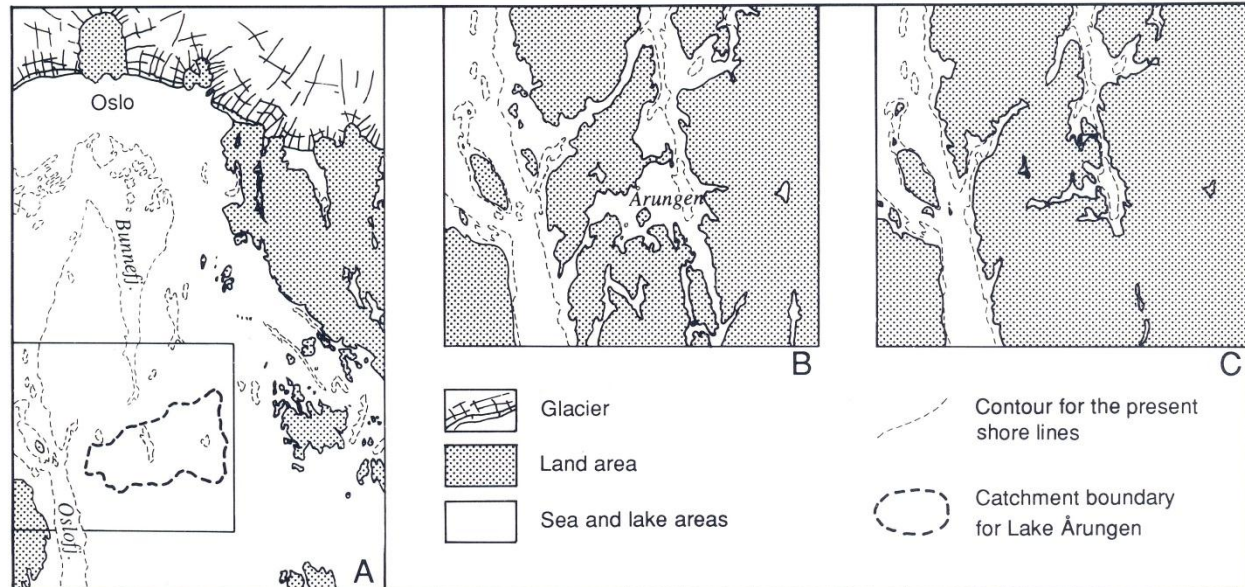
Isavsmelting :

A. Bre - land-hav
ca. 11 000 fn.

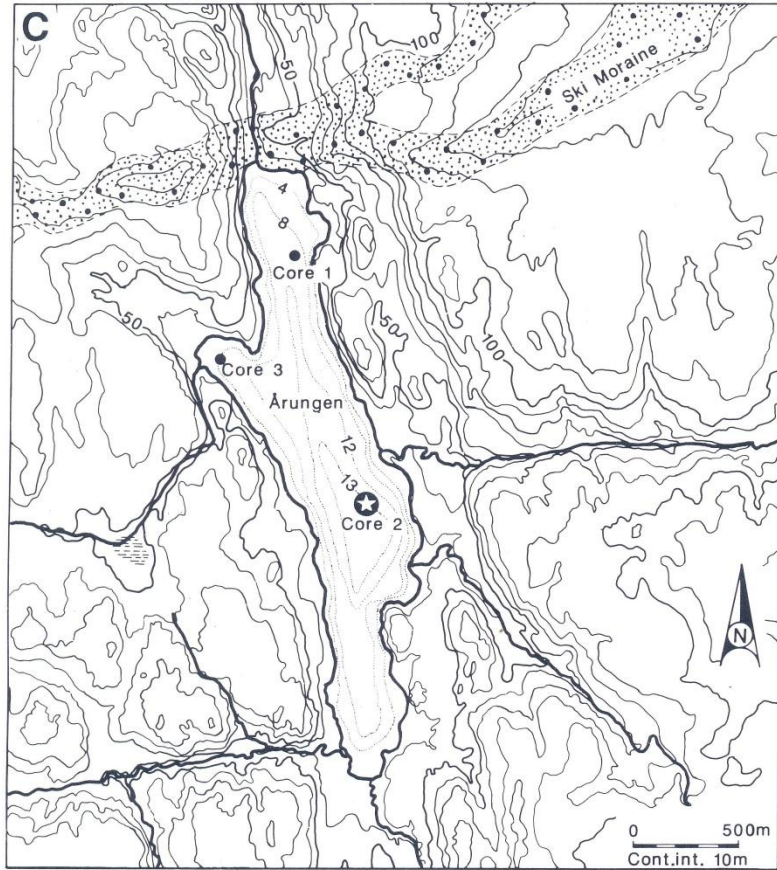
Landheving:

