



Regional Adjustment of Precise Levelling around the Baltic

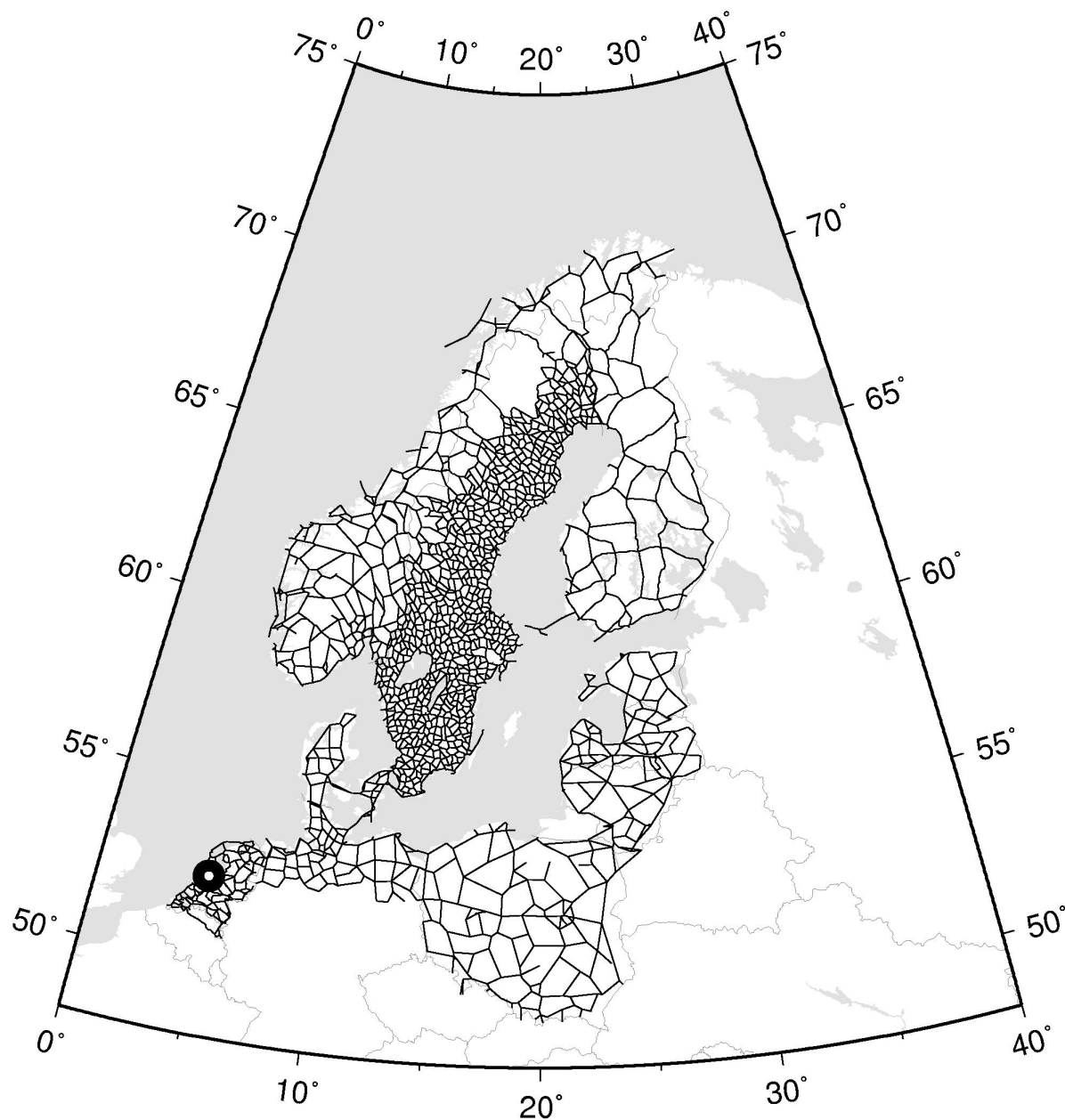
Nordic Geodetic Commission, WG for Height Determination
NKG WGH

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New national
levellings:
Finland
Norway
Sweden
UELN data
Estonia
Germany
Latvia
Lithuania
Netherlands
Poland





Big thanks to

- BKG, Germany
- Estonian Land Board
- National Land Service, Latvia
- National Land Service, Lithuania
- Directorate-General of Public Works and Water Managements, Netherlands
- Head Office for Geodesy and Cartography, and Institute of Geodesy and Cartography, Poland
- UELN Computing Center



