Precise linking of late Quaternary palaeoclimate records in the North Atlantic region using volcanic ash layers

Stefan Wastegård, Department of Physical Geography,
Stockholm University
stefan.wastegard@geo.su.se

Tephra studies group

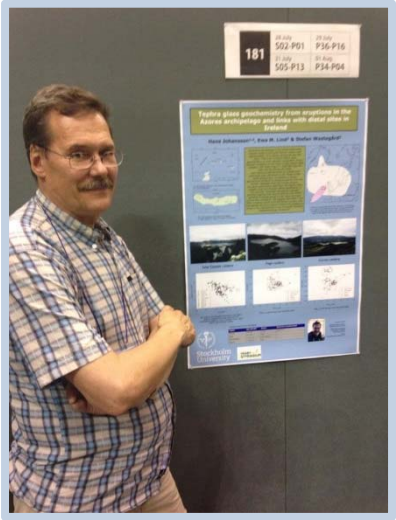


PhD Ewa Lind
Faroes, Norway,
Sweden, N Atlantic
(now at Geoveta AB)





Simon Larsson (PhD student)
south Scandinavia
Helene Sunmark (MSc student)
Peleponessos, Greece



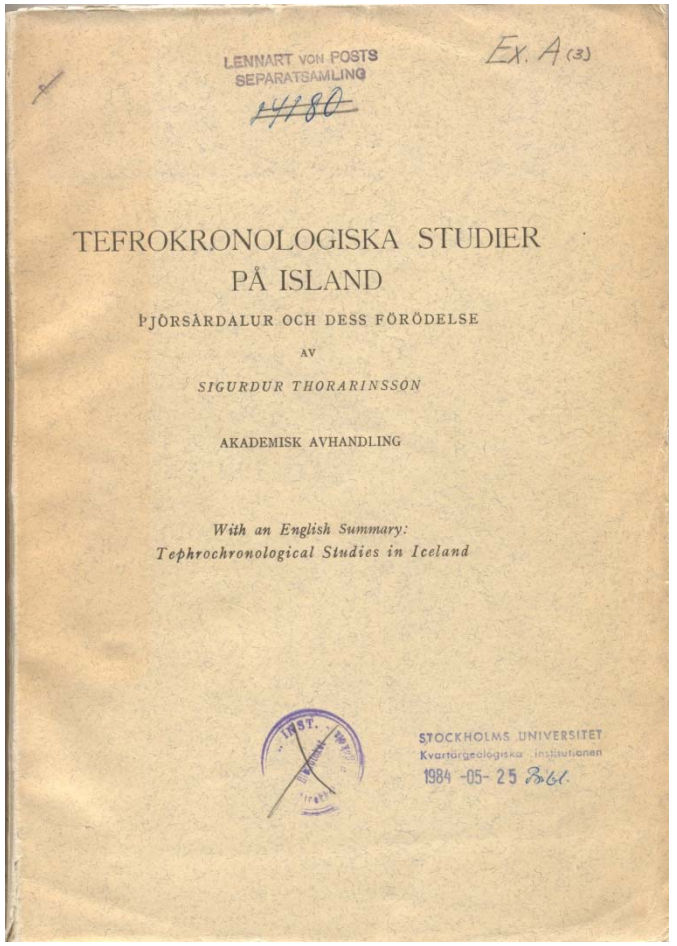
Prof Stefan Wastegård
North Atlantic Region,
Greenland, Patagonia

PhLic Hans Johansson,
Azores Islands

Swedish Meteorological and Hydrological Institute

Stockholm University





LENNART VON POSTS SEPARATSAMLING

Ex. A (3)

