NKG2005LU Revisited

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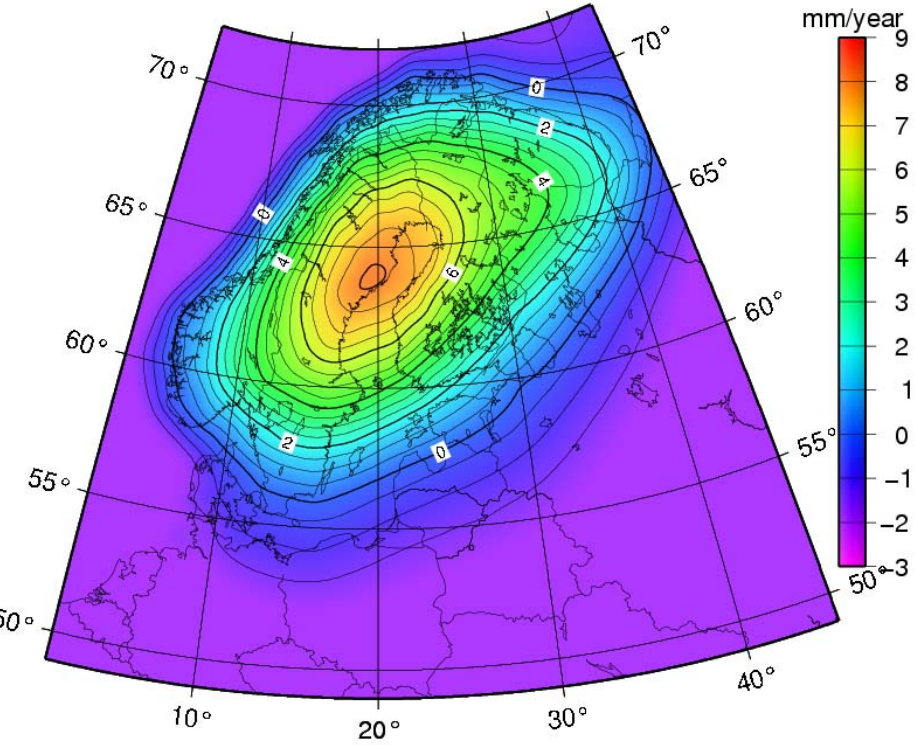
LANTMÄTERIET

NKG2005LU

Apparent uplift:



- The ”official” NKG land uplift model computed by the Working Group for height determination.
- Used to compute the Baltic Levelling Ring (BLR) and the latest European height system realisation EVRF2007.
- A combination of GNSS, tide gauge and repeated levelling observations (Vestøl 2005) with the geophysical model of Lambeck et al. (1998)
- Absolute uplift = (Apparent uplift + 1.32 mm/year)·1.06
- The **purpose** of this talk is to evaluate NKG2005LU using the latest BIFROST velocities of Martin Lidberg and the new GIA model of Milne.

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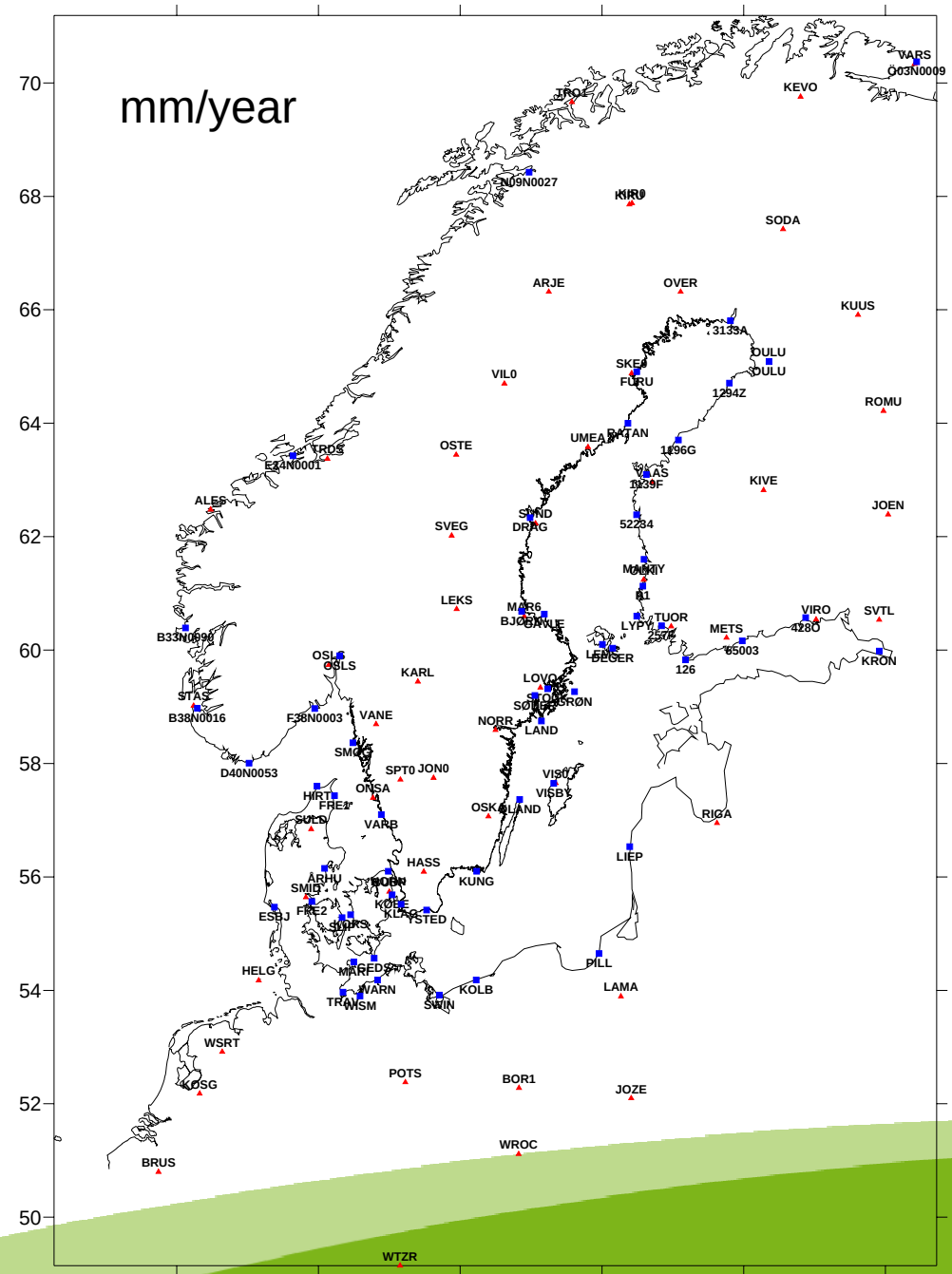