Purposes, problems

- Support the countries in the creation of new national height systems
- A testbed for the data before inclusion into UELN
- For the problems which both national systems and UELN/EVRF share in the area
 - the treatment of postglacial rebound:
model
epoch for heights 2000.0
 - no loop closure around the Baltic available

History I



- Started in the NKG WGH in 2001-2 as an internal DK-FI-NO-SE project
- 2001-2003 uplift modelling, discussion of harmonizing new national systems (FI-NO-SE; DK just got DVS90)
- Need to work with data from the whole Baltic levelling ring (BLR) and to NAP datum point
- endorsed by EUREF TWG in 2003 at Toledo
- UELN-95/98 data from EE, LV, LT, PL, DE, NL obtained 2003-4
- Levellings completed in SE (2003) and FI (2004)

History II



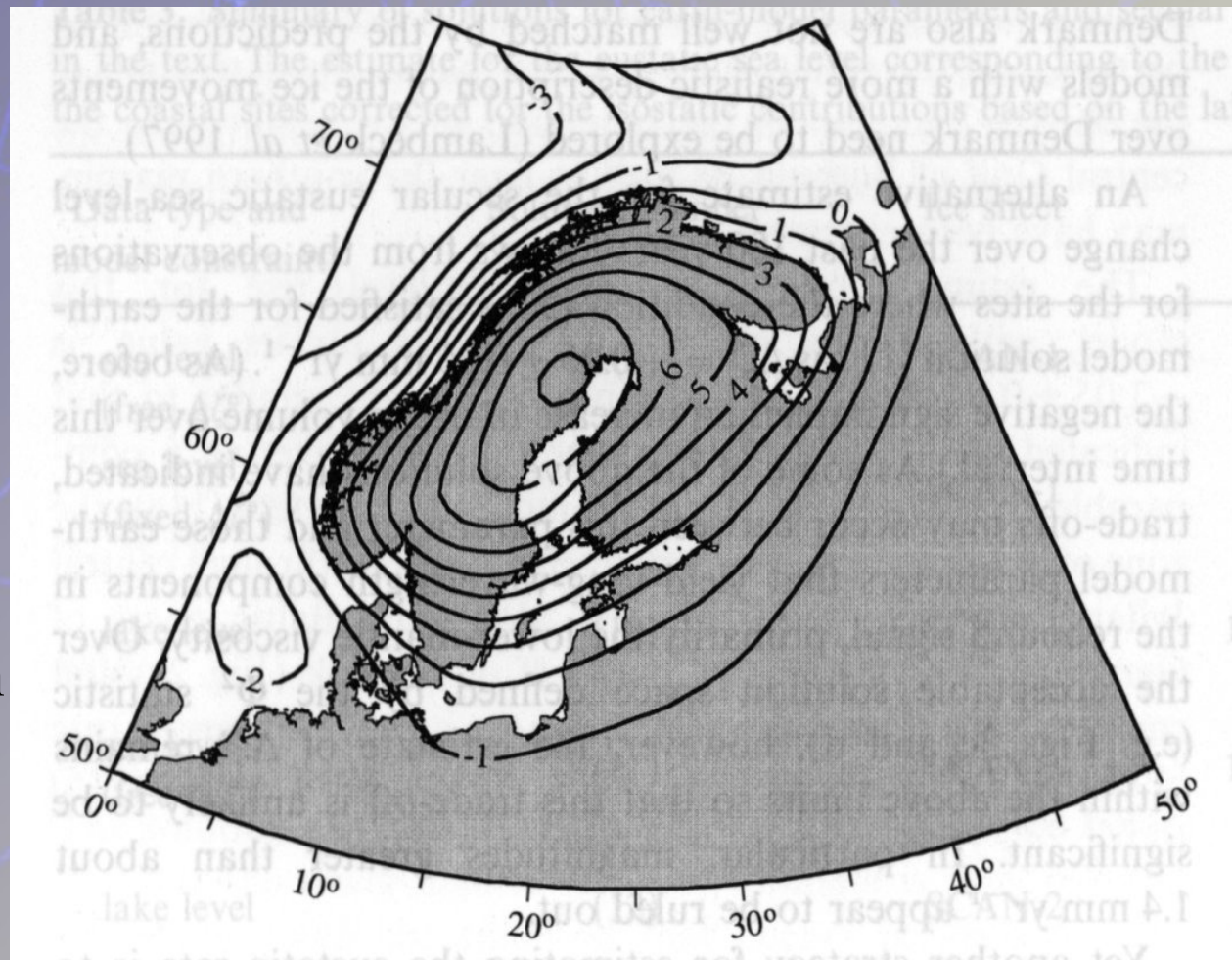
- BLR Adjustments with various PGR models 2004...2005, comparisons with non-levelling data
- Observed PGR model by Vestöl (2004): collocation of heterogeneous data
 - repeated precise levellings, even scattered
 - tide gauge rates
 - GPS rates
- Hybrid PGR model by Ågren-Svensson (2004-5): areal extension of Vestöl (2004) using the geophysical model by Lambeck et al. (1998)
- "Definite" BLR adjustment in 2005, used for the creation of new Swedish height system RH2000