TEFROKRONOLOGISKA STUDIER PÅ ISLAND

ÞJÓRSÁRDALUR OCH DESS FÖRÖDELSE

AV

SIGURDUR THORARINSSON

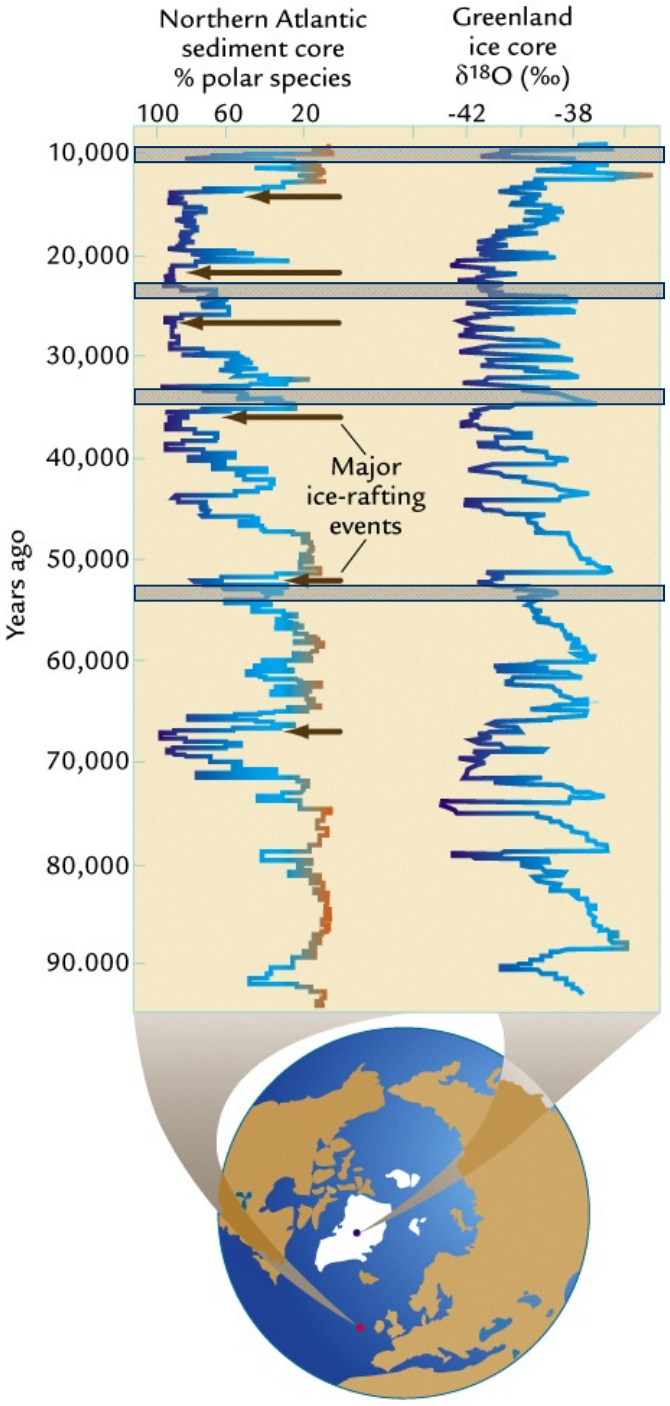
AKADEMISK AVHANDLING

With an English Summary:
Tephrochronological Studies in Iceland

STOCKHOLMS UNIVERSITET
Kvartärgeologiska institutionen
1984 -05- 25

Sigurdur Thórarinsson (1912-1983), PhD thesis at Stockholm University College 1944

På Island föreligga alltså synnerligen gynnsamma förutsättningar för upprättandet av en absolut geologisk kronologi baserad på mätningar, konnekteringar och dateringar av vulkaniska asklager. Som internationell term för en dylik asklagerkronologi föreslår jag termen *tefrokronologi* (eng. *tephrochronology*, fr. och ty. *tephrochronologie*) av grek. τέφρα, aska.



Ash Zone I (c. 12,100 cal BP)

Fugloyarbanki/FMAZ II (c. 26,700 BP)

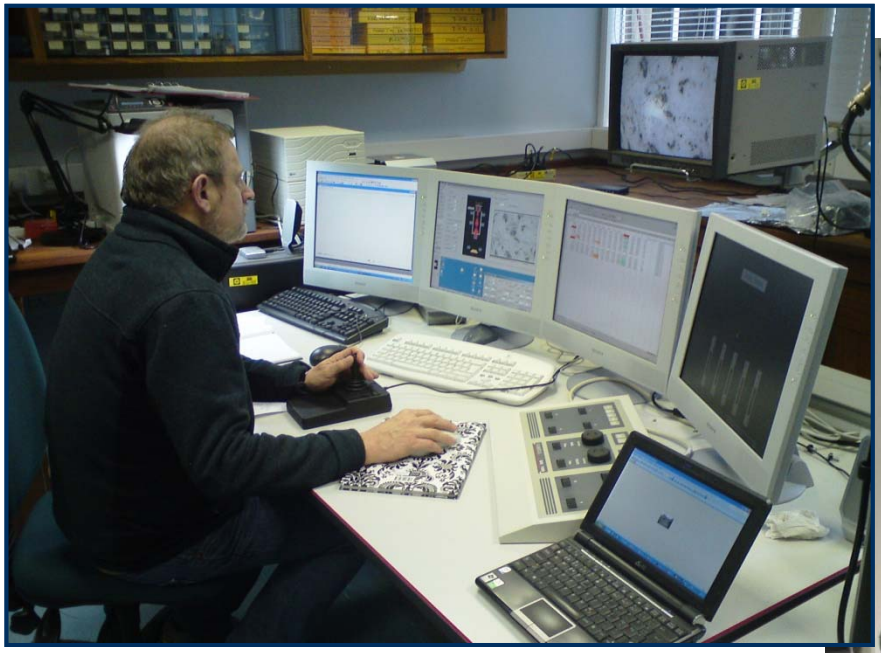
FMAZ III (Faroe Marine Ash Zone III) (c. 38,100 BP)