GNSS-stations and tide gauges used to compute NKG2005LU

- Absolute land uplift from Lidberg's Licentiate thesis (2004); see also Lidberg et al. (2007).
  - BIFROST
  - Ca 1996-2004
  - GAMIT
  - ITRF 2000
- Apparent land uplift from tide gauges for the time span 1892-1991 from Ekman (1998).

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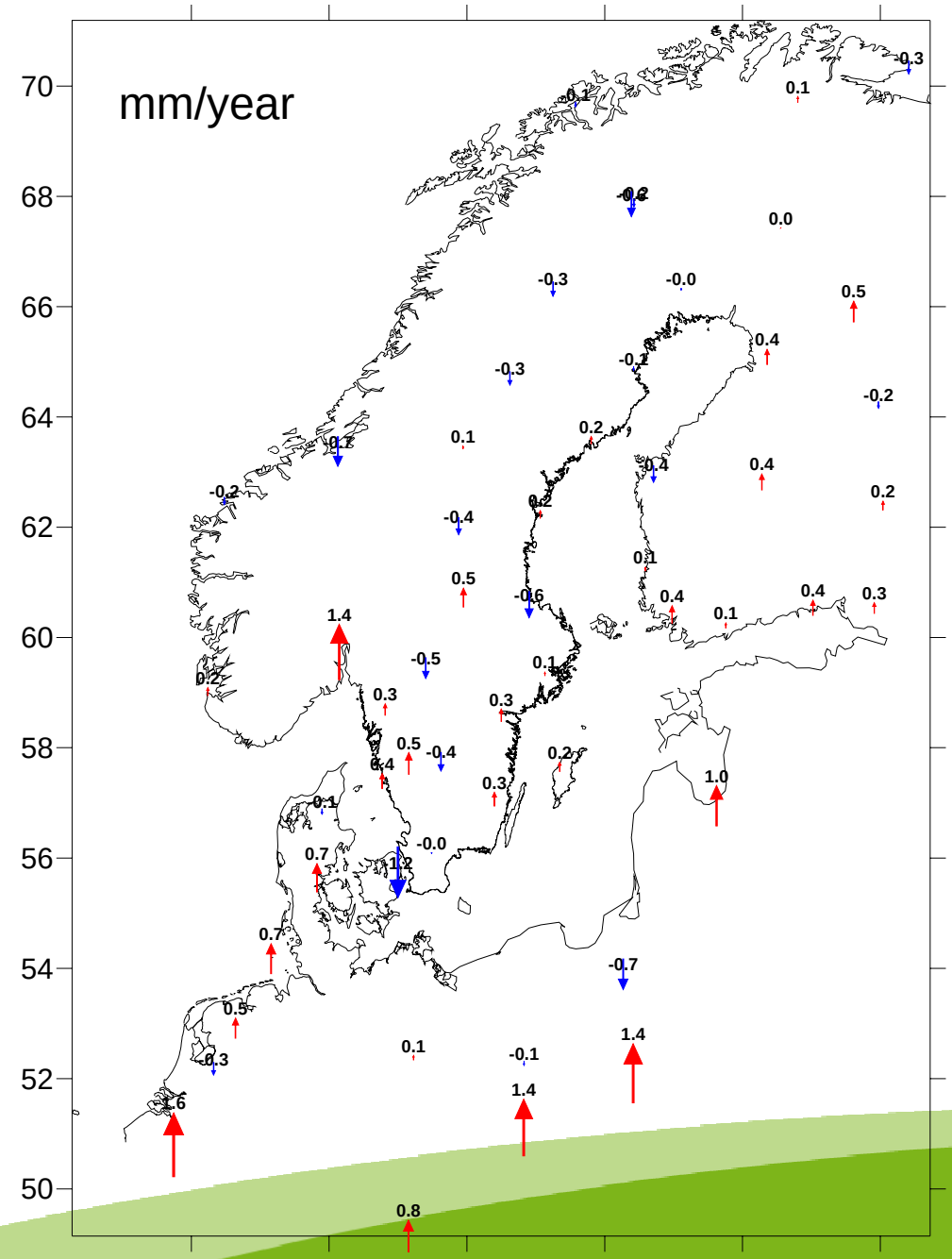
GNSS residuals for NKG2005LU