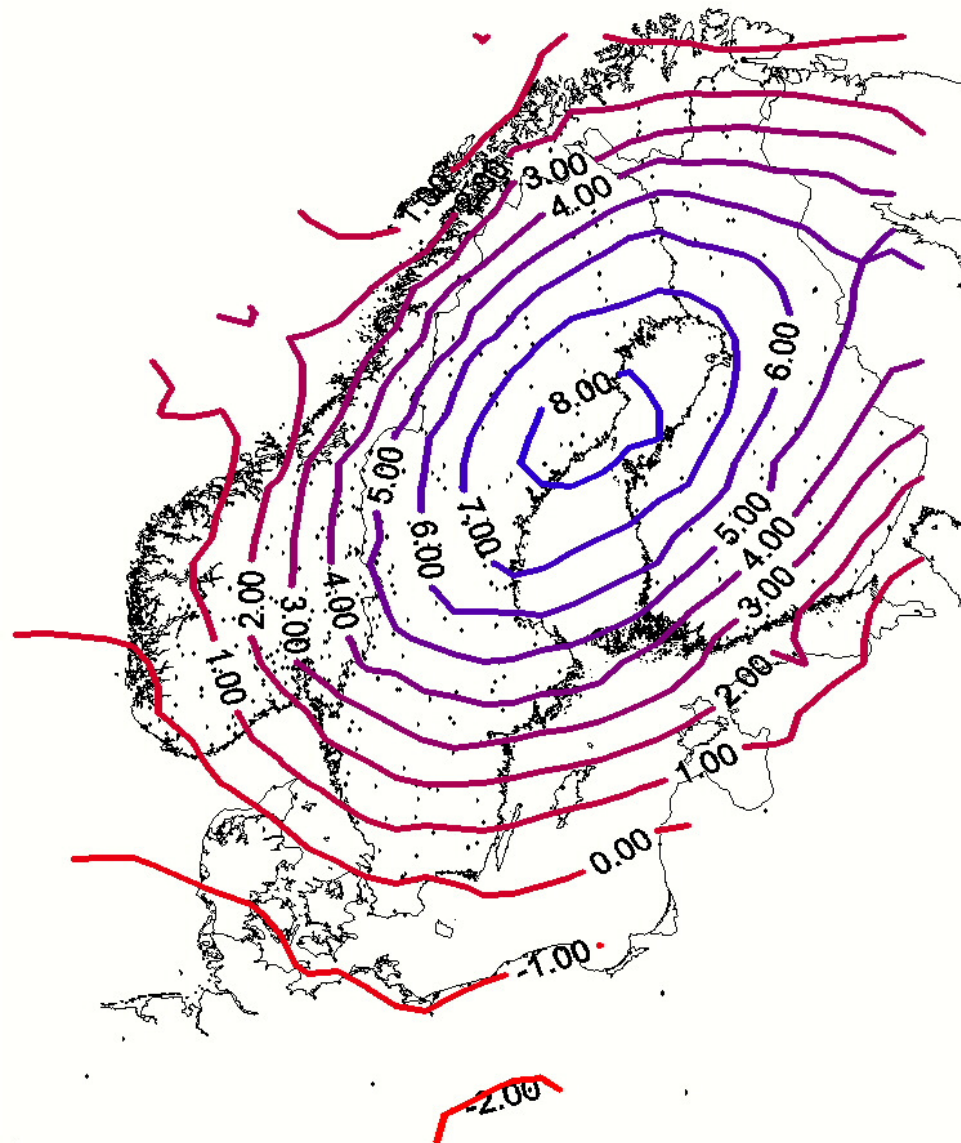


Lambeck, Smither,
Ekman, Geophys.
J. Int. (1998).