B. Land – hav ca. 8900 fn.
(Åpen fjord-fase)

C. Land – hav ca. 7500 fn.
(Lukket fjord-fase)



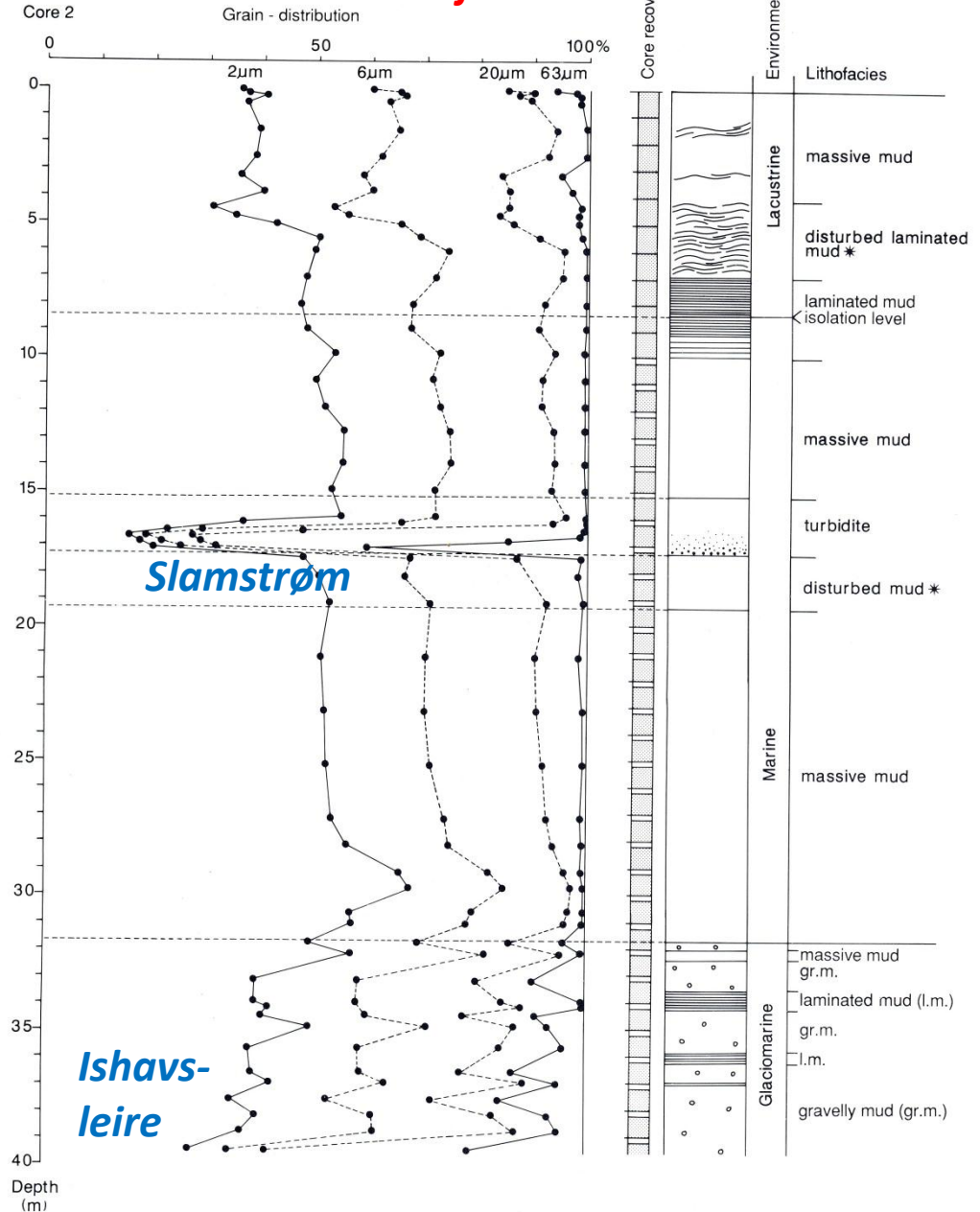
Årungen



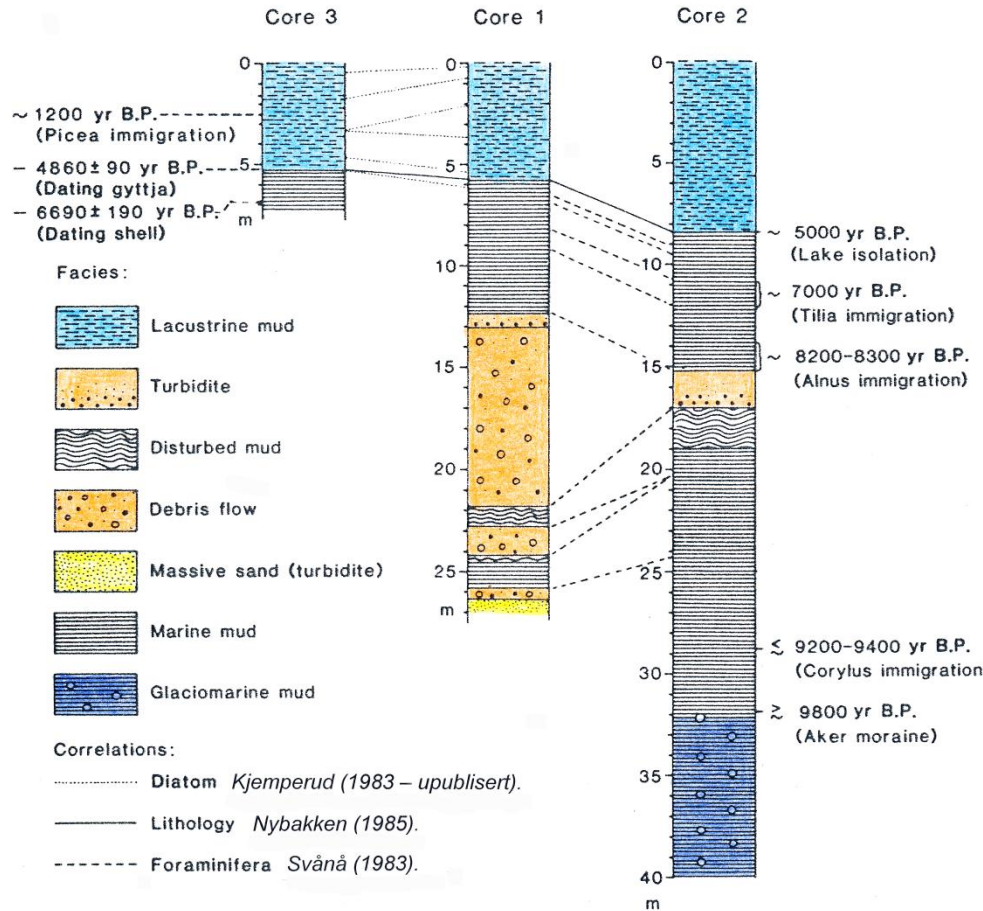
Topografien rundt - og i Årungen.

Kjerne 1 og 2 er hentet med 54 mm stempelbor (NGI), fra dypeste del av innsjøen (ca. – 13 m).

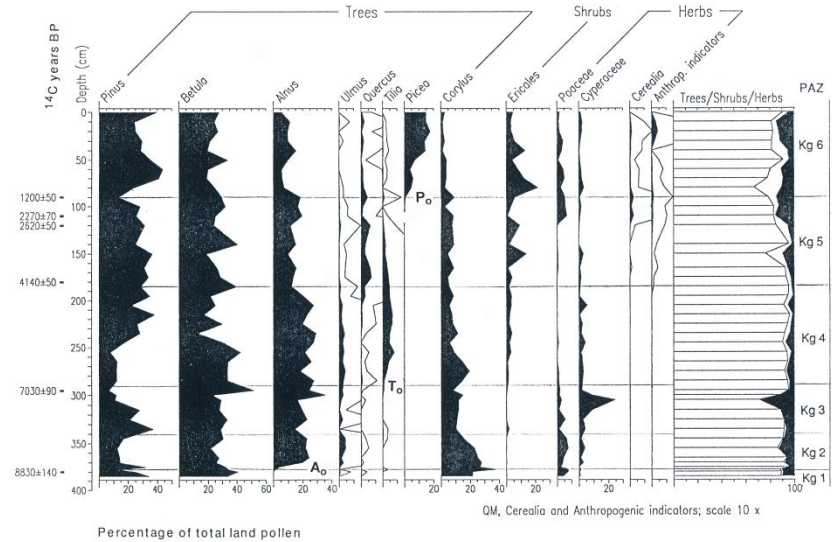
Kornfordeling og lagdeling i kjerne 2



Stratigrafi og kronologi



Korsegården bog, Akershus, Norway
 Selected pollen percentages
 Analyst: R. Sorensen 1985