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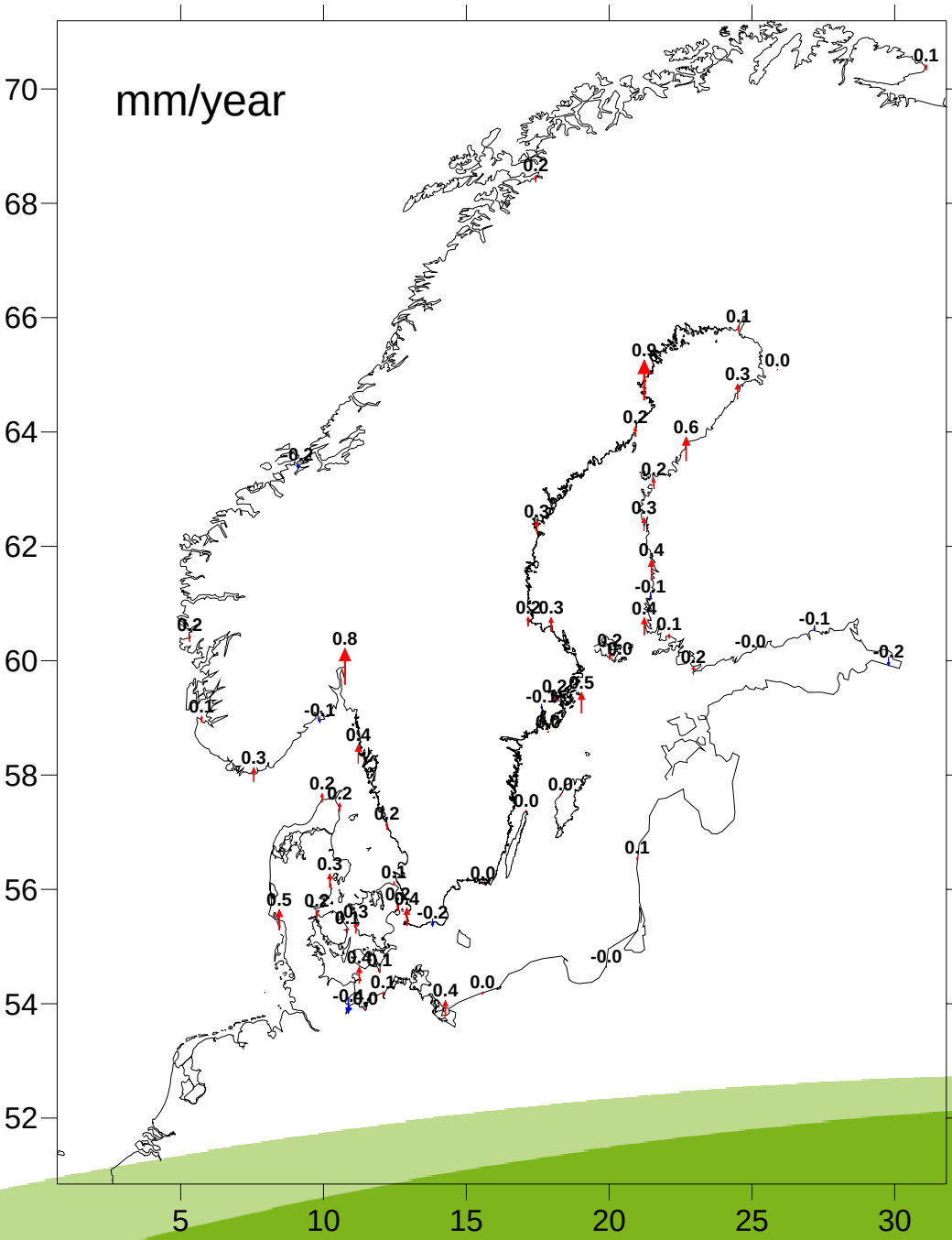
Tide gauge residuals for NKG2005LU