Vertical rates from
a model of Glacial
Isostatic
Adjustment (GIA),
tuned to TG rates
provided by Ekman
(1996).

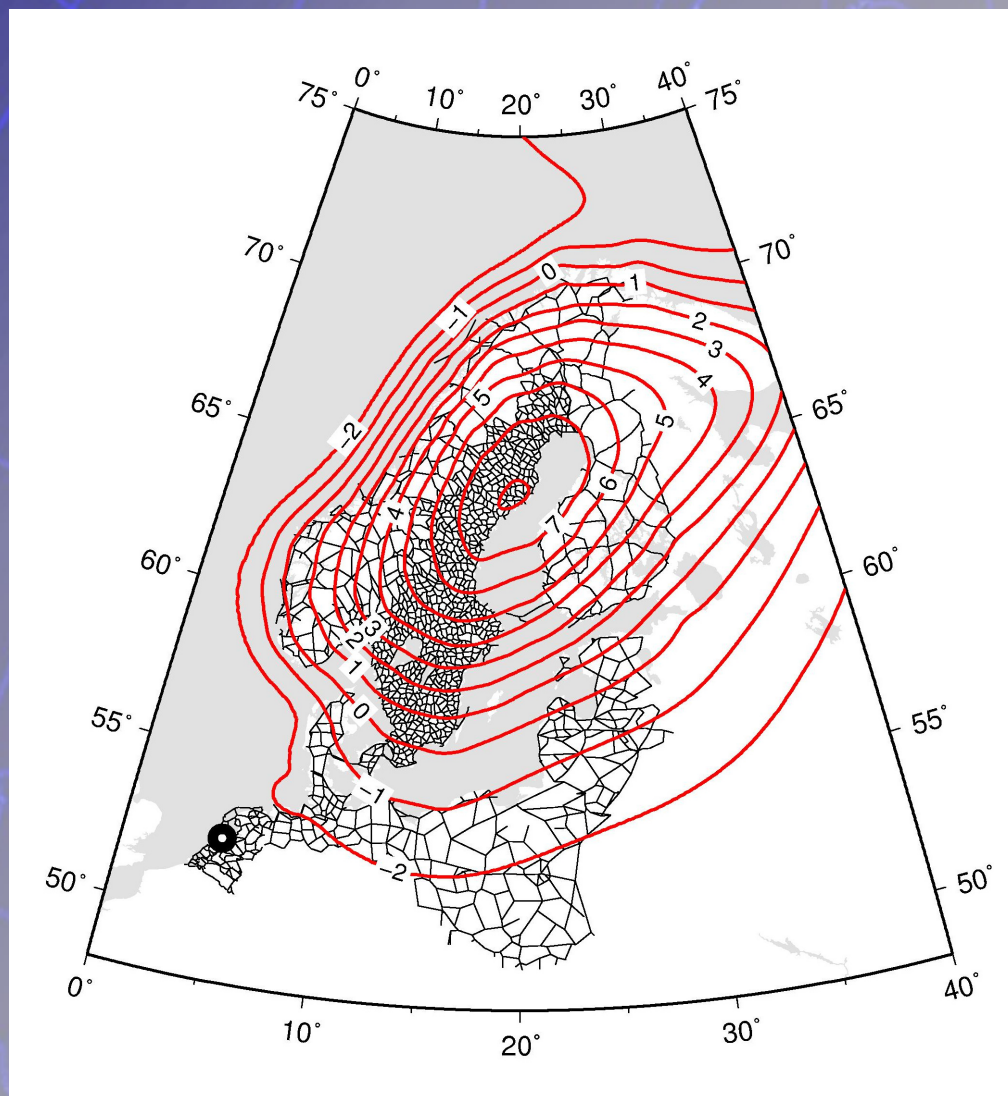
Rates relative to
MSL in mm/yr





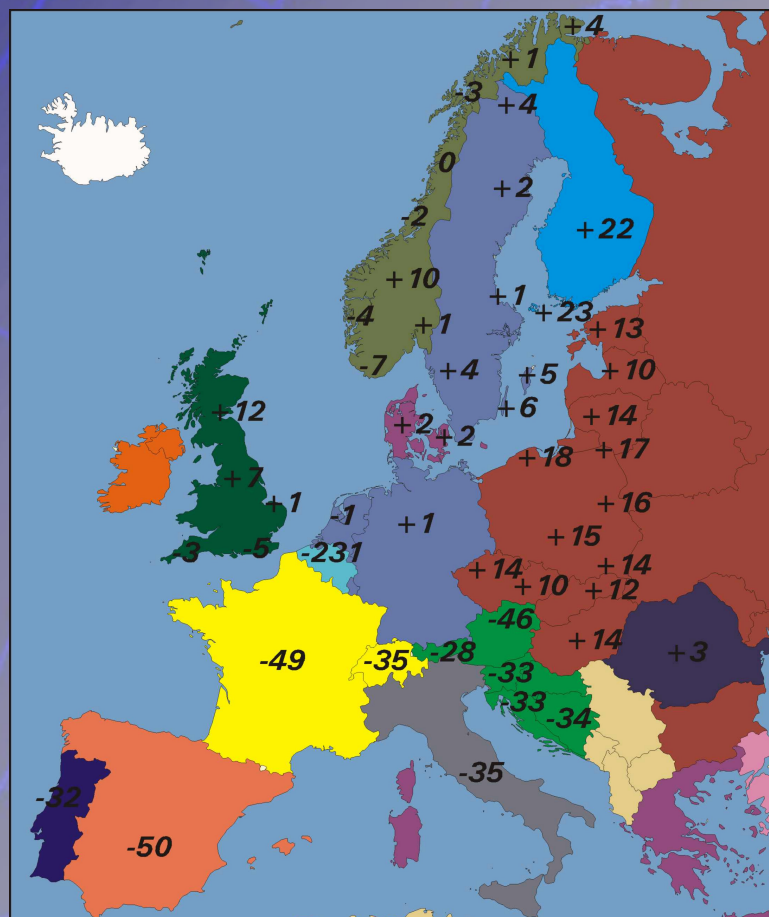
Olav Vestöl
(2004),
mm/yr relative
to MSL.

Uplift map
collocated from
observed rates
only: repeated
precise
levelling, tide
gauges,
permanent GPS.



Merged
model

Transformation from National Height Datums in Europe into the EVRF 2000 Datum (NAP) (Sacher et al., 2002)



Differences between UELN heights and national heights in Europe (in cm)