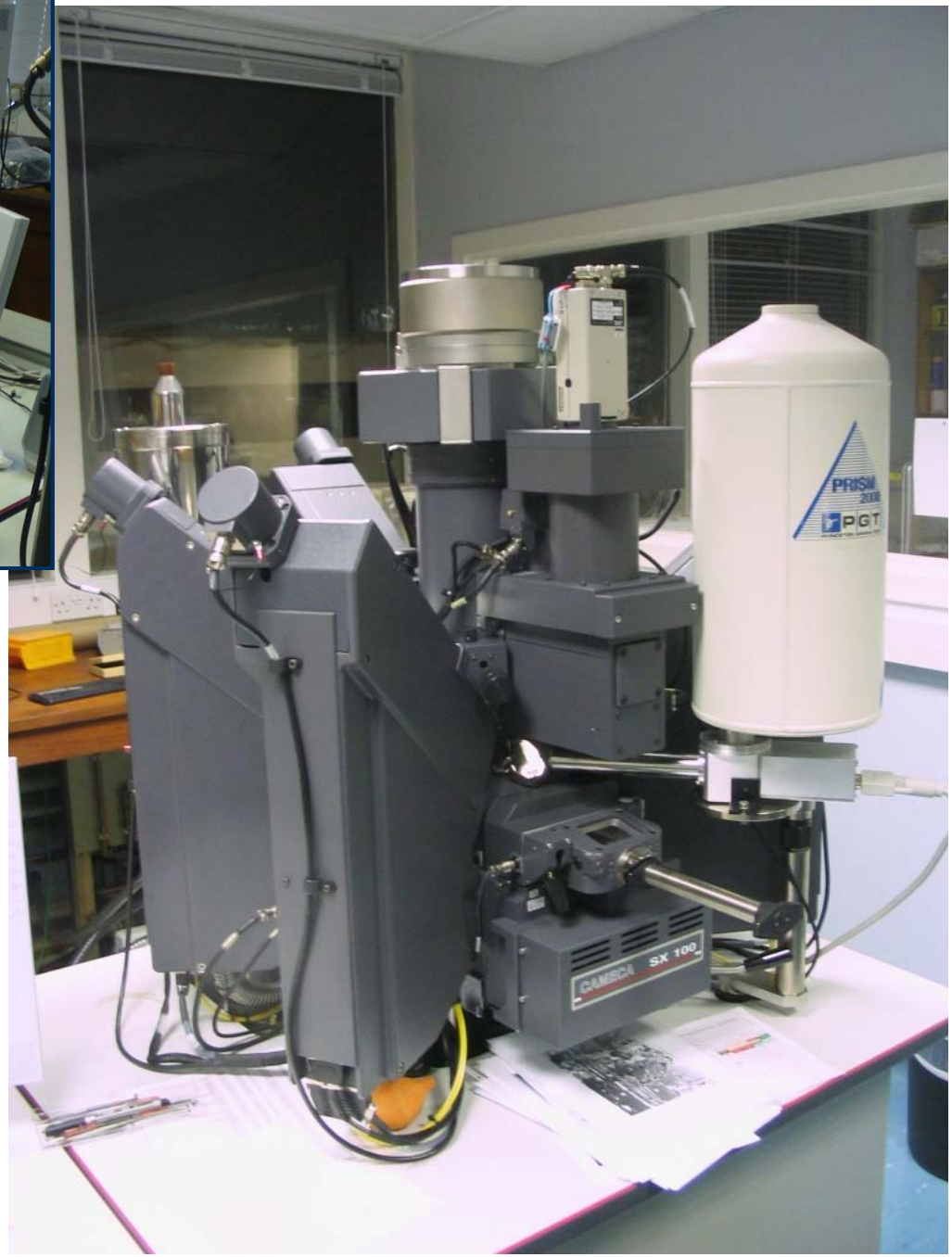
Ash Zone II (c. 55,500 BP)

How can we know if the records are synchronous?