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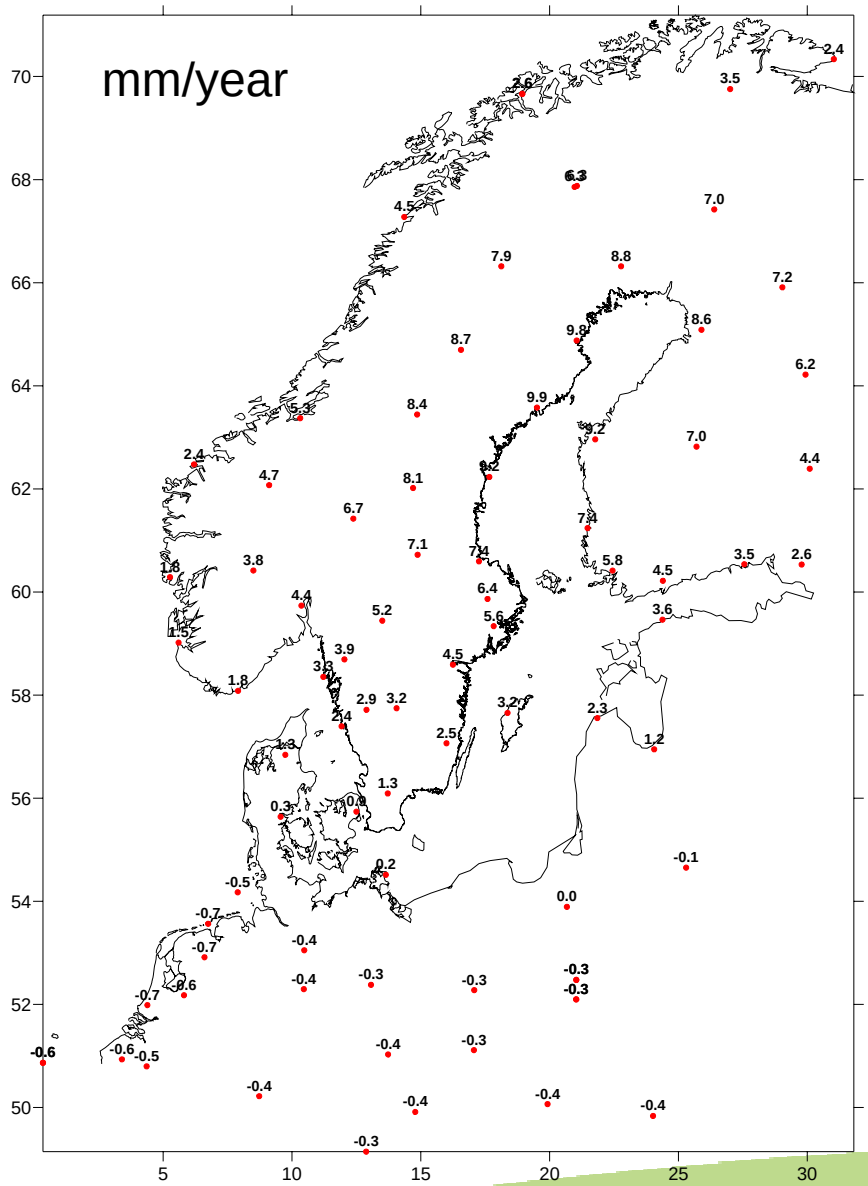

New GIA model (Milne 2008)

- An updated version of Milne et al. (2001) derived using Lidberg's Licentiate velocities.
- 120 km lithosphere, $5 \cdot 10^{20}$ Pa s upper mantle viscosity, $5 \cdot 10^{21}$ Pa s lower mantle and Ice model of Lambeck et al. (1998)
- The model is so far only available to us as point values at the GNSS-stations.