September 2000

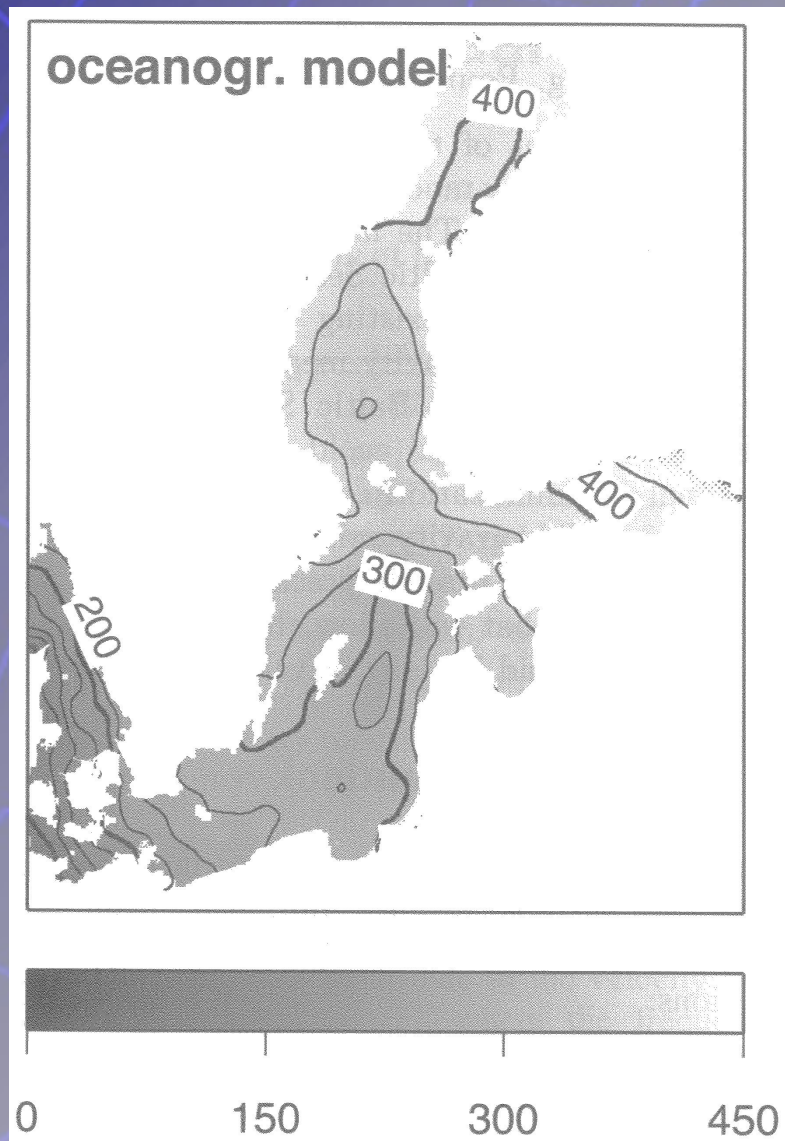


From SST Finland and Estonia should have approximately the same figure

