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# Convergence of ITRF parameters
# and
# Impact of aligning ETRS89 to ITRF2014

EUREF 2017

# Presentation

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## Motivation

- lack of theoretical knowledge
- need for more information
- neutral input for ETRF2014 discussion

## Topics

- convergence of ITRFs
- impact of proposed ETRS89 realisations

# Part 1

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## Convergence of ITRF parameters

Plot transformation parameters between past ITRFs and ITRF2014

source: http://itrf.ensg.ign.fr/doc_ITRF/Transfo-ITRF2014_ITRFs.txt

# ITRF parameters

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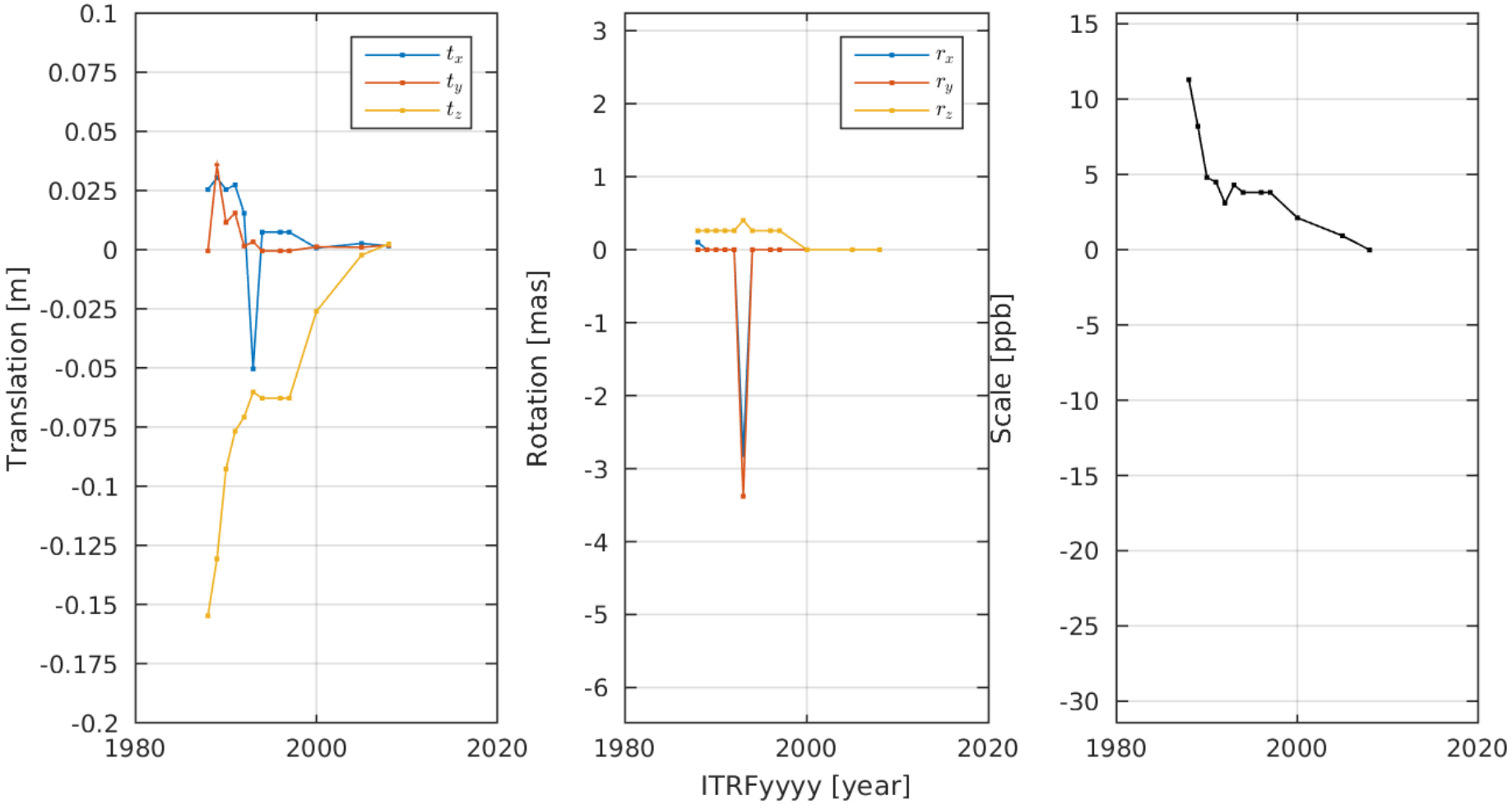