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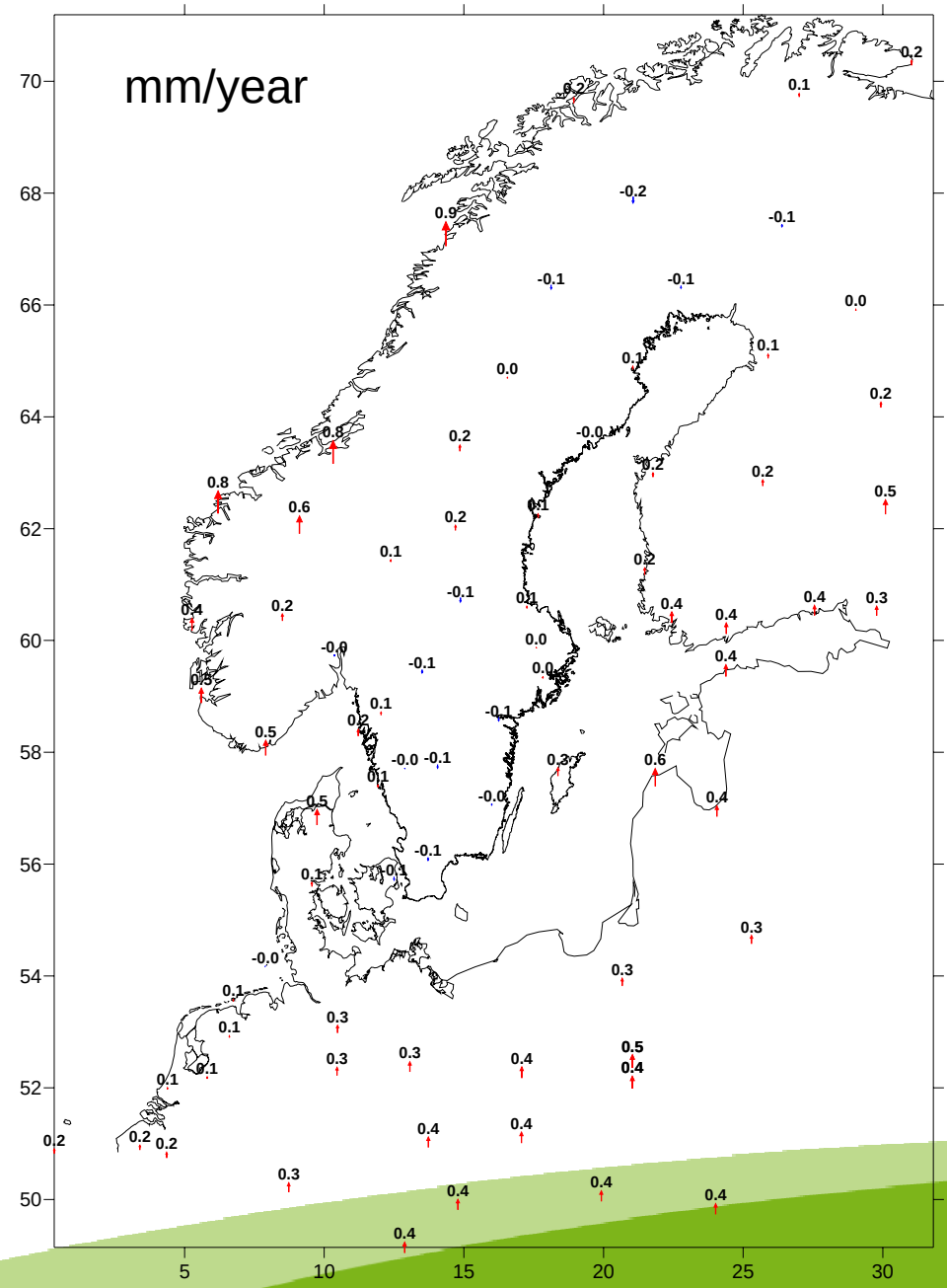

Difference between the new GIA model and NKG2005LU

- Negligible differences in Sweden and northern Finland.
  - The same GNSS-velocities has been utilised for both models.
  - Tide gauges used for NKG2005LU and for Lambeck's ice model (?)
  - The degree of smoothing applied for NKG2005LU seems reasonable
- Larger differences along the Norwegian coast and to the south-east.
- Overall the differences are fairly small.

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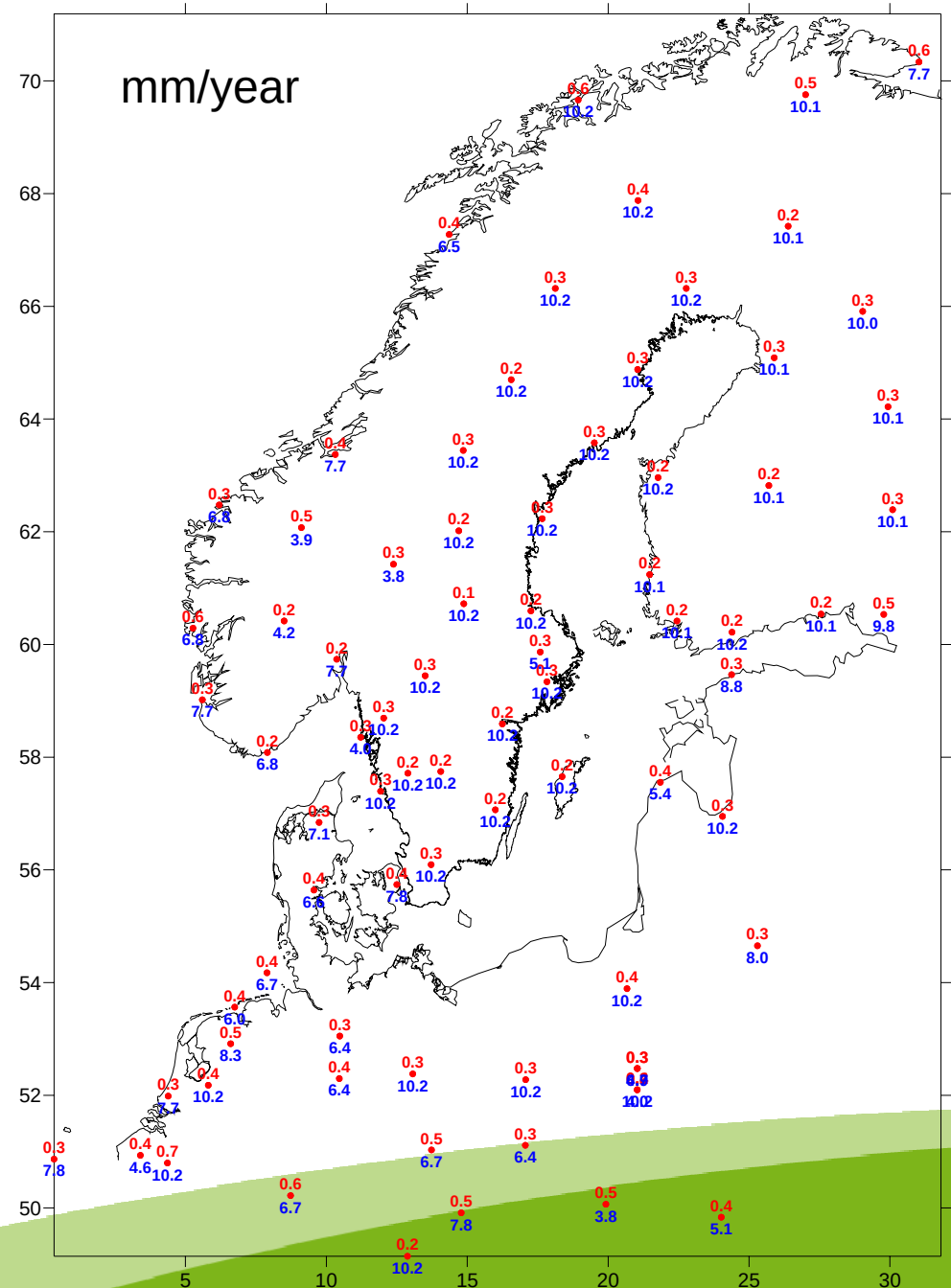