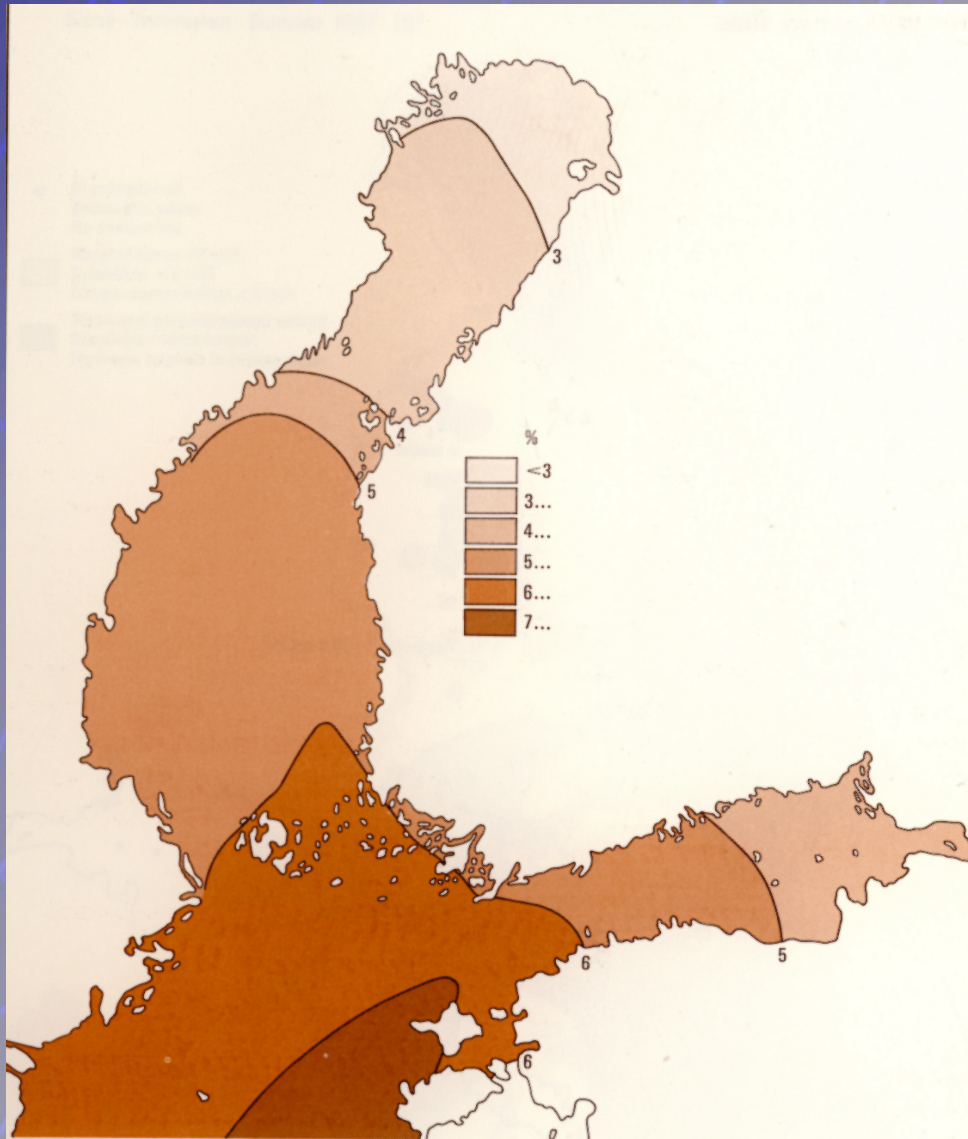


Baltic mean SST modelled in mm

from a dynamical model, 5-
year run by Novotny et al.
(2002)