Ruddiman, 2007

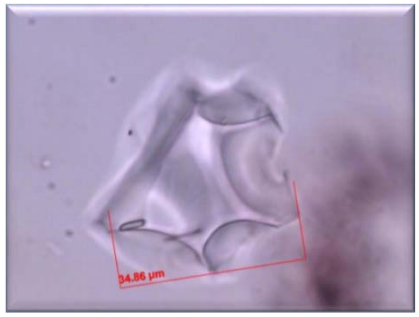
Stockholm University



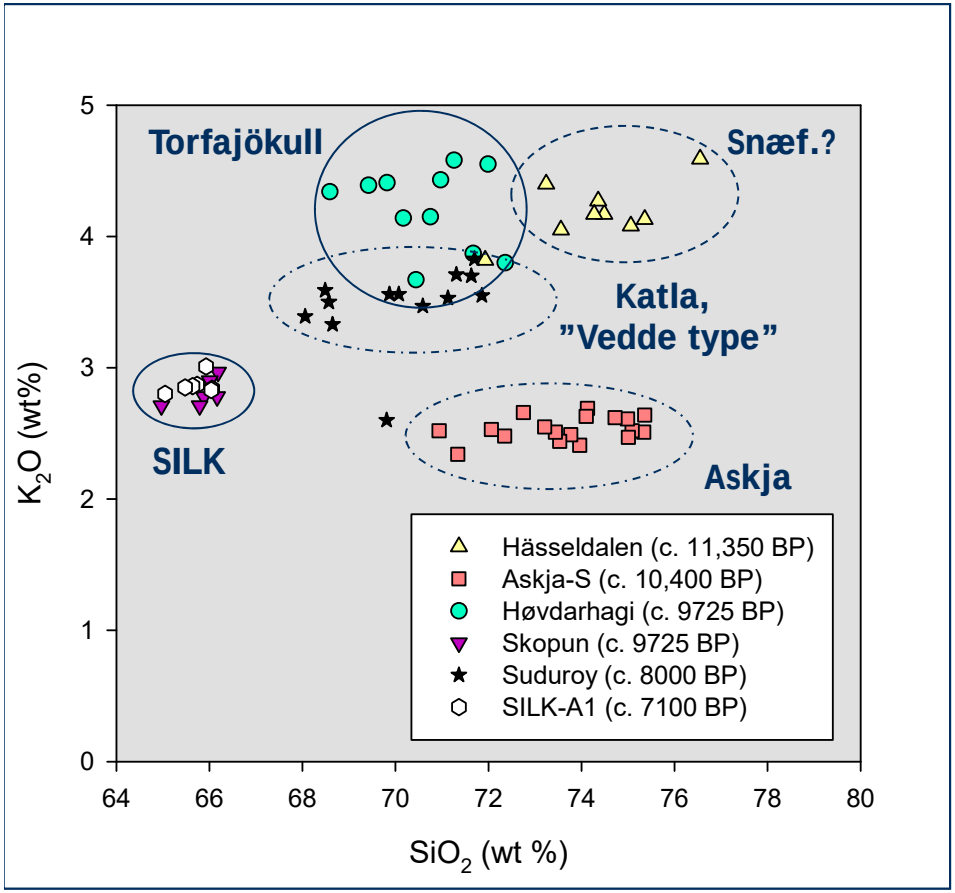


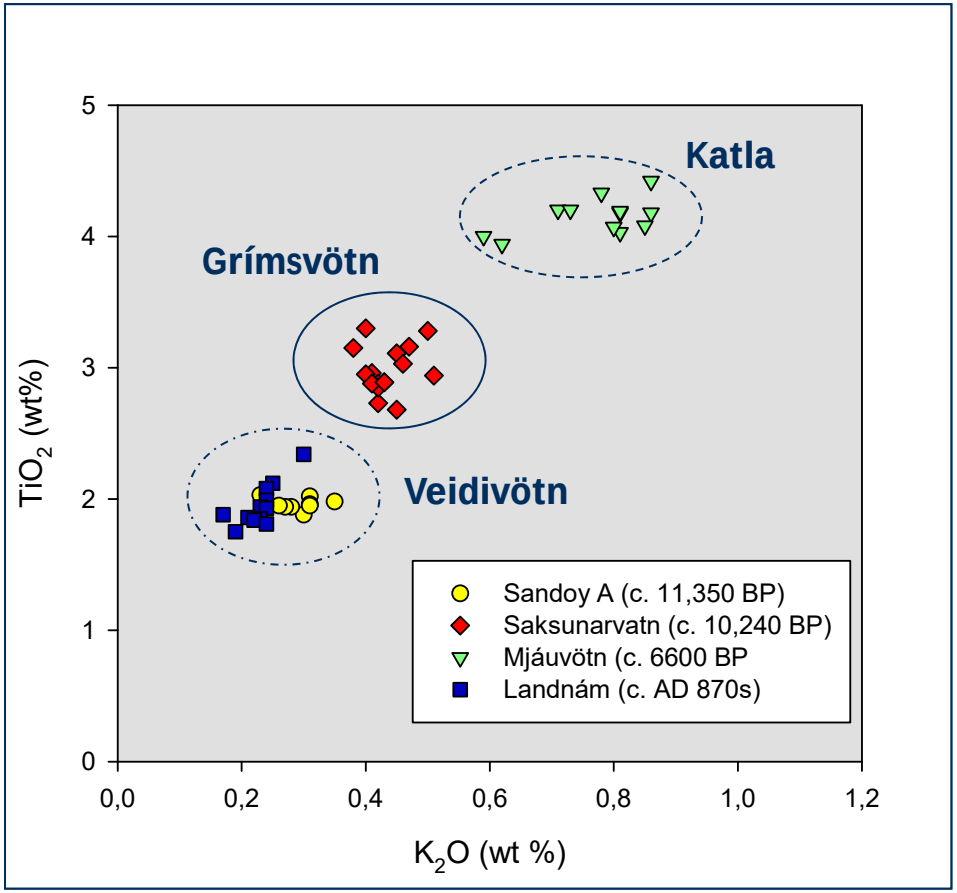
Geochemical identification

Cameca SX 100 electron microprobe, University of Edinburgh, Scotland



Geochemical fingerprinting of Holocene tephras, Faroe Islands (Wastegård/Lind)





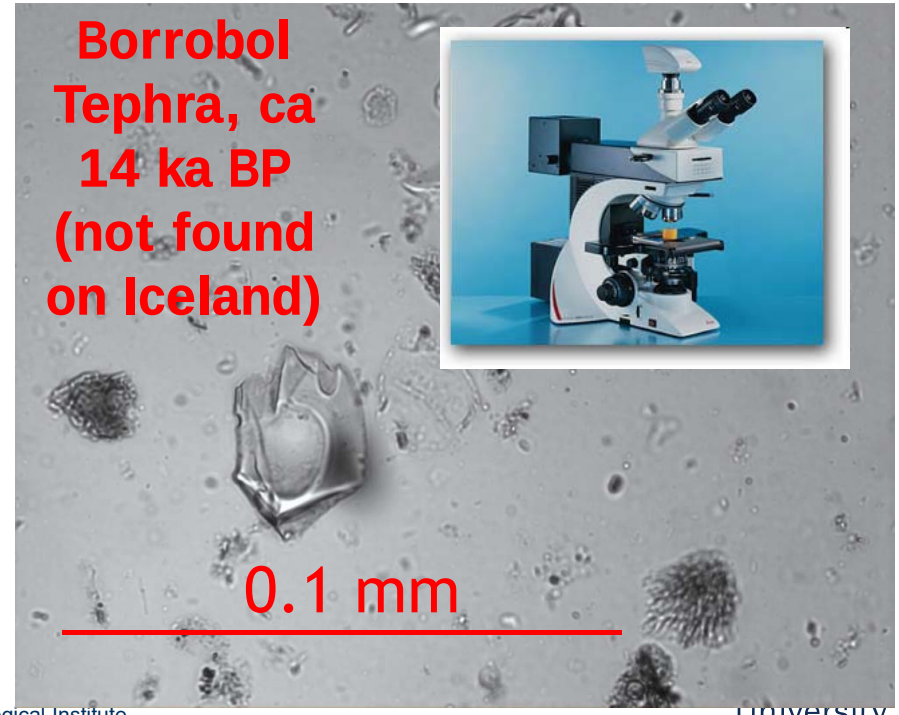
Silicic tephras
(Askja, Katla & Torfajökull)