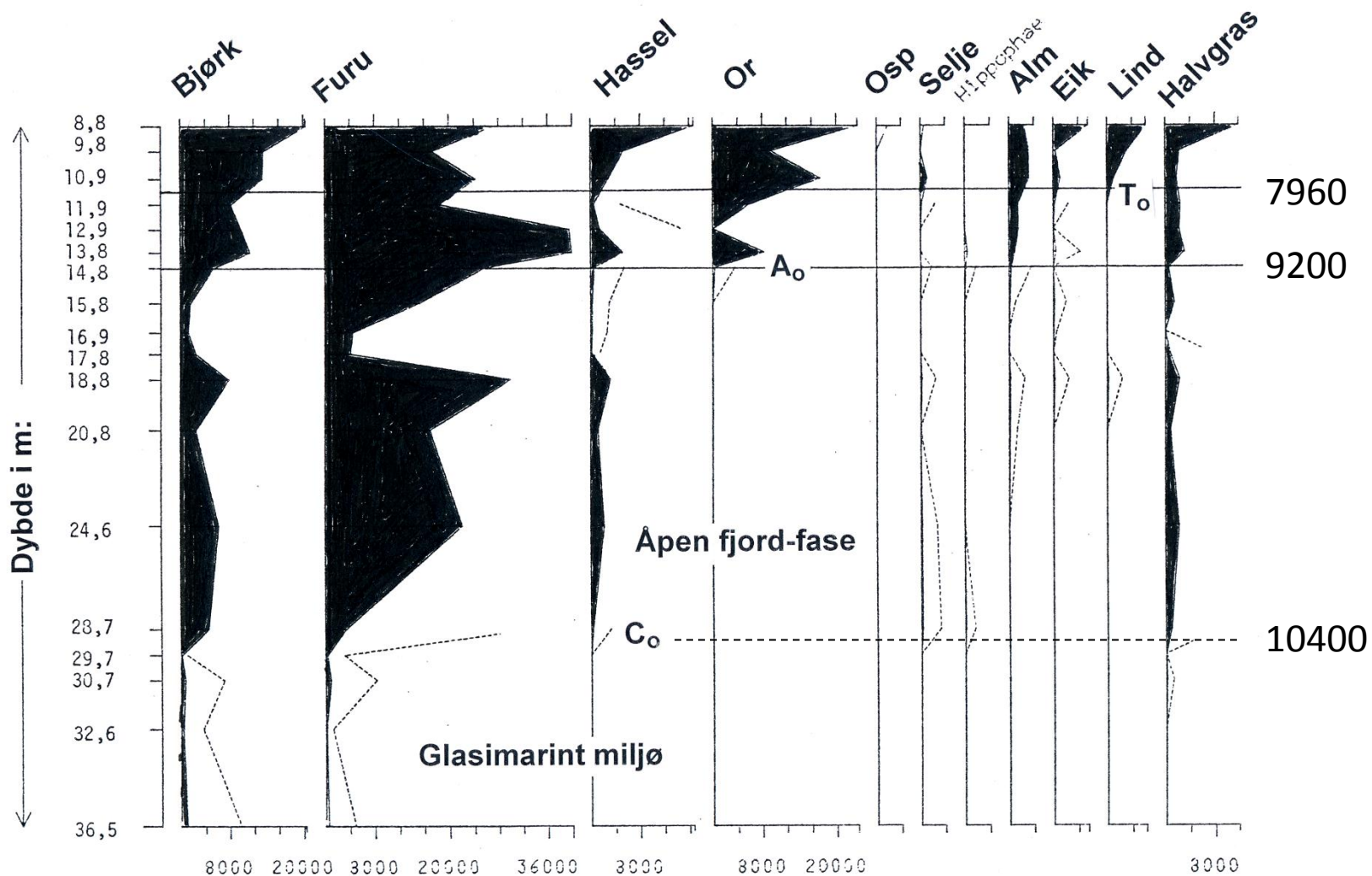


Kronologi i ferskvanns-sedimentene: **Kjerne 3 og pollenanalyse**

Kronologi i marine sedimenter: **Kjerne 2 og pollenanalyse**

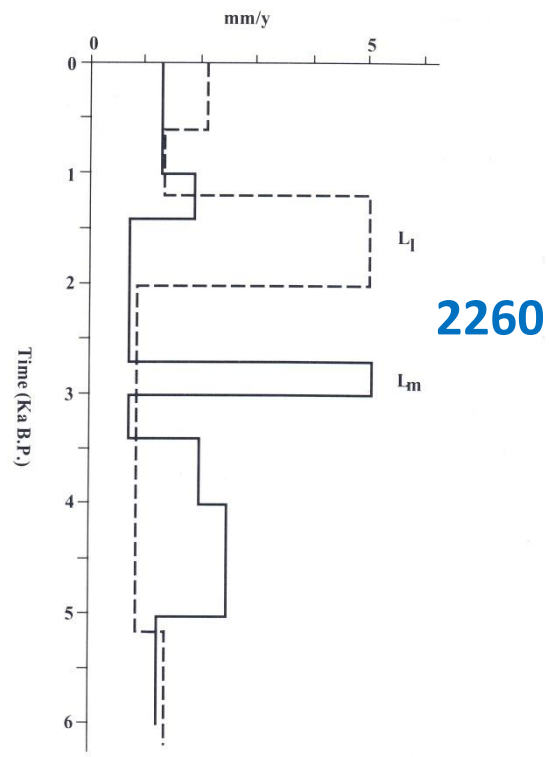
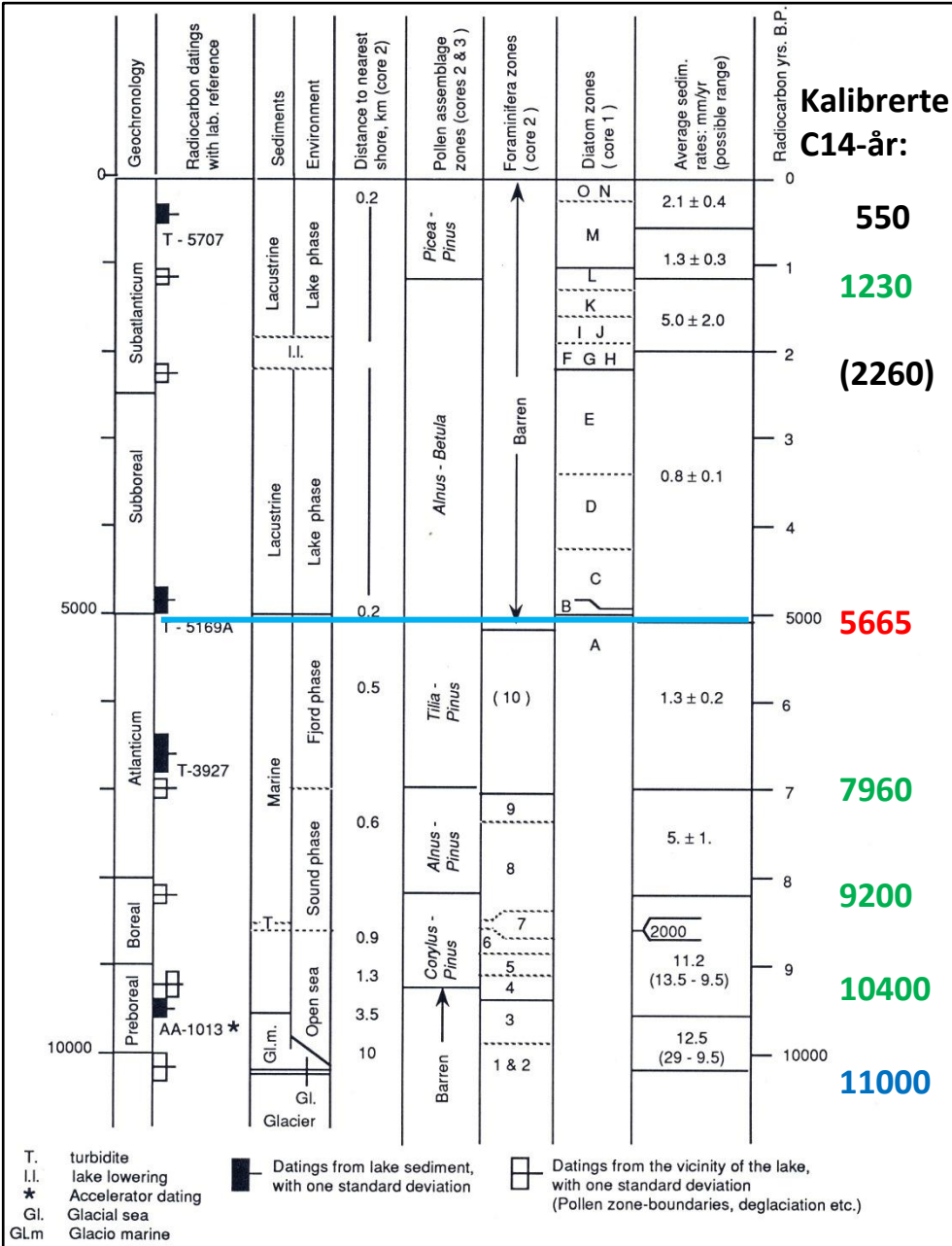
Vegetasjonshistorien

og kronologi



Svånå (1983).

Årungen - miljø & sed. rater



To alternative sedimentasjonsmodeller
Heltrukken linje: Magneto-stratigrafisk kronologi.
Stiplet linje: C-14 kronologi av 'tappings-hendelsen'.

Østensjøvann i Ås – 91 m o.h.

Innsjøen sett fra sør – med ‘Ski-morenen’ i horisonten.

Bak fotografen ligger et stort felt med gravhauger fra jernalderen.

Pollenanalysen indikerer korndyrking fra sen neolittisk tid (ca. 4500 år fn.)

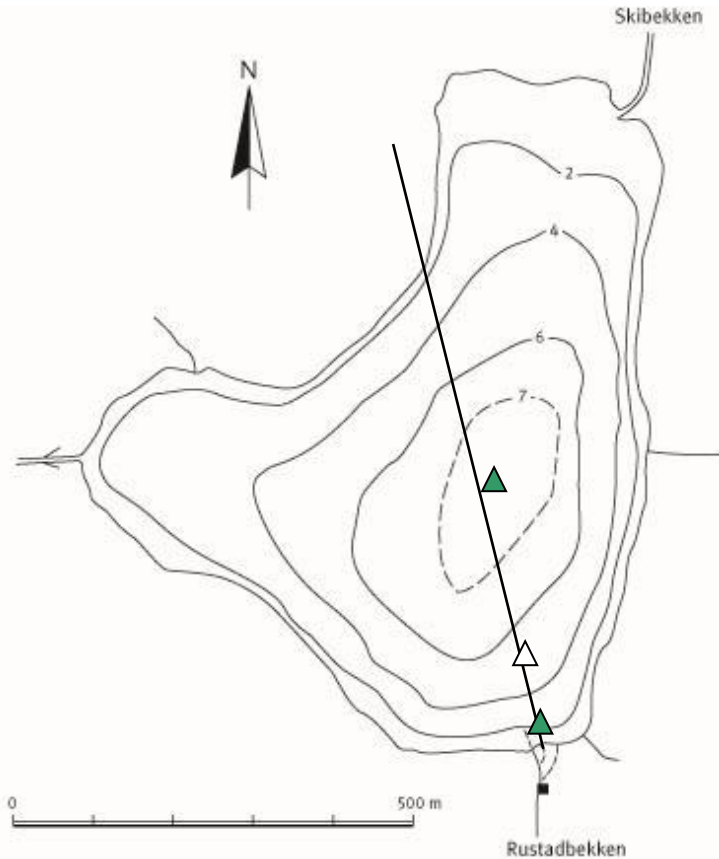
Arkeologiske funn tyder på gårdsanlegg fra bronsealder.



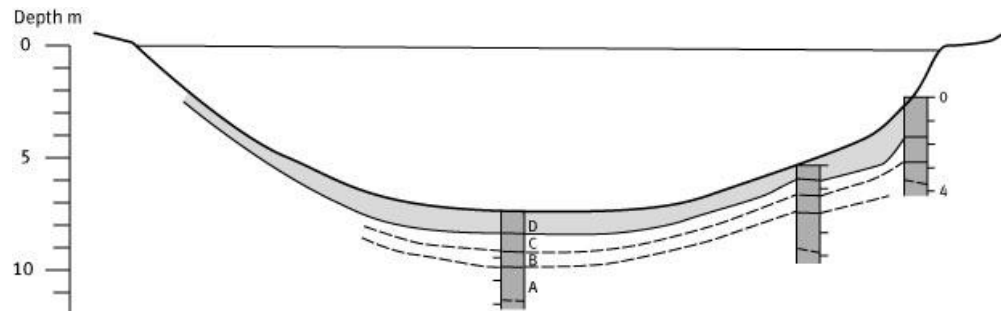
Gamle kart (fra 1870) viser at kulturlandskapet har endret seg lite i de siste 150 år, men driftsformen har endret seg dramatisk – fra vekselbruk med mye husdyr til ensidig korndyrking i de siste 50 år.

Jernploger og en del andre ‘moderne’ landbruksmaskiner ble introdusert mellom 1800 og 1850 i denne regionen – en teknisk revolusjon.

Østensjøvann, 91 m σ_h .

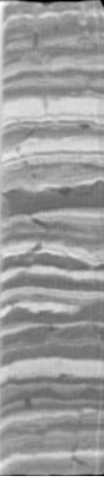



Batymetrisk kart over Østensjøvann (dypde-konturer; 2 m), og tverrsnitt av innsjøen med borepunkter (triangler).

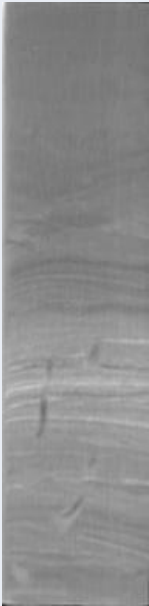

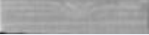
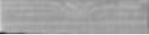


Tverrsnitt av innsjøen med borepunkter (søyler med inndeling i sediment-enheter). Øvre enhet er rastret (100 m mellom hver registrering).