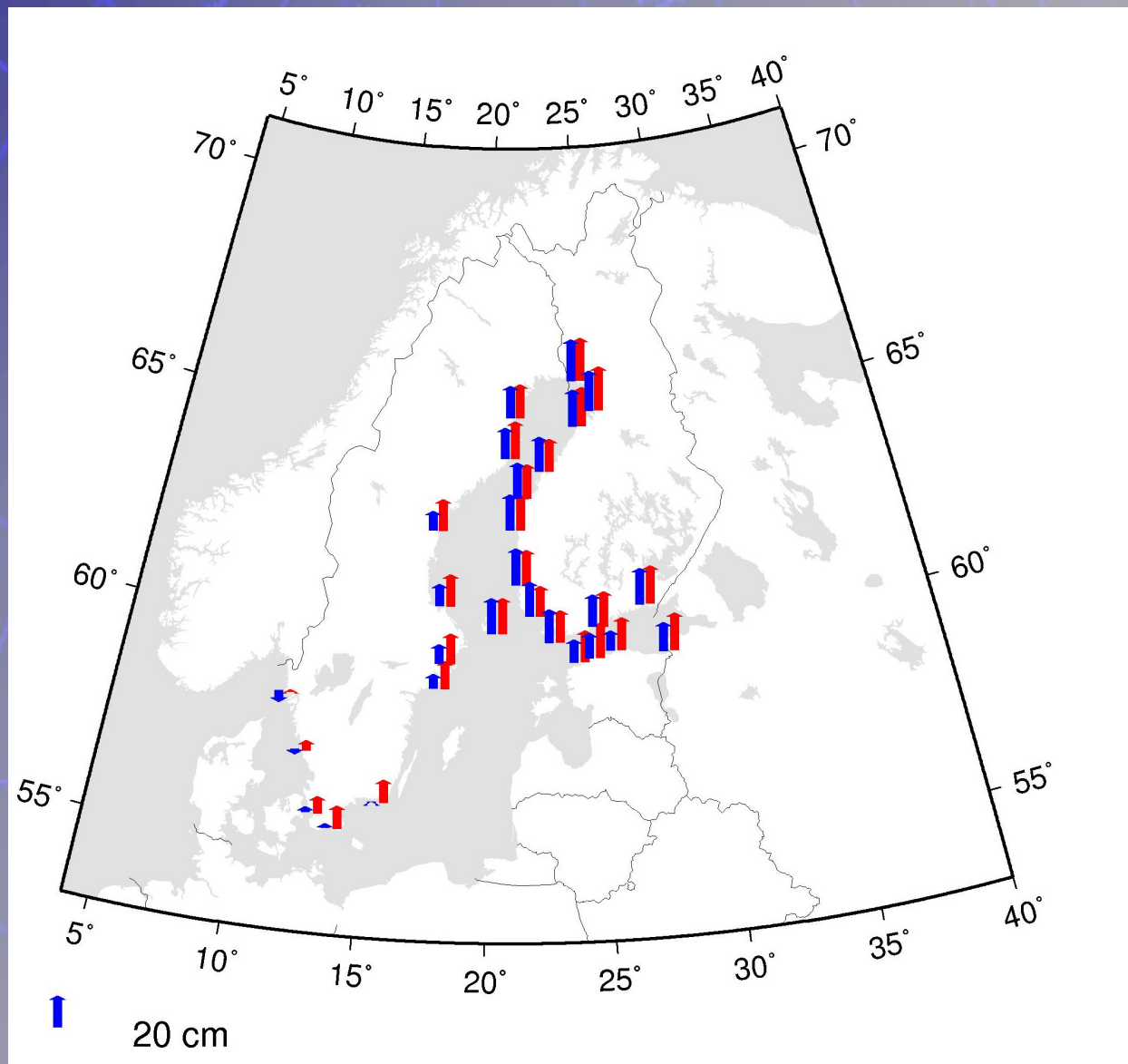
Salinity in the Baltic (down to the halocline)



1 color zone = 1 ‰

1 ‰ \approx 1 cm SST

Modified from
Atlas of Finland
(1986)



Baltic SST
from
EVRF2000
(blue)
and
BLR2000
(red)