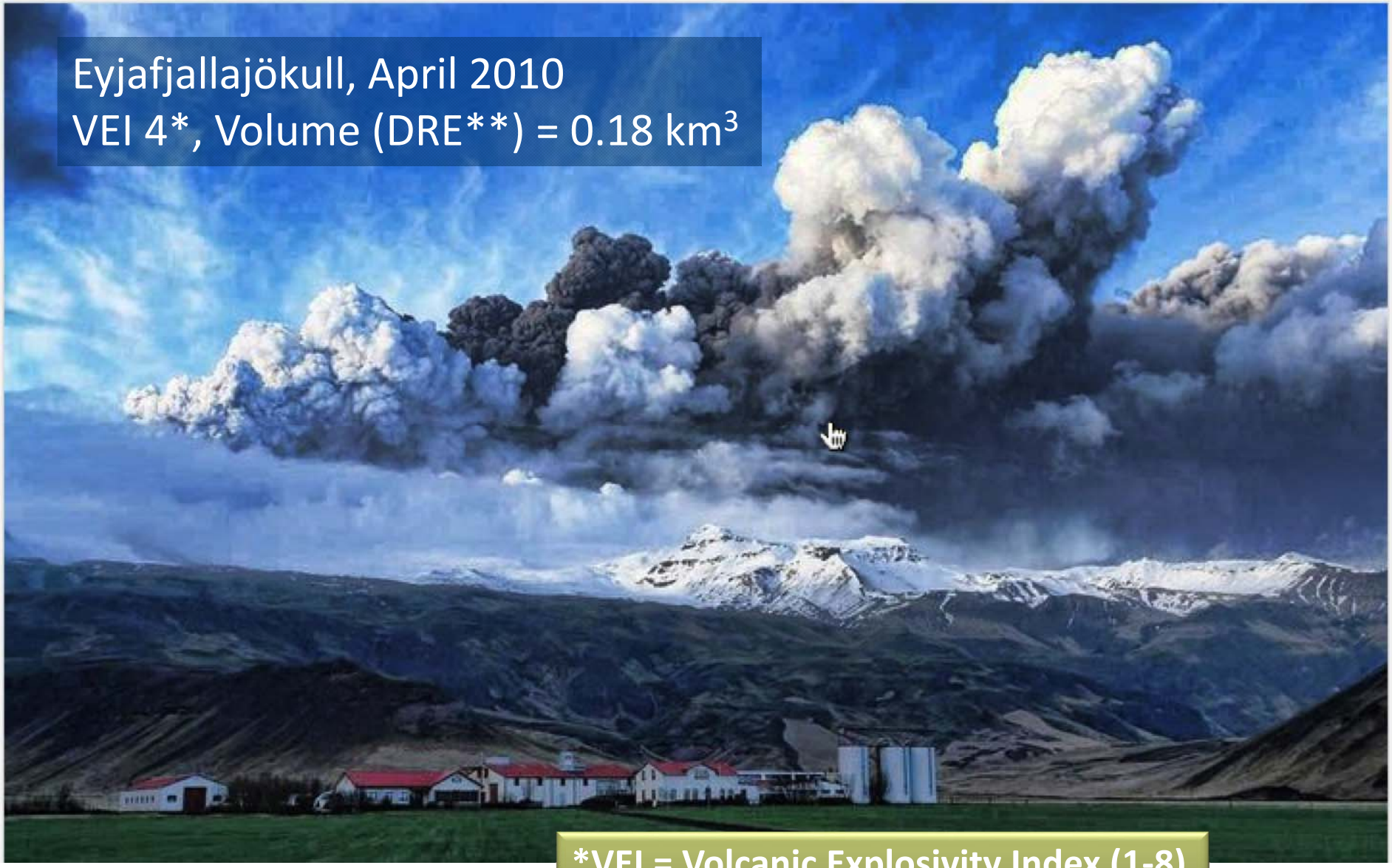
Basaltic tephras
(Veidivötn, Grímsvötn & Katla)

Proximal vs. distal tephra

- In distal areas (e.g. Scandinavia) tephras occur as *microtephra* or *cryptotephra*






Eyjafjallajökull, April 2010
VEI 4*, Volume (DRE**) = 0.18 km3
*VEI = Volcanic Explosivity Index (1-8)
**DRE = Dense Rock Equivalent

Saksunarvatn Tephra (c. 10,300 cal yr BP) – the most widespread basaltic tephra in the North Atlantic region