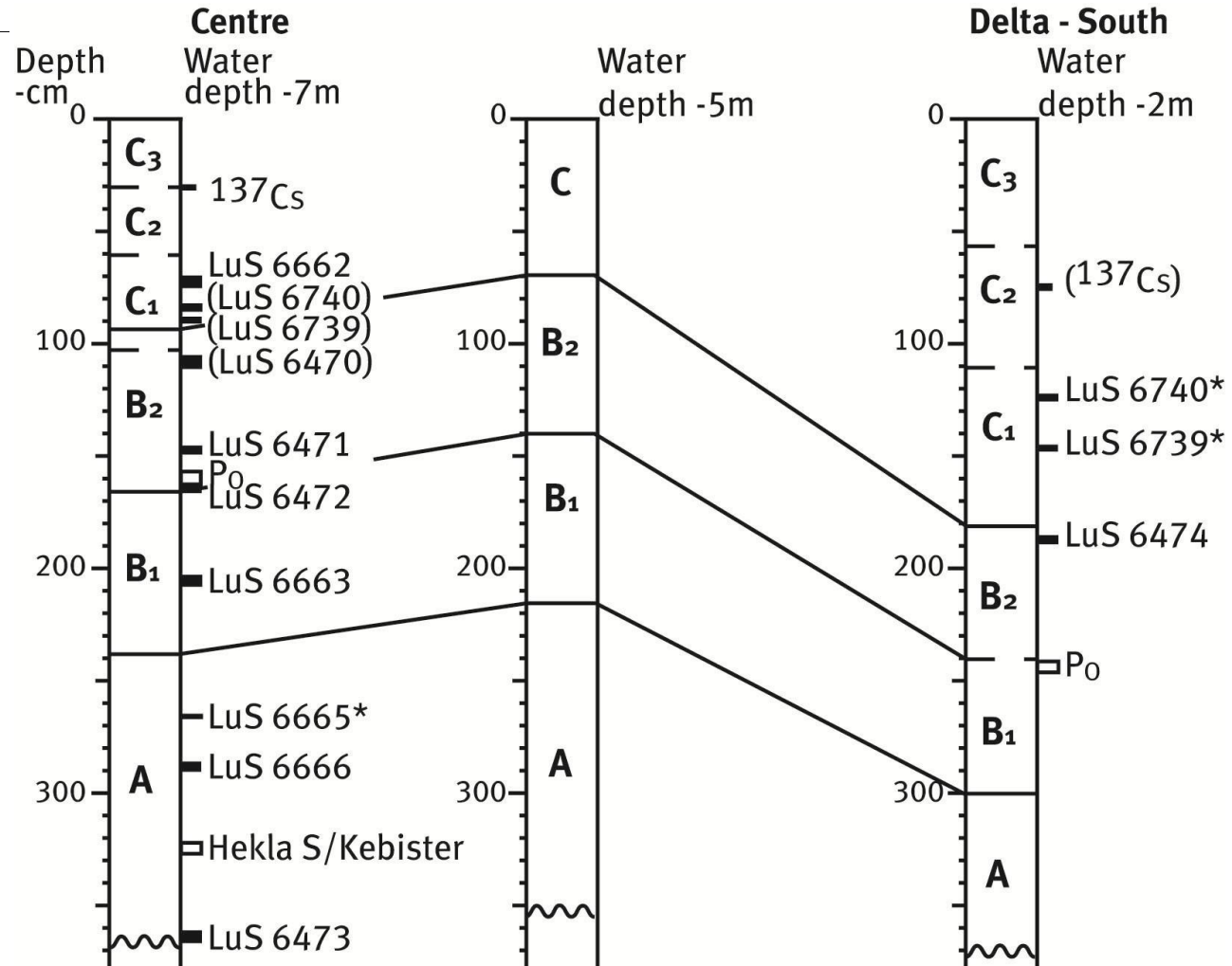
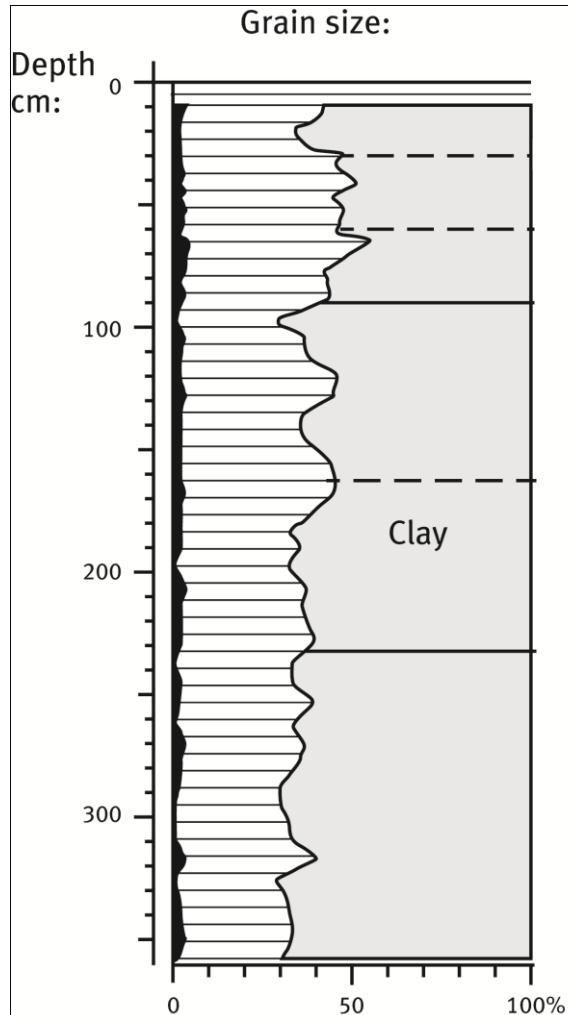
Sedimentbeskrivelse - 1

Sedim. image:	Depth ,cm:	Age – calibr. yrs:	Unit Description:
	25	AD 1980	Unit C – upper part, representing modern agricultural management, with strong erosion, and pollution from both farms and urban areas. Timespan represented is ca- AD 1980 – 1940.
		AD 1963	¹³⁷ Cs-date = 1963 Maximum loading of sediments and pollution. Black layers (FeS _x) are common, indicating frequent anoxic conditions in the bottom waters. Grain-size distribution: ca. 2 % sand, 35-45 % silt, and 50-55 % clay. Maximum contents of available phosphorous, but minimum biogenic silica and low C/N ratios, indicate domination of blue-green algae and Pediastrum over diatoms(Meyers & Teranes 2001). Some gas (methane) production.
	45	ca. AD 1940	
	125	ca. AD 1180	Unit B2 – middle part, representing Late Medieval conditions, with moderate agricultural activity and little erosion. Timespan represented is ca- AD 1180 – 940. Massive clay gyttja (ca. 13 % TOC) with traces of gas escape features (black lines in the image), and/or bioturbation. Grain-size distribution: ca. 2 % sand, 30-40 % silt, and 55-65 % clay. Moderate contents of available phosphorous, high biogenic silica indicate high diatom production. High C/N ratios indicate some terrestrial input, which coincide with maximum distribution of Norway spruce (Picea) in the surroundings.
	145	ca. AD 940	