Lidberg's PhD velocities (2008)

- BIFROST
- Reanalysis of all data up to November 2006.
- GAMIT
- ITRF 2005
- "Realistic" standard error/years of observation plotted above/below the station.

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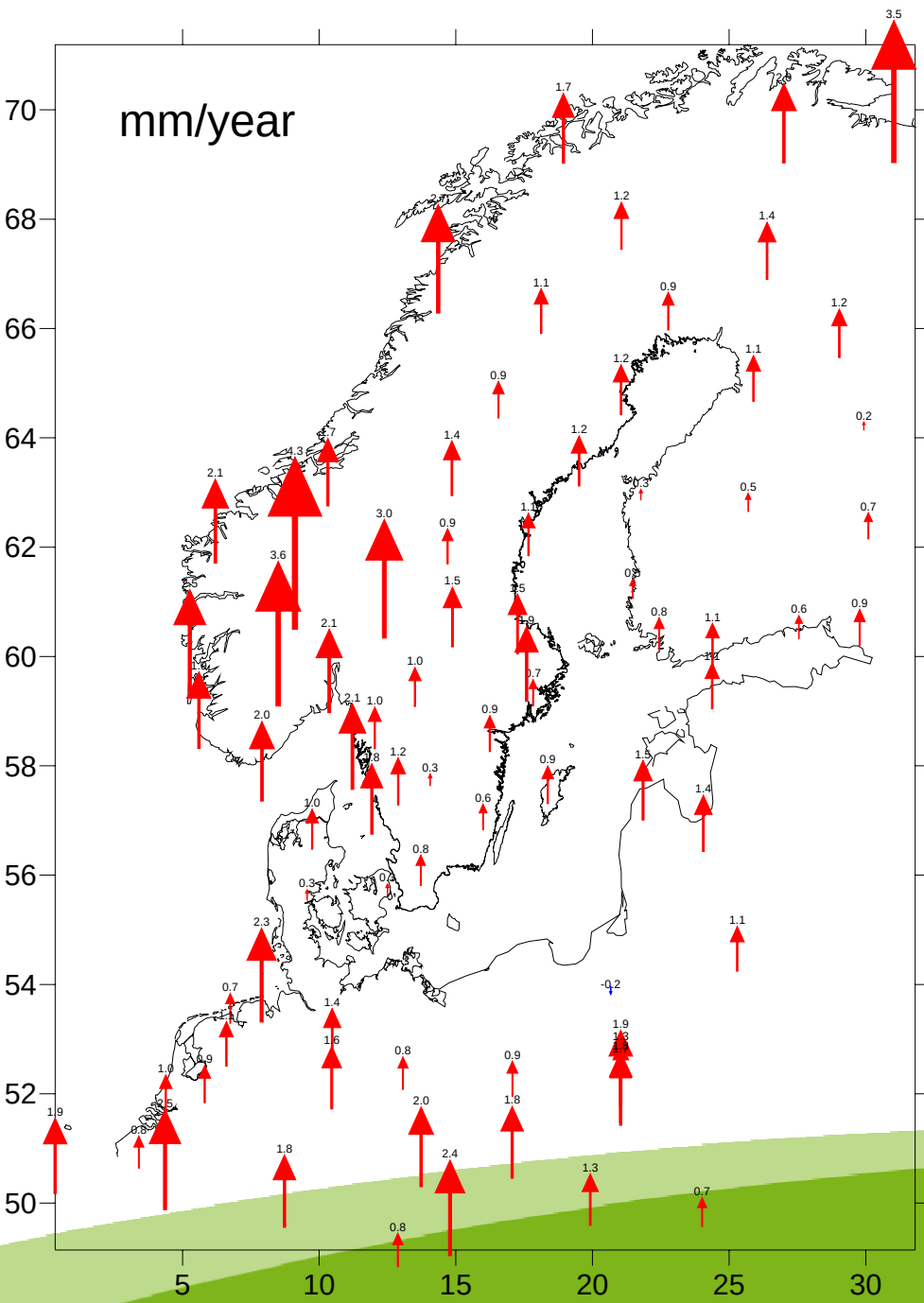