# ITRF parameter rates

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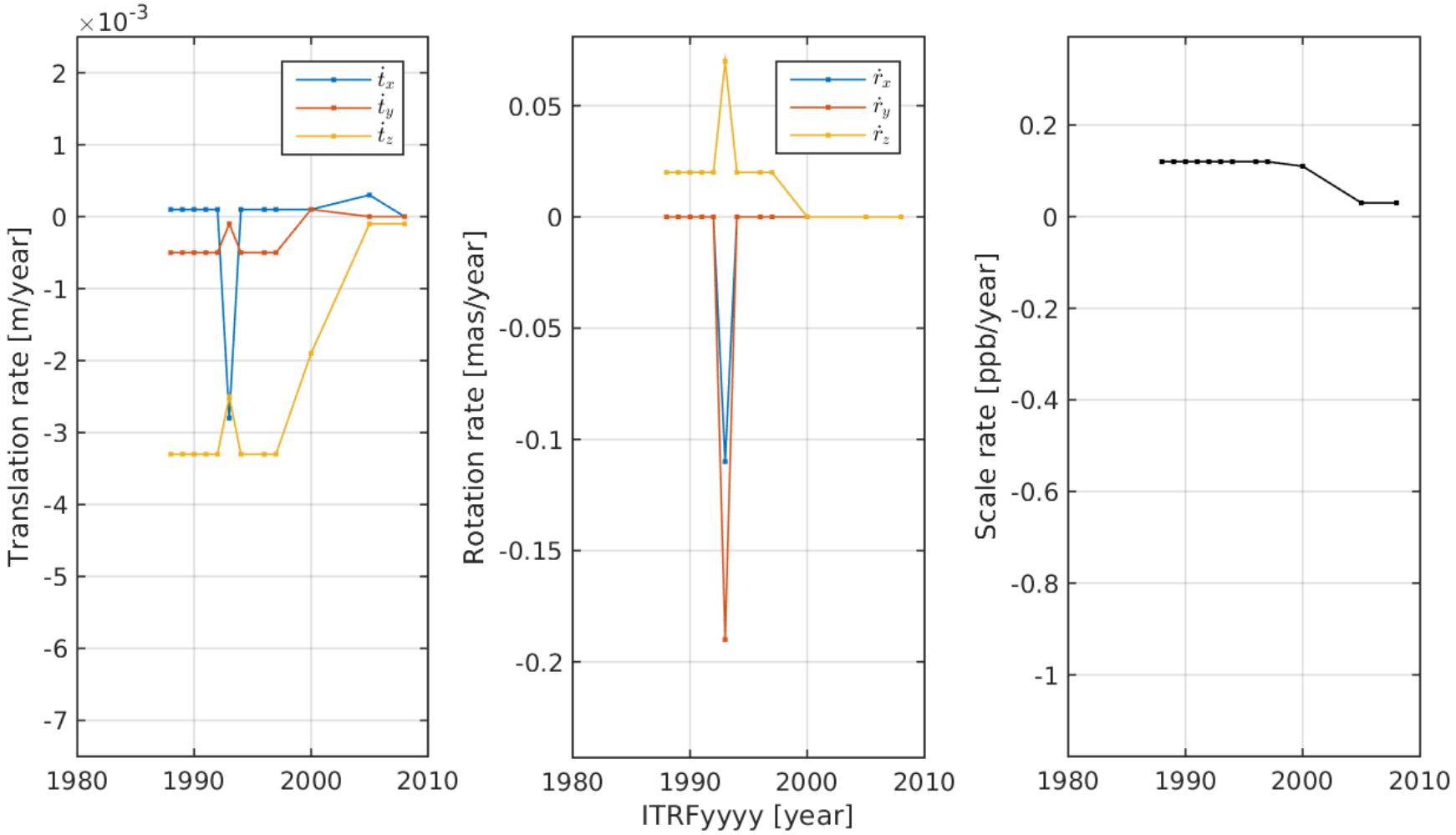

# Conclusion



## Transformation parameters

differences 2005, 2008 and 2014: < 1 cm

## Transformation parameter rates

differences 2005, 2008 and 2014: < 1 mm/y

# Part 2

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## Impact of proposed ETRS89 realisations

Plot the differences of:

ITRF2014 grid => ETRF2014**P**

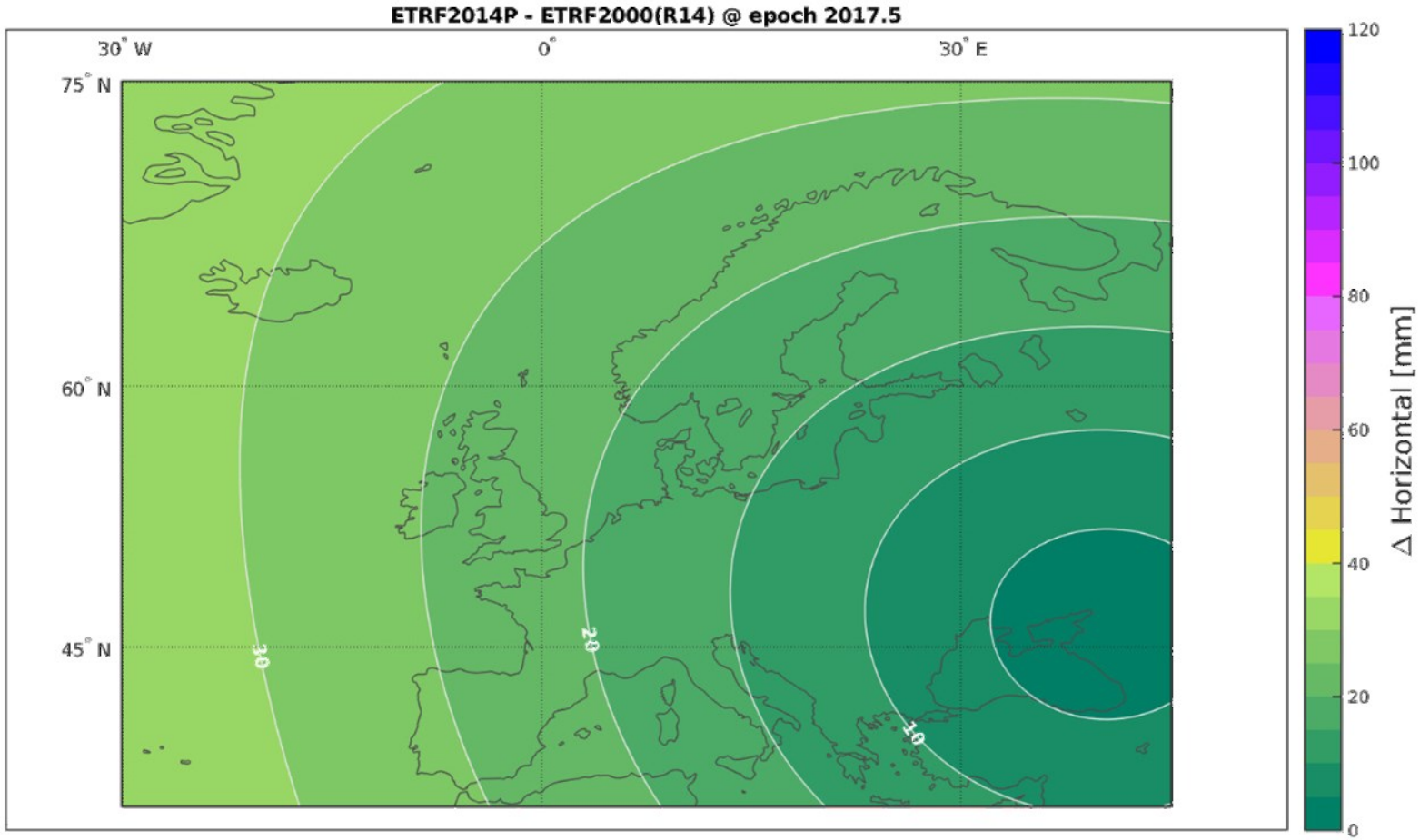
and

ITRF2014 grid => ETRF2014**P-G**

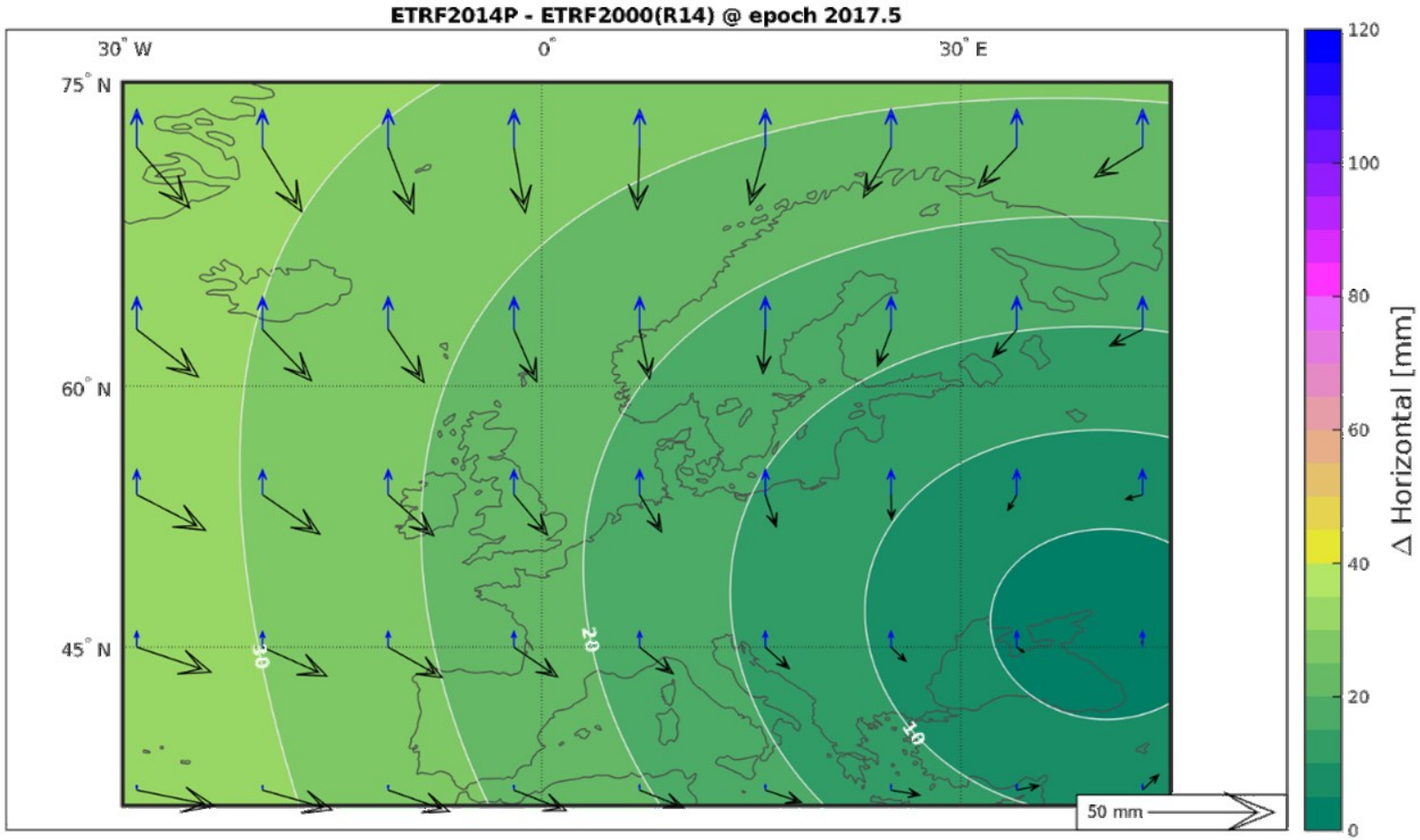
compared with:

ITRF2014 grid => ETRF**2000**(Ryy)

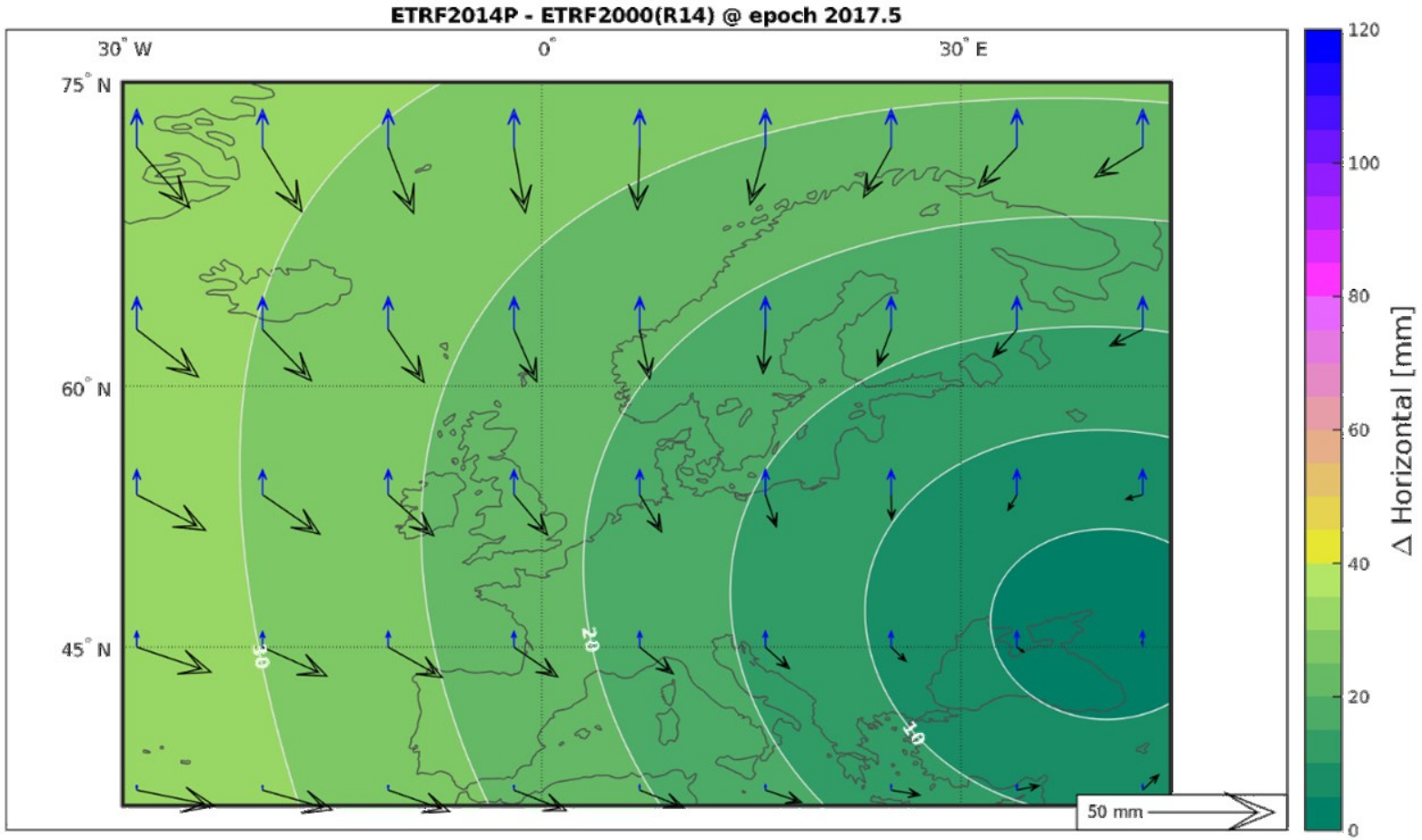
| Frame (epoch 2000.0) | $t_x$ mm | $t_y$ mm | $t_z$ mm | $s$ ppb | $r_x$ mas | $r_y$ mas | $r_z$ mas | $\dot{t}_x$ mm/yr | $\dot{t}_y$ mm/yr | $\dot{t}_z$ mm/yr | $\dot{s}$ ppb/yr | $\dot{r}_x$ mas/yr | $\dot{r}_y$ mas/yr | $\dot{r}_z$ mas/yr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ETRF2000(R14) | 53.7 | 51.2 | -55.1 | 1.02 | 0.891 | 5.390 | -8.712 | 0.1 | 0.1 | -1.9 | 0.11 | 0.081 | 0.490 | -0.792 |
| ETRF2014P | 55.3 | 53.1 | -52.7 | 0.00 | 0.968 | 5.852 | -8.349 | 0.0 | 0.0 | 0.0 | 0.00 | 0.088 | 0.532 | -0.759 |
| ETRF2014P-G | 0.0 | 0.0 | 0.0 | 0.00 | 0.968 | 5.852 | -8.349 | 0.0 | 0.0 | 0.0 | 0.00 | 0.088 | 0.532 | -0.759 |