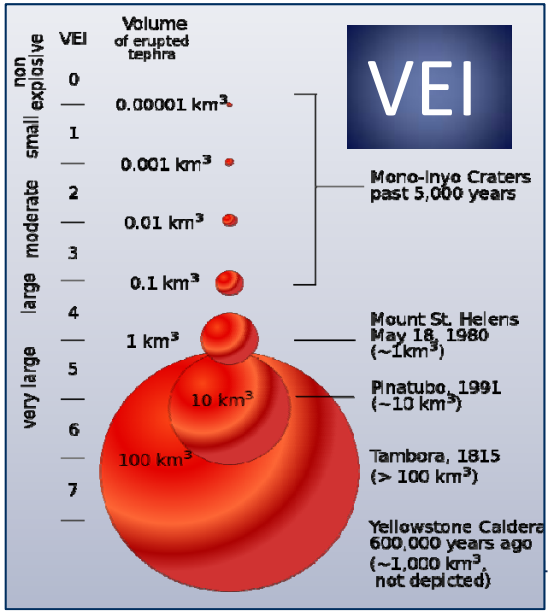


Photo from a palaeolake site on the Faroe Islands (photo: Ewa Lind)

Up to 6 eruptions
VEI 5-6

Erupted volume:
>150 km^3

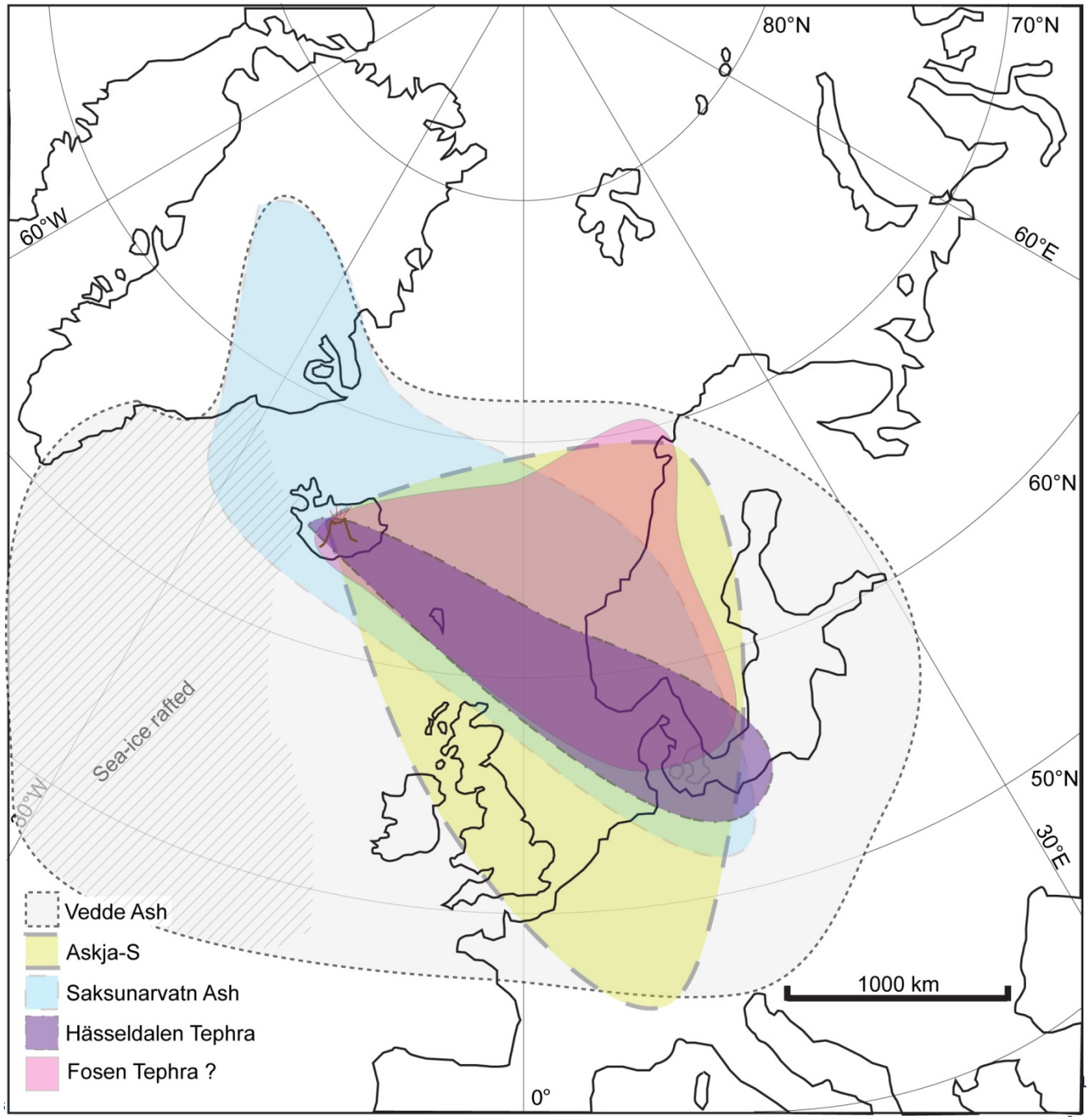
Eyjafjallajökull x 800!