Difference between Lidberg's PhD velocities and NKG2005LU

- Velocities in ITRF 2005 differ significantly from those in ITRF 2000 due to mass center fixing problems.

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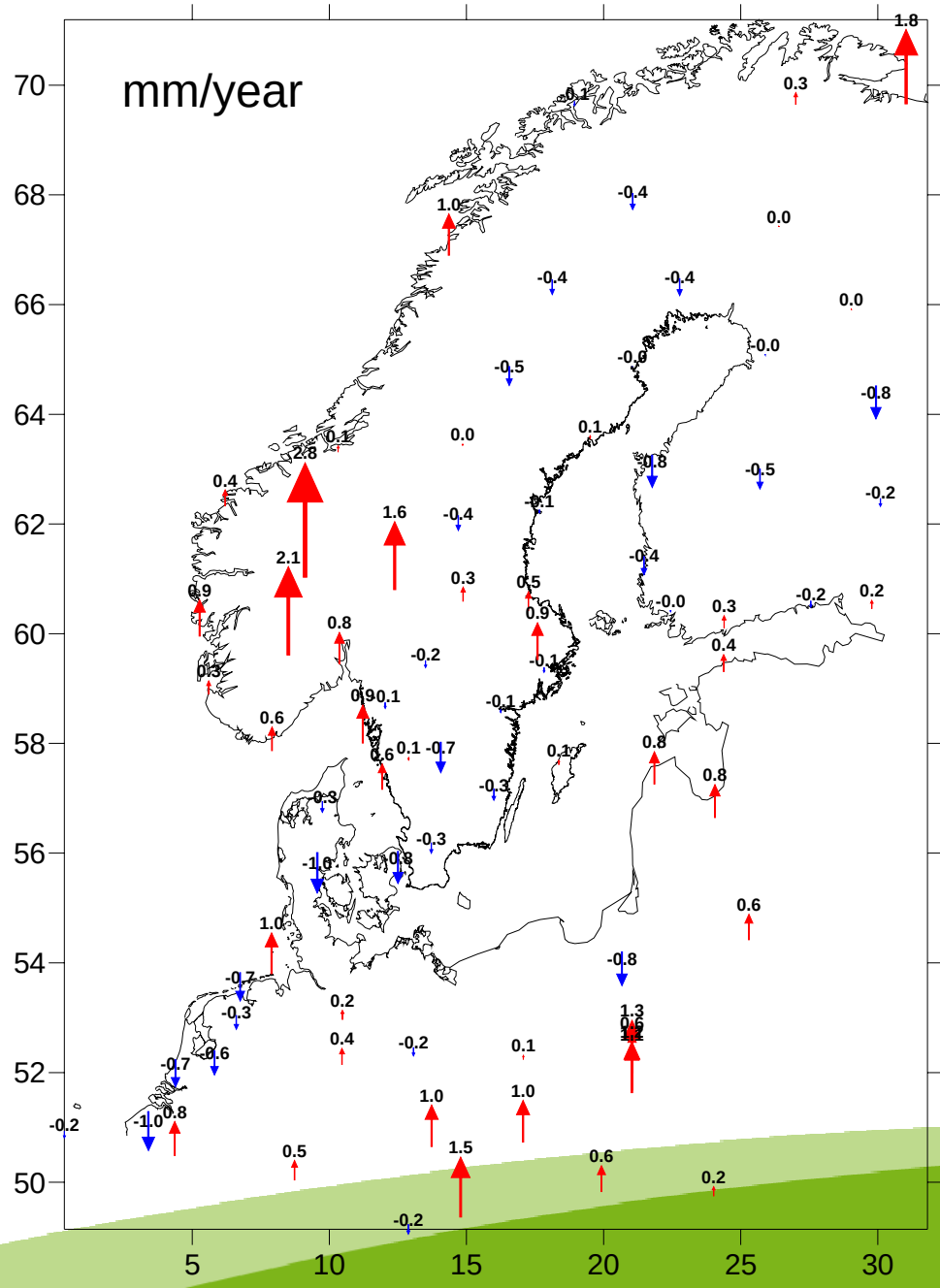

Difference between Lidberg's PhD velocities after 4-par. transformation and NKG2005LU

- 4-parameter fit/transformation to the new GIA model using all the stations to the left.
- The "banana shape" tend to make the velocity for new stations with short observation lengths too high.
- Reasonable agreement on average with a few exceptions.
- Exceptions:
  - Southern Norway (Short obs. length)
  - The forebulge area to the south
  - Barents Sea