ETRF2014P - ETRF2000(R14) @ epoch 2017.5
30° W
0°
30° E
75° N
60° N
45° N
10
20
30
Δ Horizontal [mm]
120
100
80
60
40
20
0

# ETRF2014**P** difference



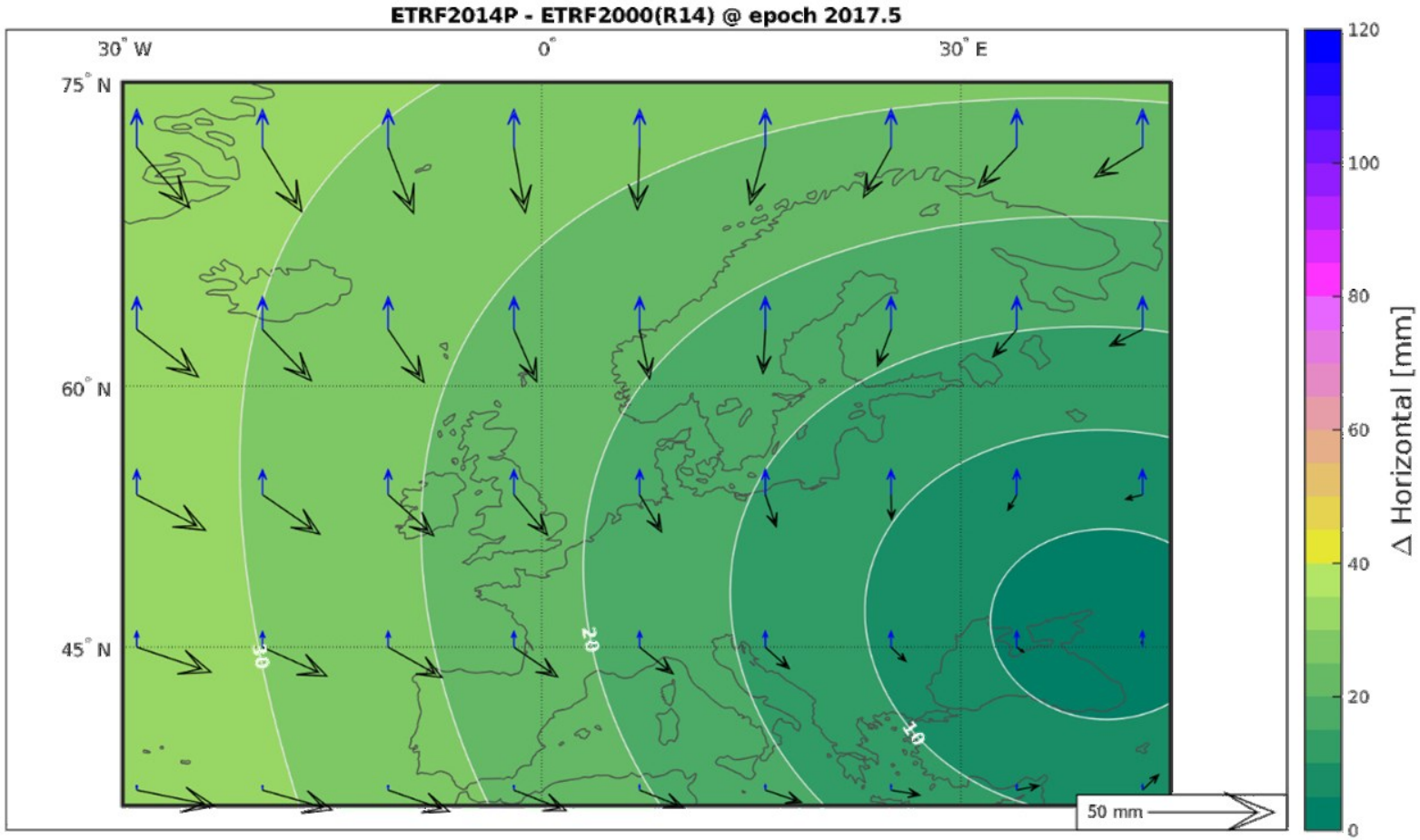
# ETRF2014**P** difference



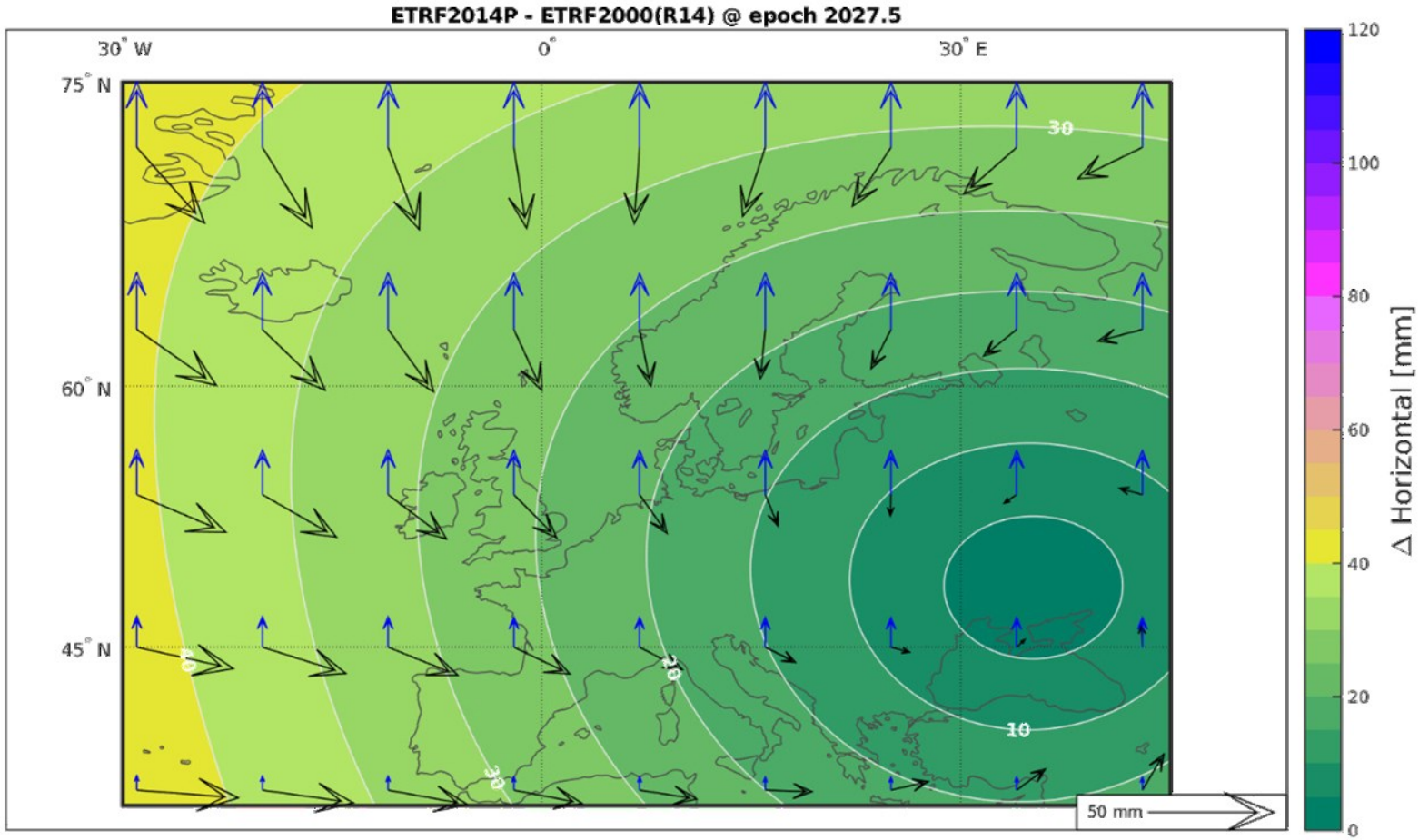