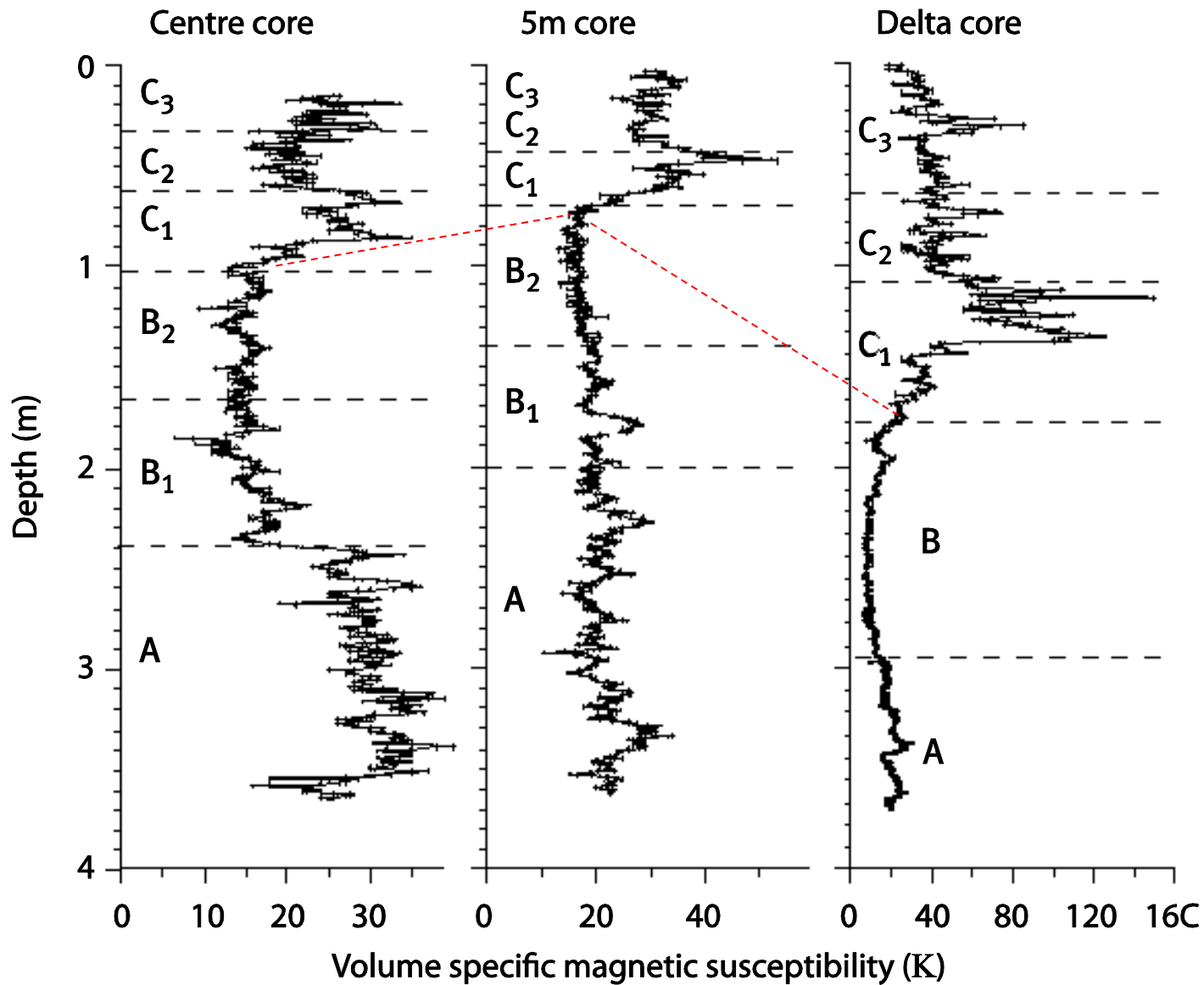
Sedimentbeskrivelse - 2

	205	ca. AD 70	<p>Unit B1 – middle part, representing Younger Iron Age, with continuous farming and cattle-grazing in the area. Timespan represented is ca.- AD 70 – 220 BC.</p> <p>The unit is transitional, changing from massive clay gyttja (high TOC, but low C/N ratios) to diffuse lamination with low TOC contents.</p> <p>High contents of charcoal (see pollen-diagram) indicate that this is a period of land clearance.</p> <p>Grain-size distribution: ca. 2 % sand, ca. 35 % silt, and ca. 63 % clay. Moderate - low contents of available phosphorous and biogenic silica.</p>
	225	ca. 220 BC	<p>Unit A – upper part, representing Bronze Age and early farming. <i>LuS 6665-B</i> = 805 –895 BC (C14-datering) (macro-remains of grasses and herbs; black in image) Timespan represented is ca.- 800 – 1170 BC.</p> <p>The first grain-growing in the region is dated back to ca. 4000 years BP (see pollen-diagram), but the first phase of continuous farming is recorded from ca. 3200 years BP. However, unit A represents an almost unaffected ecosystem with sedimentation rates of ca. 0.6 mm yr⁻¹, low – oscillating contents of TOC and C/N ratios, and 65-70 % clay. The bottom waters must have been anoxic, preserving a possible annual lamination.</p>
	265	805-895 BC	
	285	ca. 1170 BC	

Kornfordeling og Kjerner-korreksjon

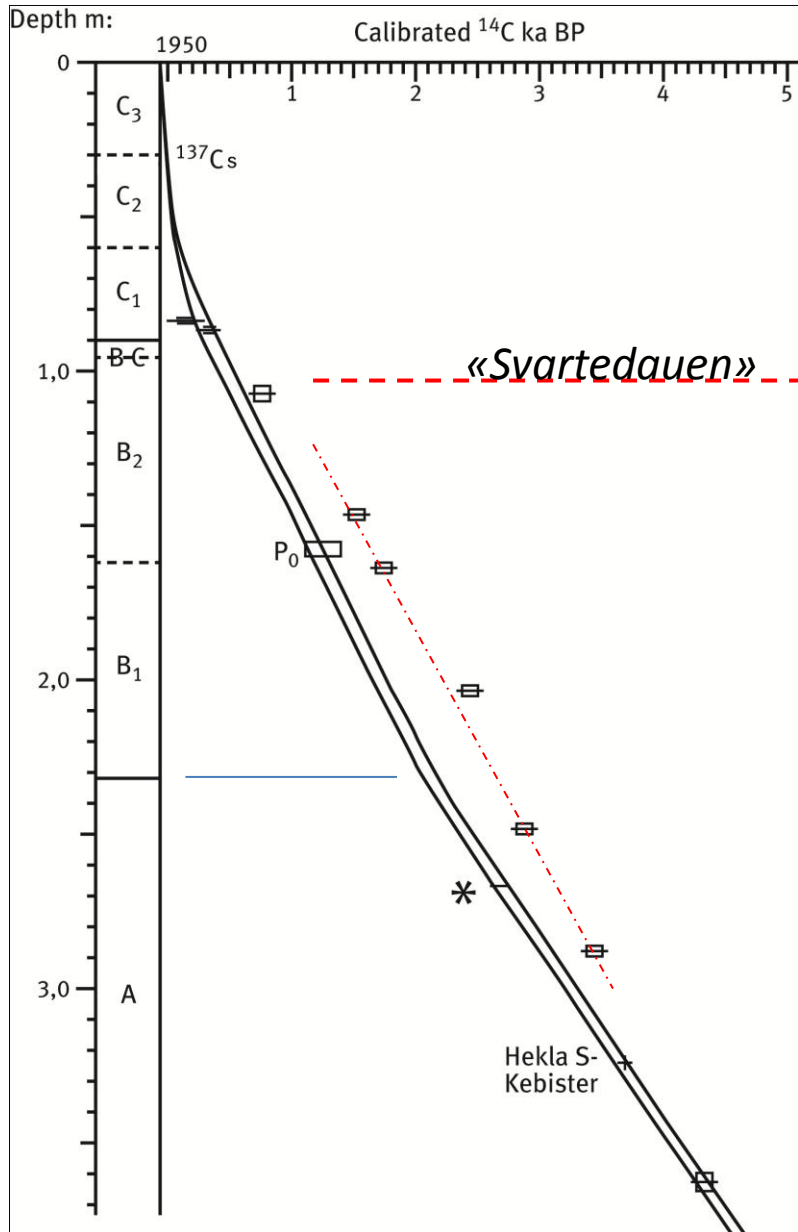


Magnetisk korrelasjon



Sedimentasjonsrater

Ratene er ukorrigerede,
naturlig vanninnhold.



mm/år:

Alder BP - kalibrert

7,5

40 år

1,5

ca. 200

Lille istid

Middelalder

0,85

ca. 1300

Vikingtid

0,65

ca. 2500

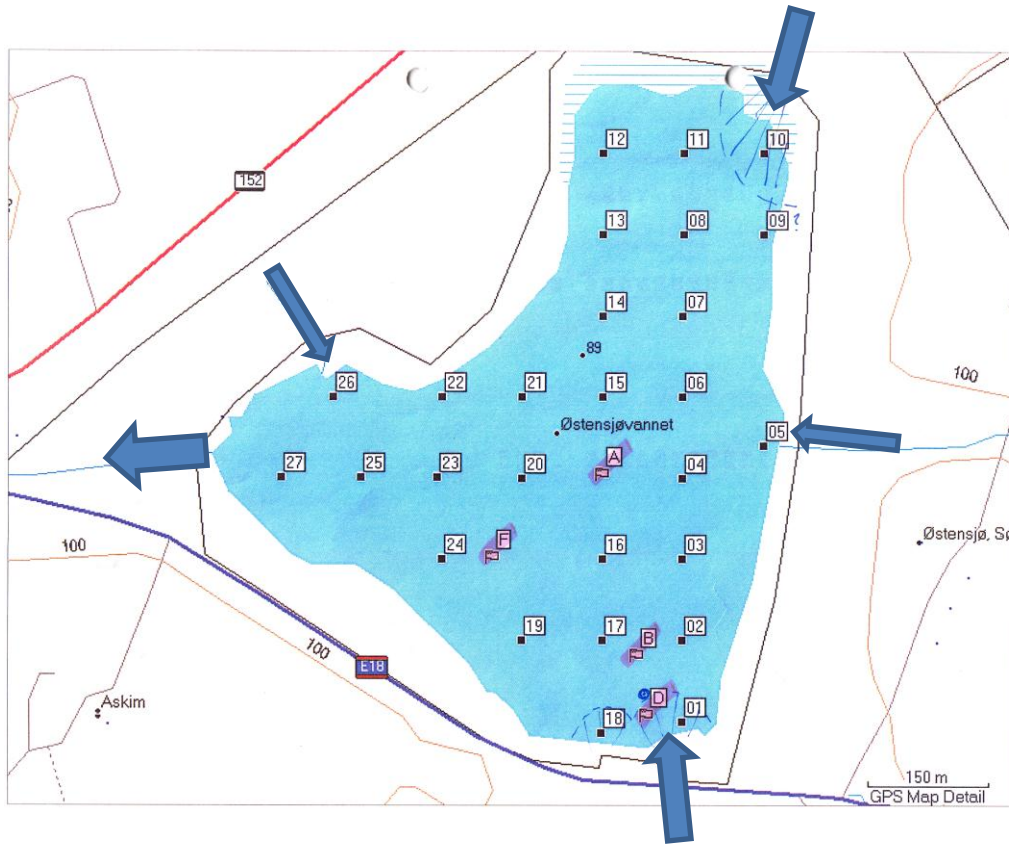
Romersk
Jernalder

0,60

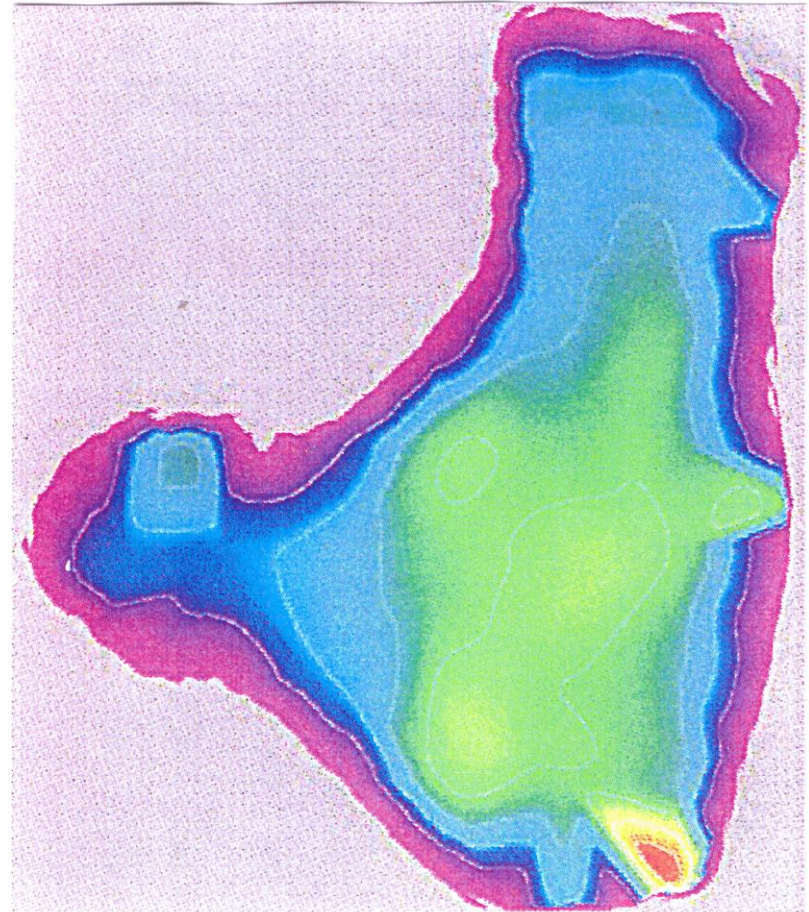
ca. 4500

Bronsealder

Sedimentasjon siste 400 år (enhet C)



Tykkelsen av enheten er målt ved 31 pkt. (100x100 m grid, GPS-lokalisert).
Overgangen mellom C og B kan bestemmes innenfor < 5 cm – fra grå leire til mørk brun leirgytje.

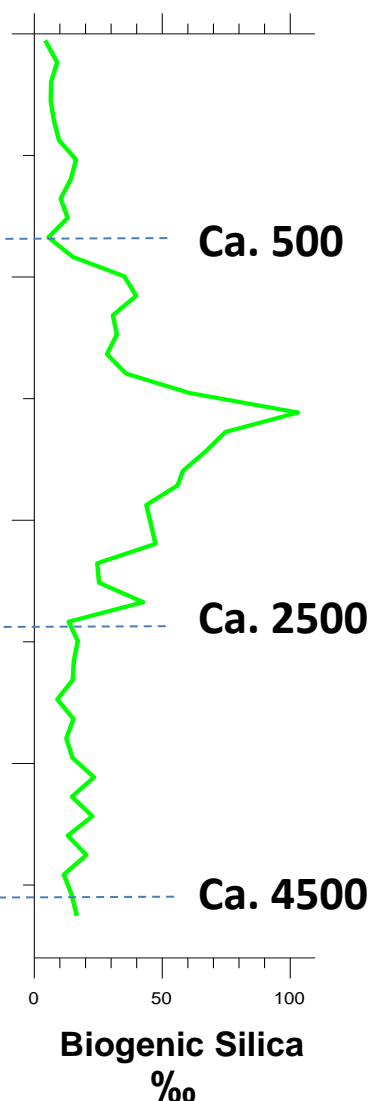
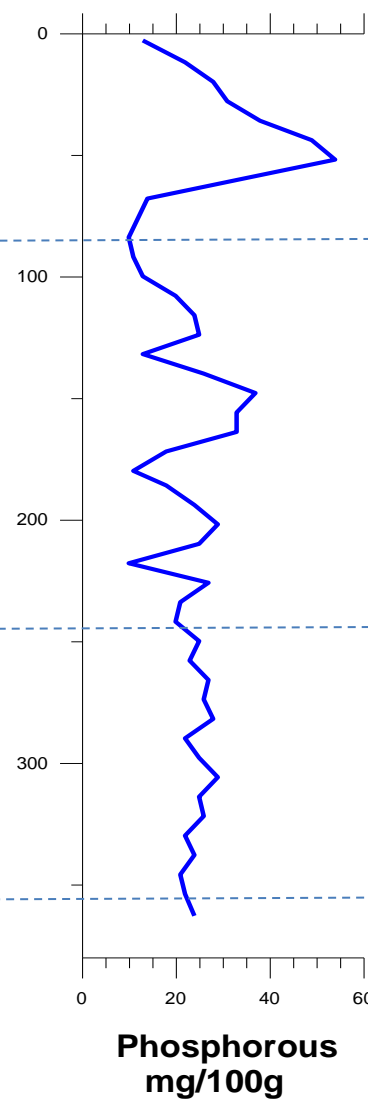
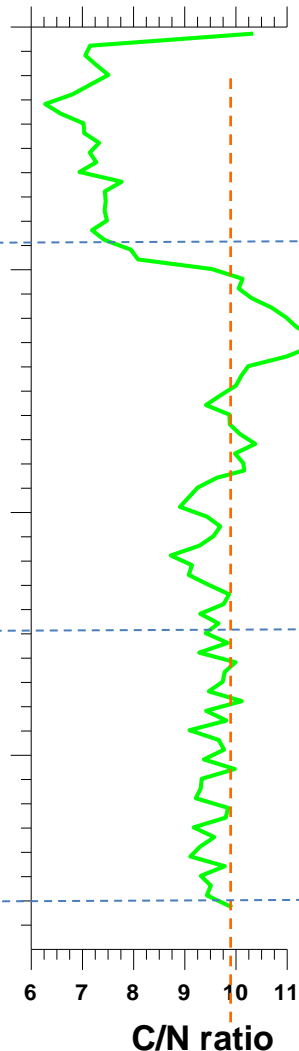
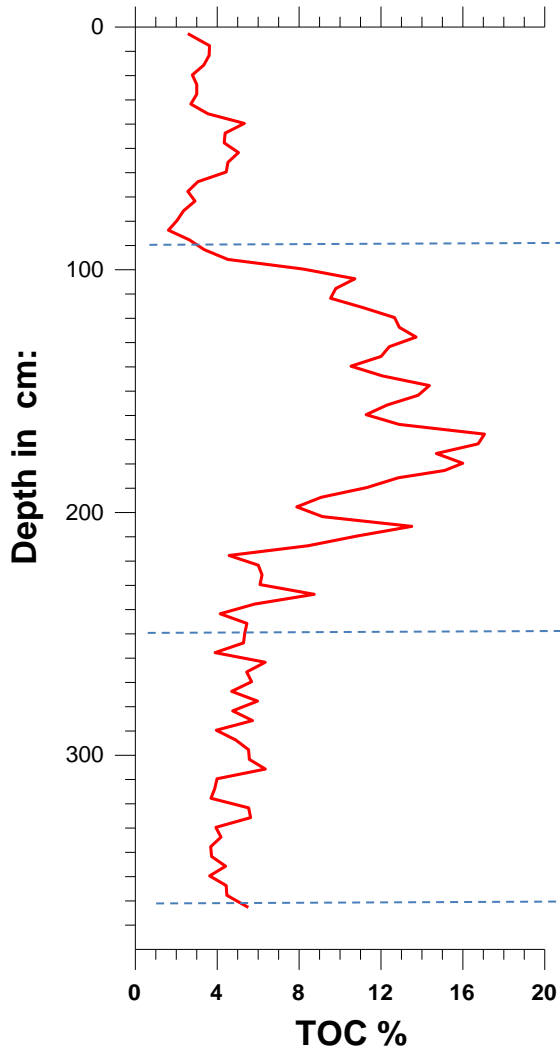


Tykkelsesvariasjon bestemt ved 'kriging'.
Mørk blå; tykkelse < 50 cm
Lys blå; tykkelse 50- 70 cm
Grønn; tykkelse > 70 cm (opp til 1,1 m)
Rød & gul (søndre delta); opp til 2 m