Bolin Centre for Climate Research
A collaboration between Stockholm University, KTH and the Swedish Meteorological and Hydrological Institute

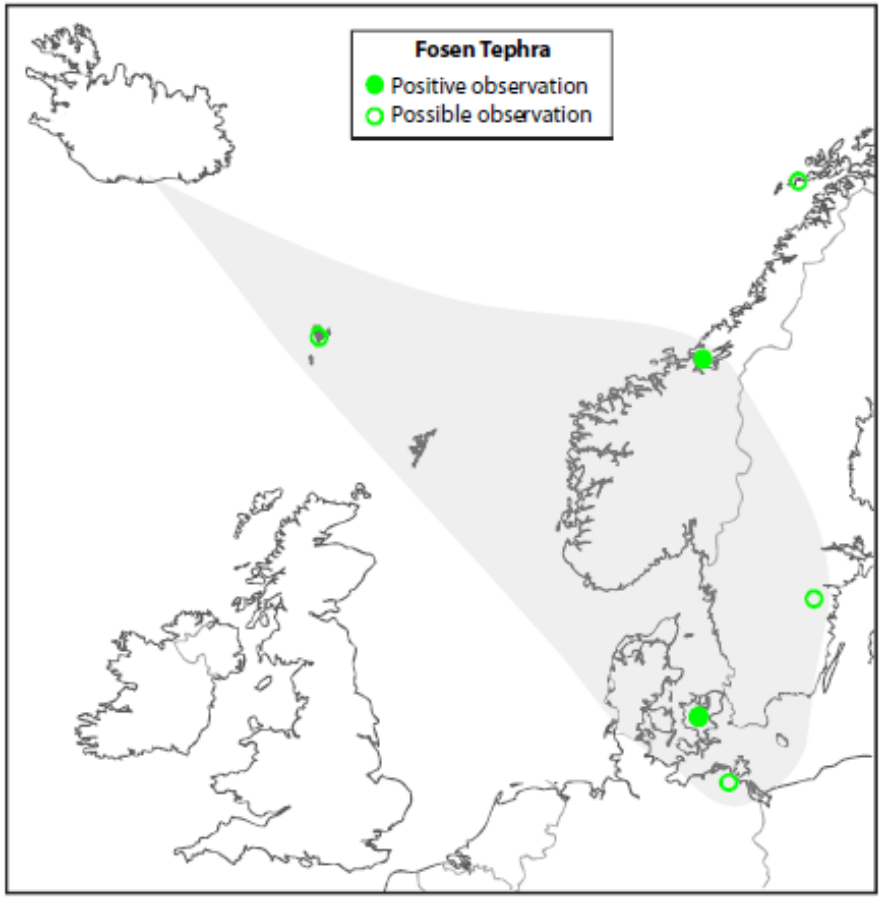
Tephra network for the Late Glacial/Early Holocene (Lind, 2014)

12,100-10,000 cal yrs BP



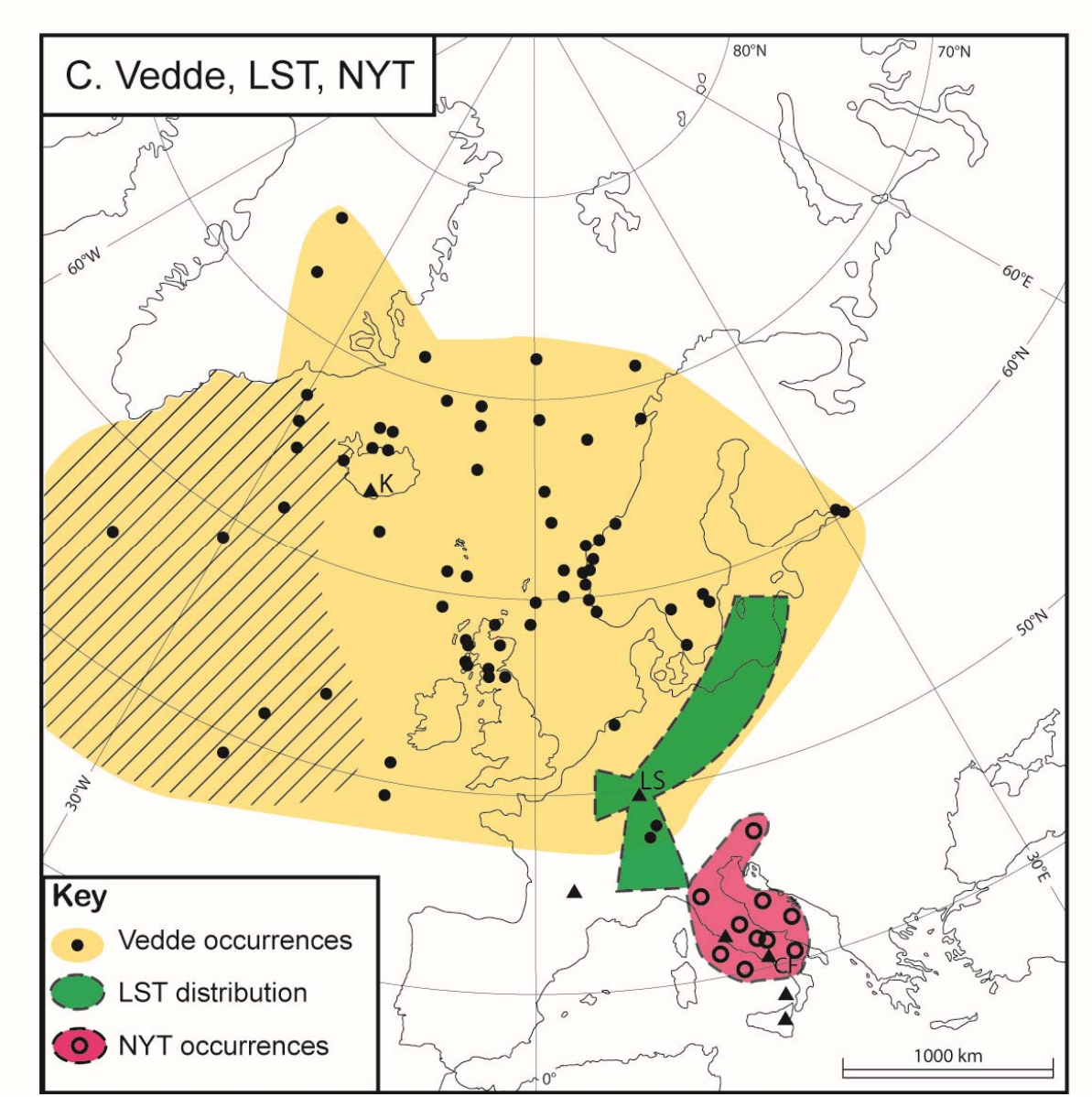
Fosen tephra, a new potentially important isochron for the early Holocene (Lind et al., 2013), c. 10,200 cal yr BP