Absolute: 7 mm Romania – 27 mm Portugal

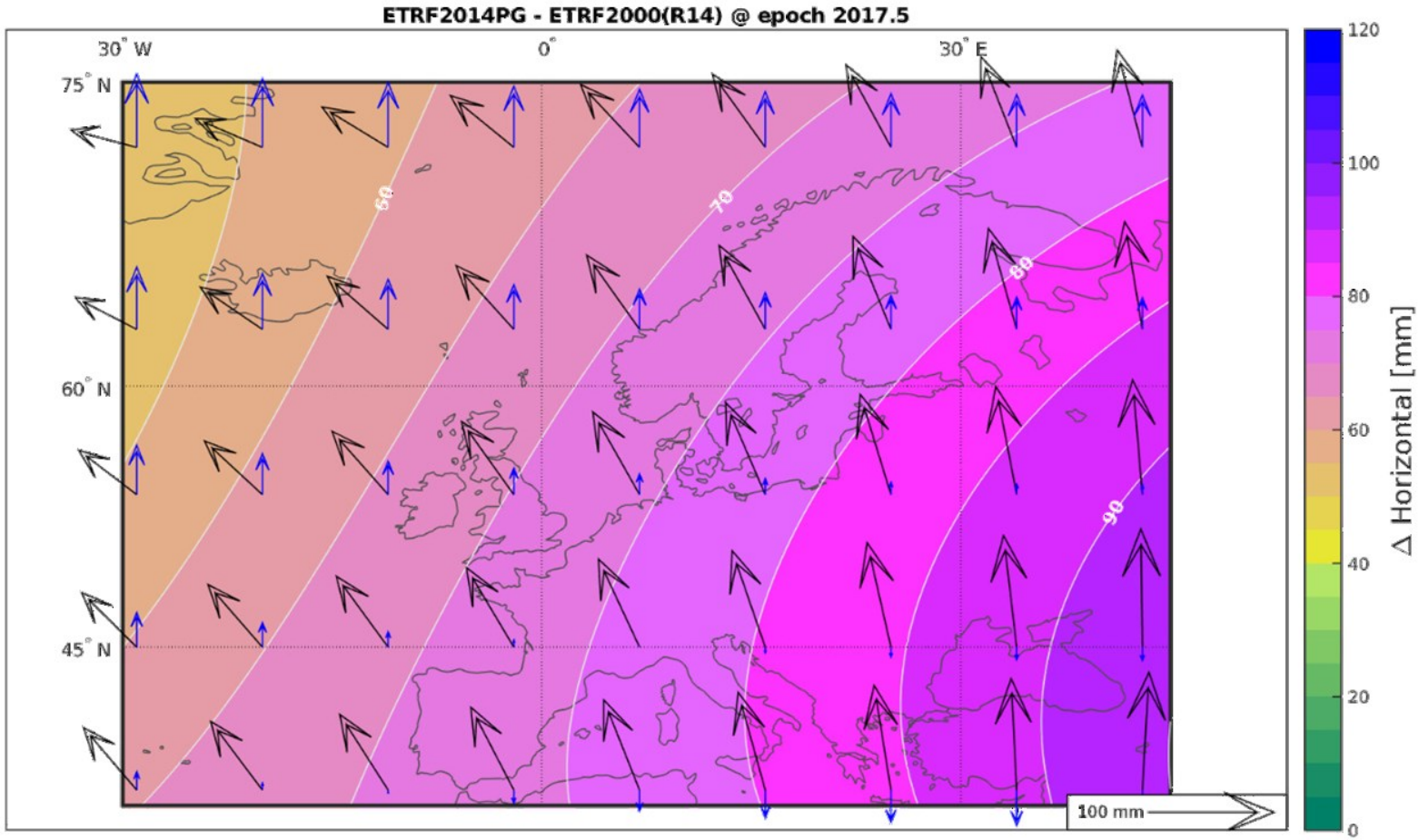
0 mm Russia – 31 mm Iceland

# ETRF2014**P** difference