TOC % -

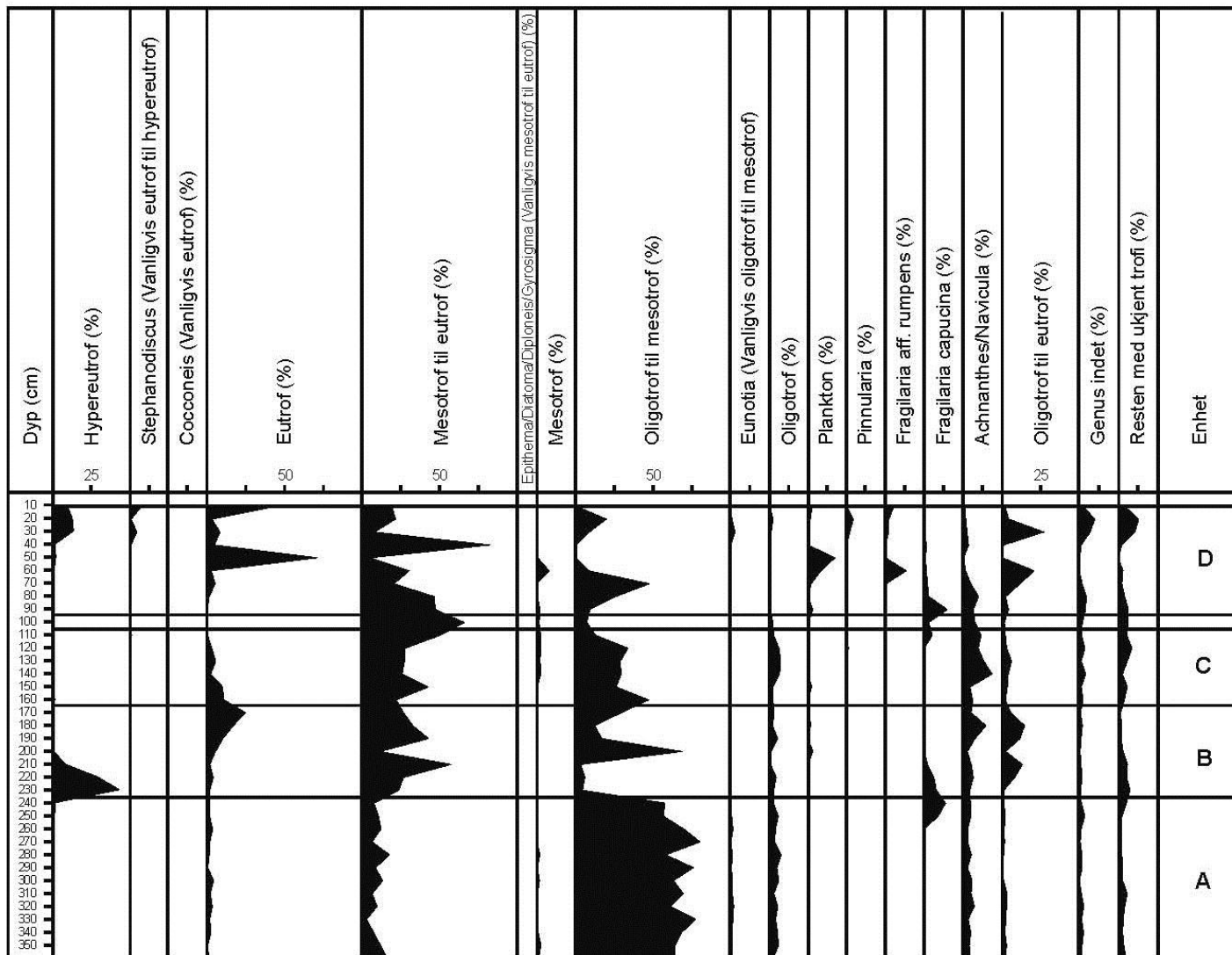
C/N -

P mg/100g - Biogent silika ‰



Diatomé-analyse

Eutrofi-klasser (ved R. Hendrickson)

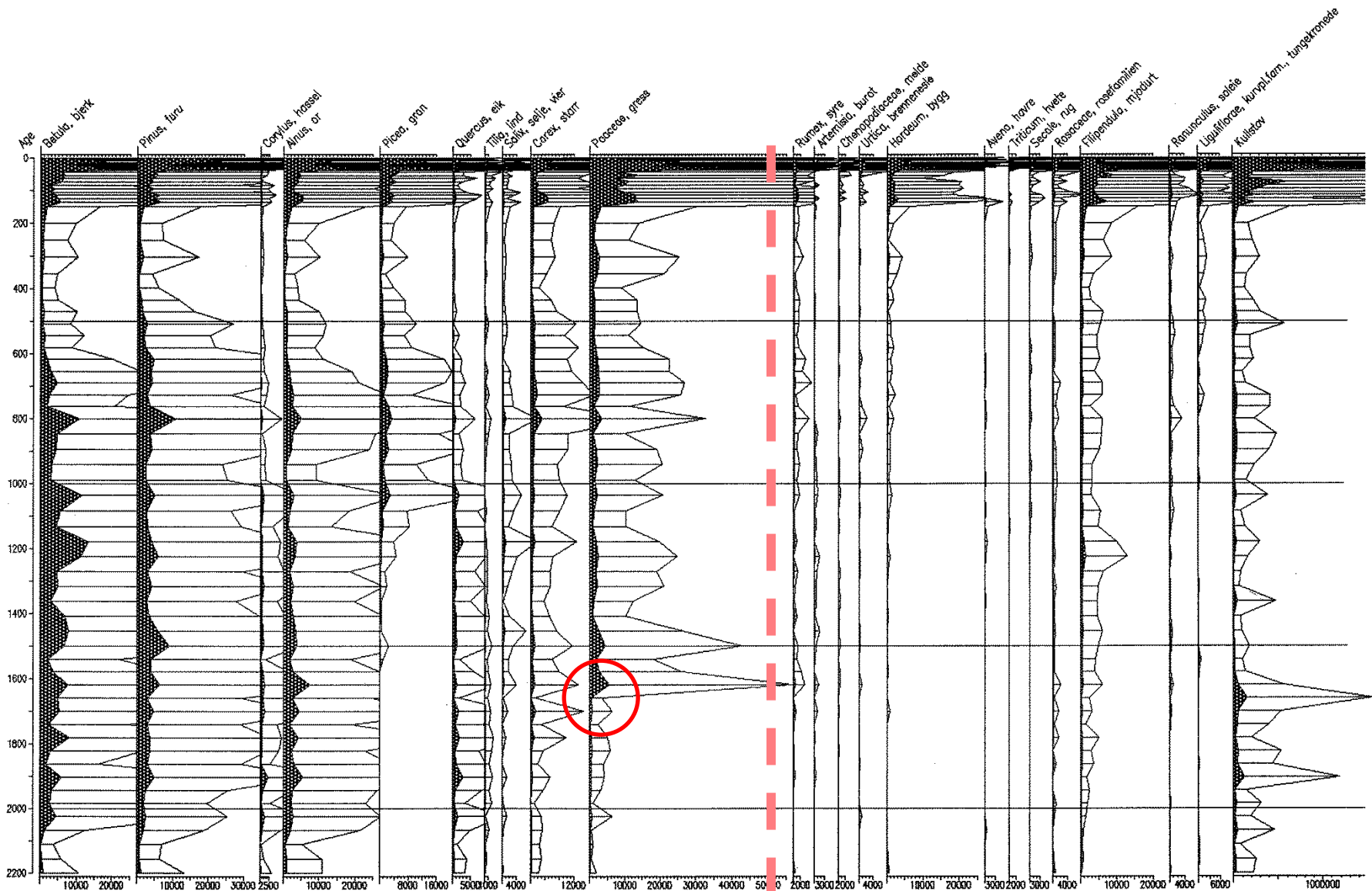


Ca. 400 før nå

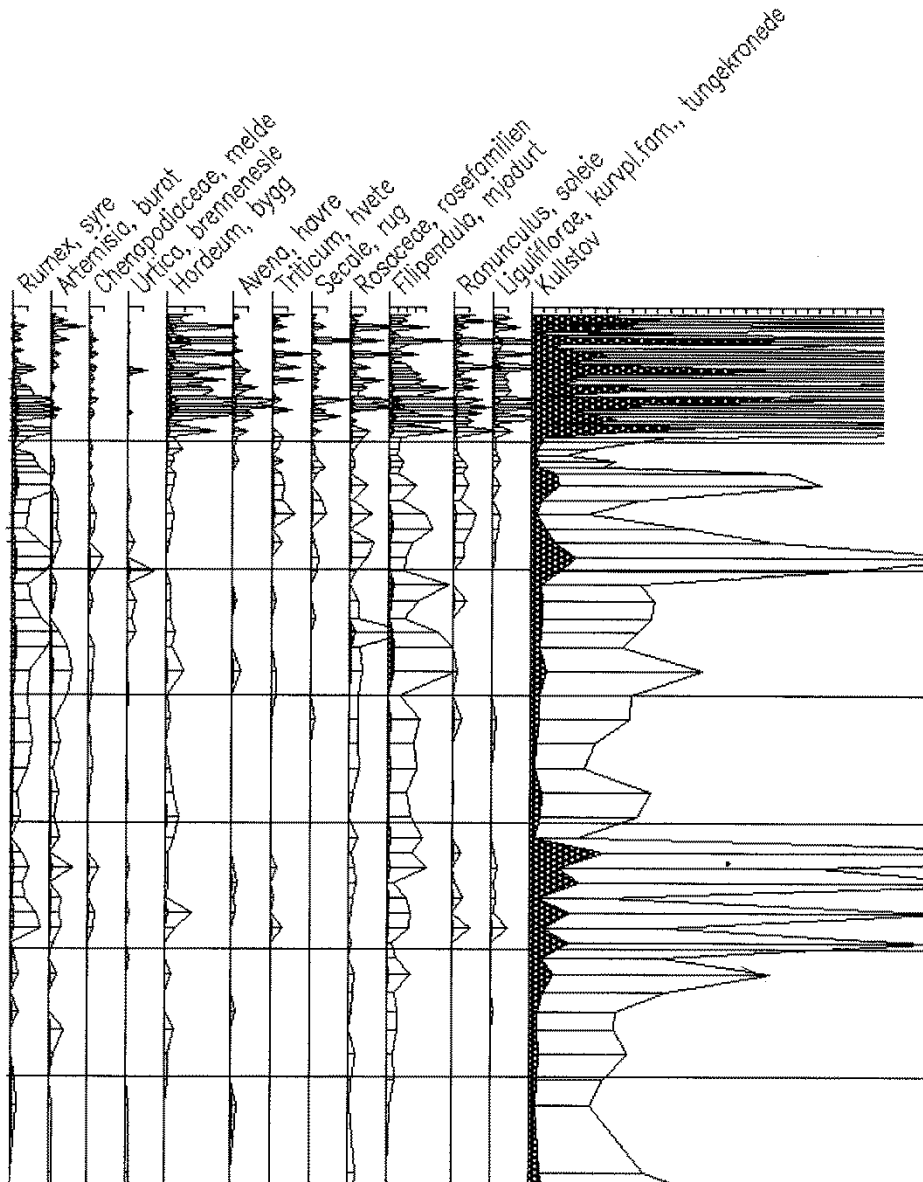
Ca. 2200 før nå

Pollenanalyse (ved Helge T. Høeg)