Grønlia fen, Fosen peninsula, W Norway

Stockholm University



Overlapping distributions

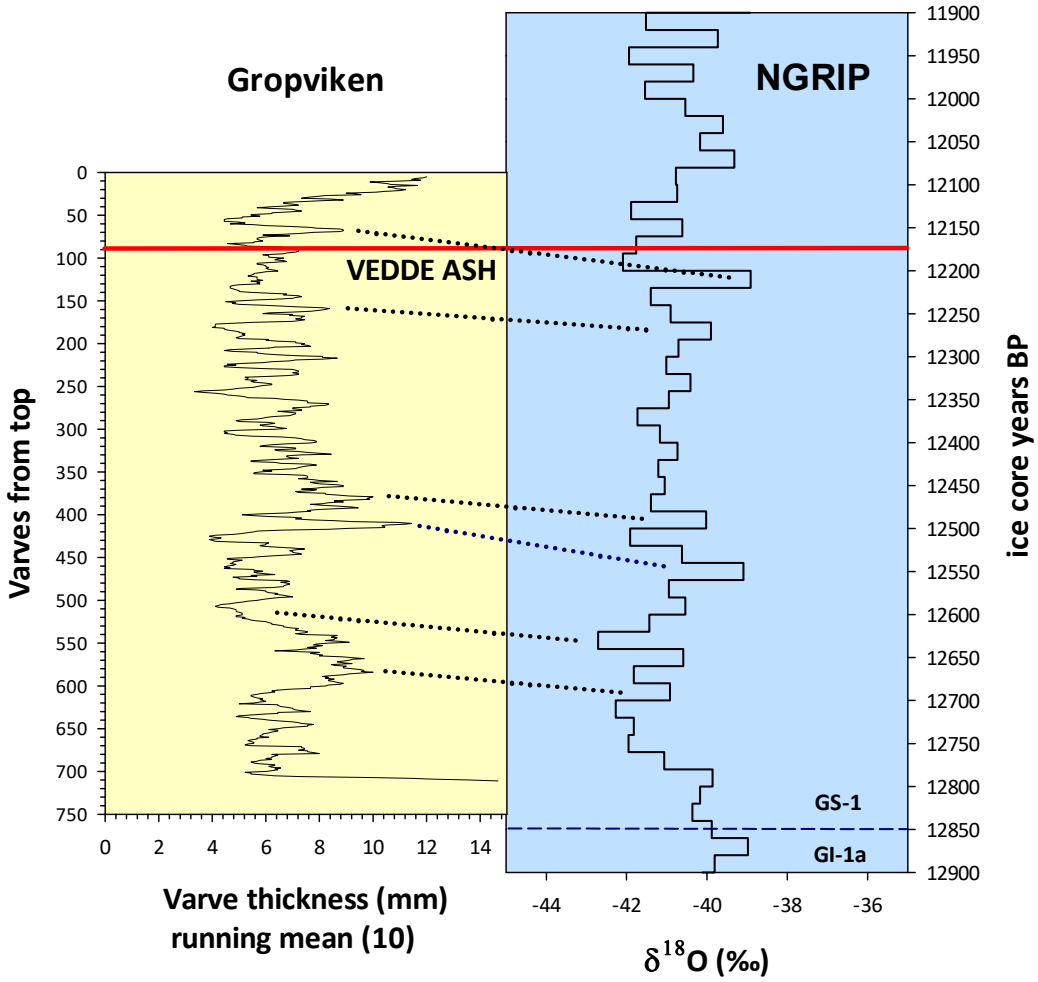
Vedde Ash 12 100 BP

Laacher See, 12 850 BP

Neapolitan Yellow Tuff, 14 000 BP

(Davies *et al*., 2012, QSR)

Correlation of Gropviken varve record with NGRIP oxygen isotope record indicates an offset of ca 50 years? (Wastegård, in prep.)






Thank you for
your attention!
Questions?
Stockholm
University
Sakurajima, Kyushu, Japan 2010