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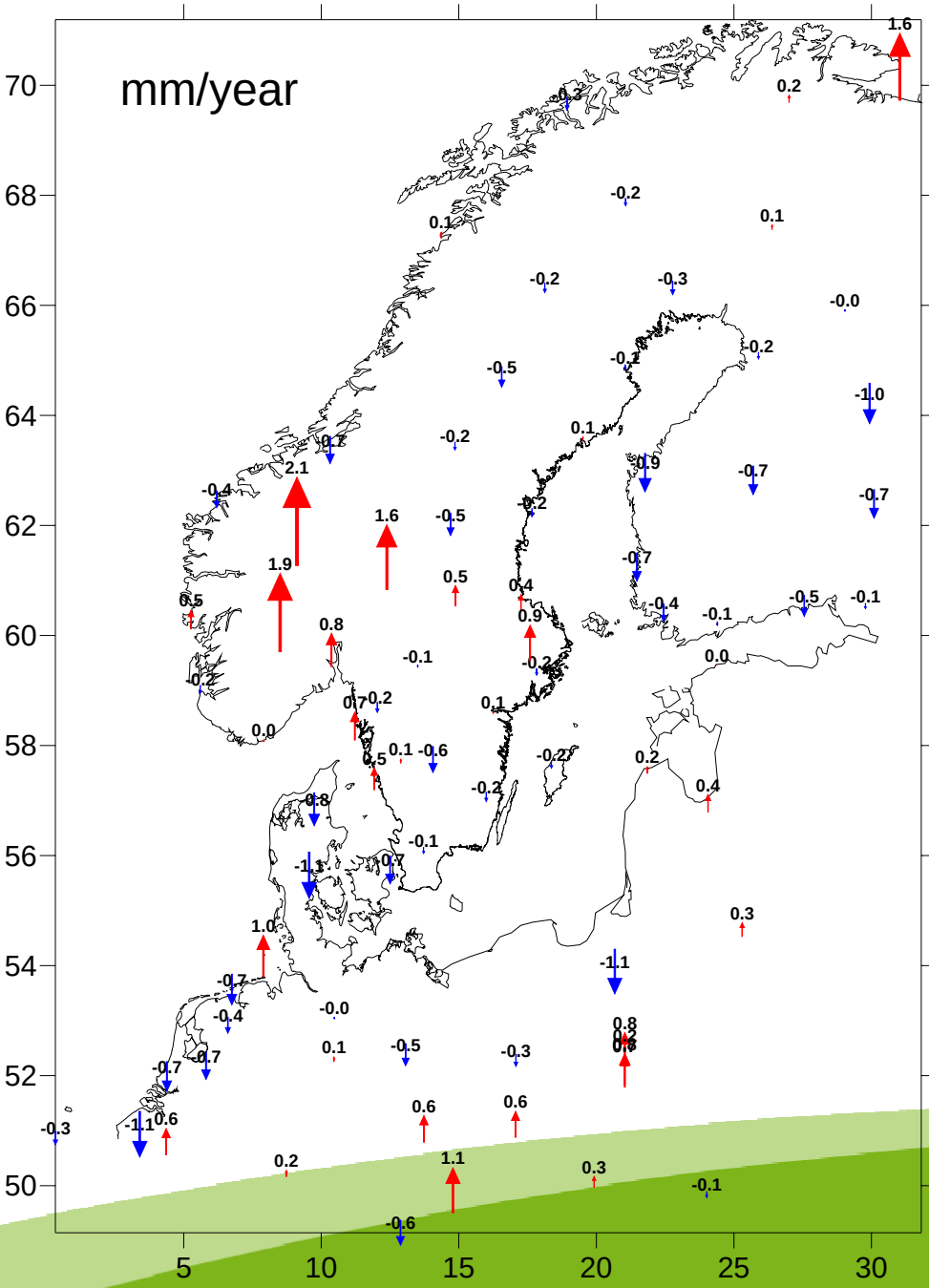

Difference between Lidberg's PhD velocities after 4-par. transformation and the new GIA model

- 4-parameter fit/transformation to the new GIA model using all the stations to the left.
- Similar results compared to NKG2005LU. (Notice that the fit has been made with respect to the GIA model in both cases.)

Conclusions

- The Nordic land uplift model NKG2005LU agrees reasonably well with the new GNSS velocities and GIA model.
- The deviating observations in southern Norway could indicate problems for NKG2005LU (and for the GIA model), but the time series in question are still much too short to say anything with certainty.
- We have not yet understood all aspects of GNSS velocity estimation, most notably the “banana shape” and reference frame problems need clarification; cf. next talk by Martin.
- There should thus be no immediate hurry to compute a new Nordic NKG model.
- Personally, I think we should wait until we have a geophysical GIA model that is a considerably improvement and until the above GNSS problems are well understood.
- This model should be based on all the available observation types (GNSS, tide gauges, AG, levelling?,…). Etc.

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