Endringer i nedbørsfeltet



Sandbruk rundt Østensjøvann



Ca. 500 år før nåtid

Ca. 950 år f. n. **Middelalder
varmetid**

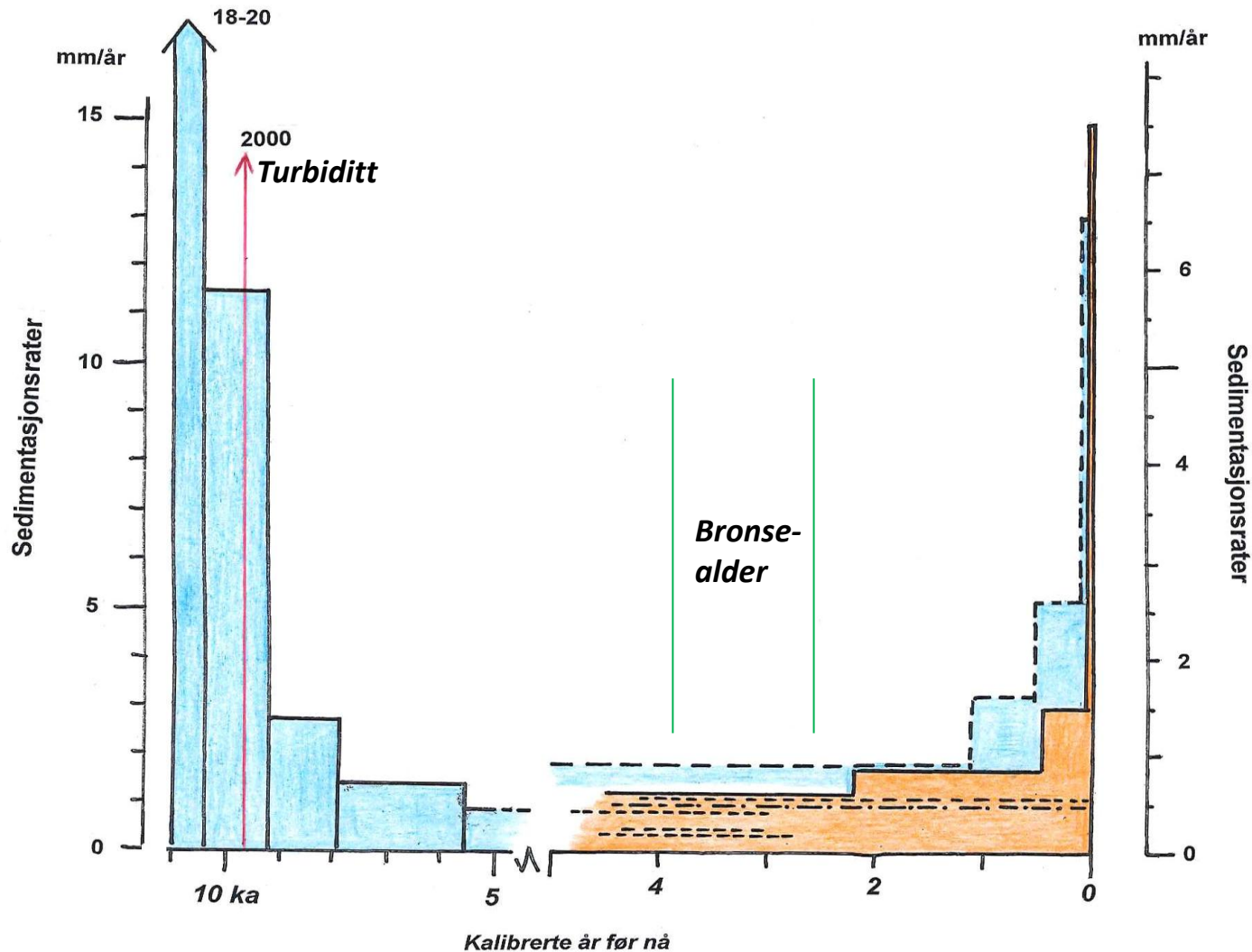
Ca. 2050 år f. n.

**Romersk
jernalder**

Ca. 2650 år f. n.

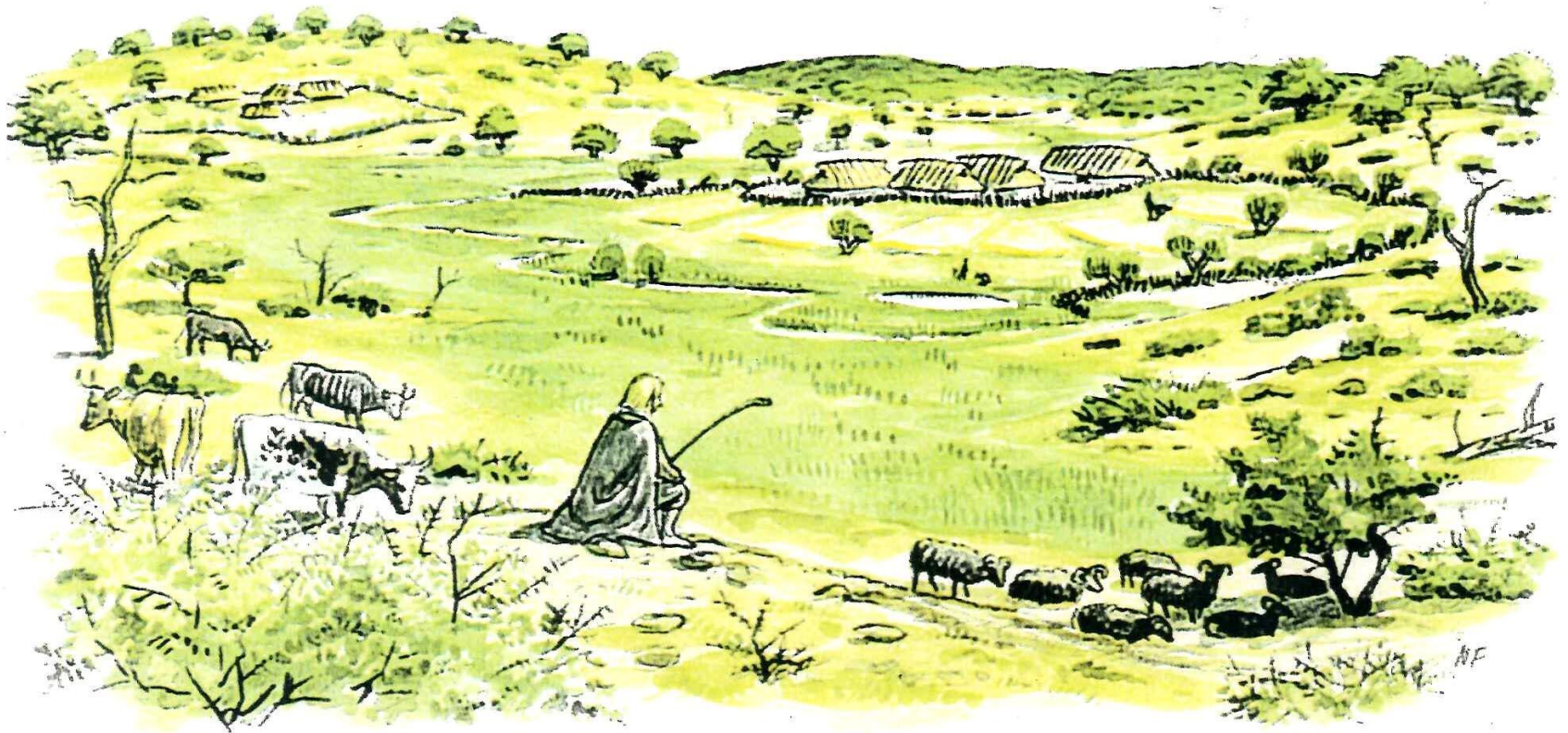
Midlere sedimentasjonsrater: Årungen - Østensjøvann

Beregnet med naturlig vanninnhold !



Skåne AD 1000

- reconstruction of the Viking Age landscape



Facts: Björn E. Berglund and Ronnie Liljegren

Artist: Nils Forshed

National Atlas of Sweden 1996

Dept. of Quaternary Geology

Lund University

Takk for oppmerksomheten