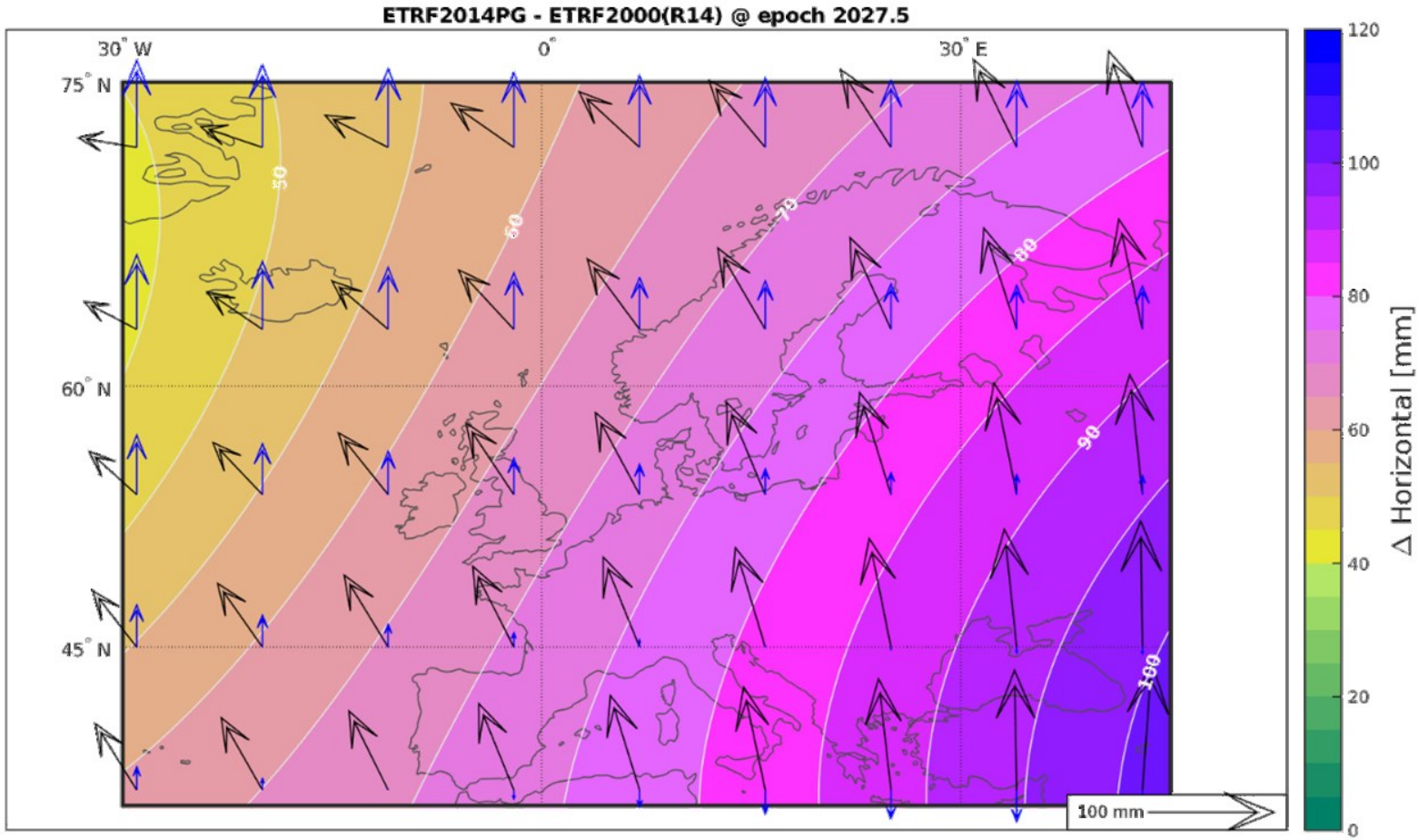


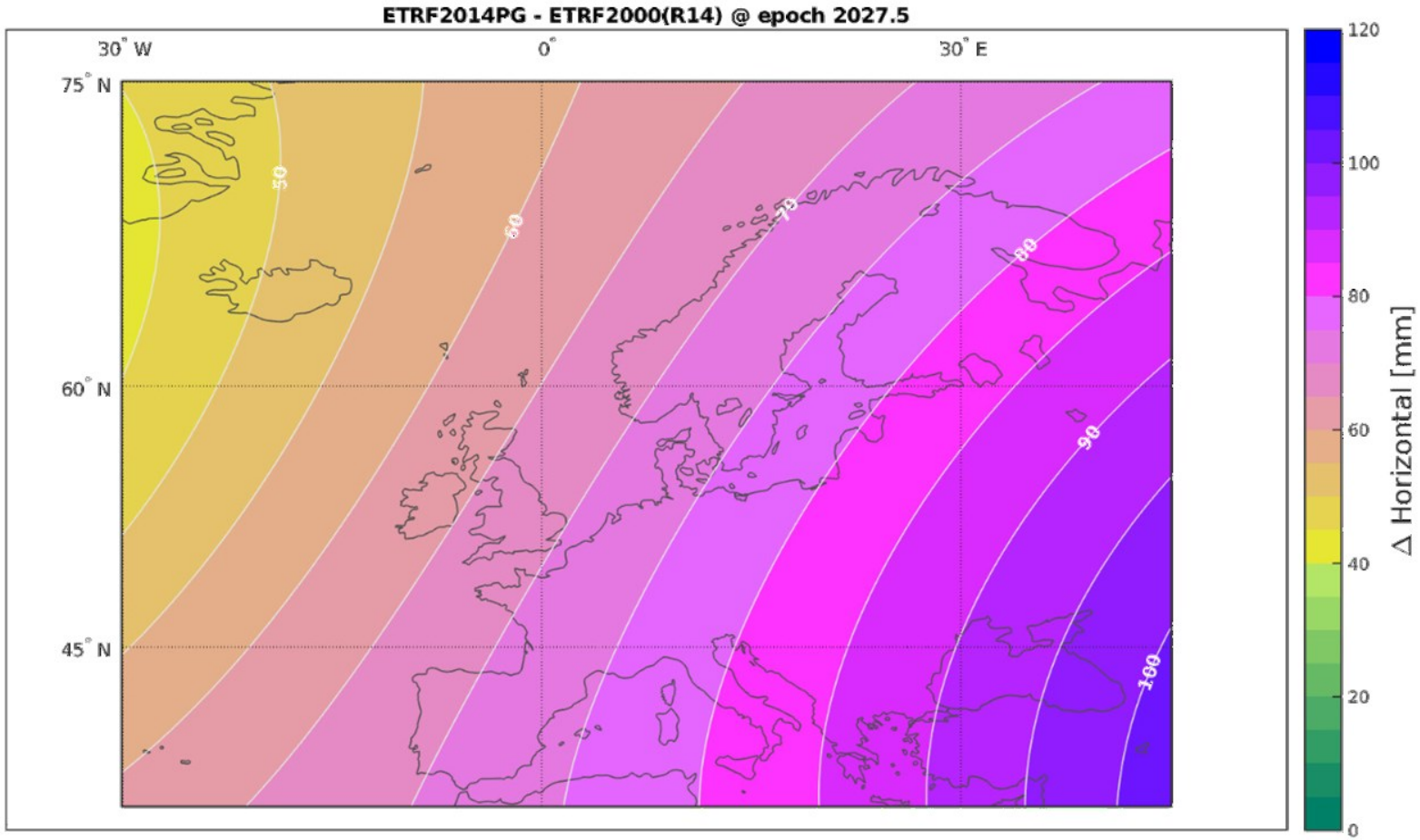

Relative max.: 35 mm Portugal – North Cape

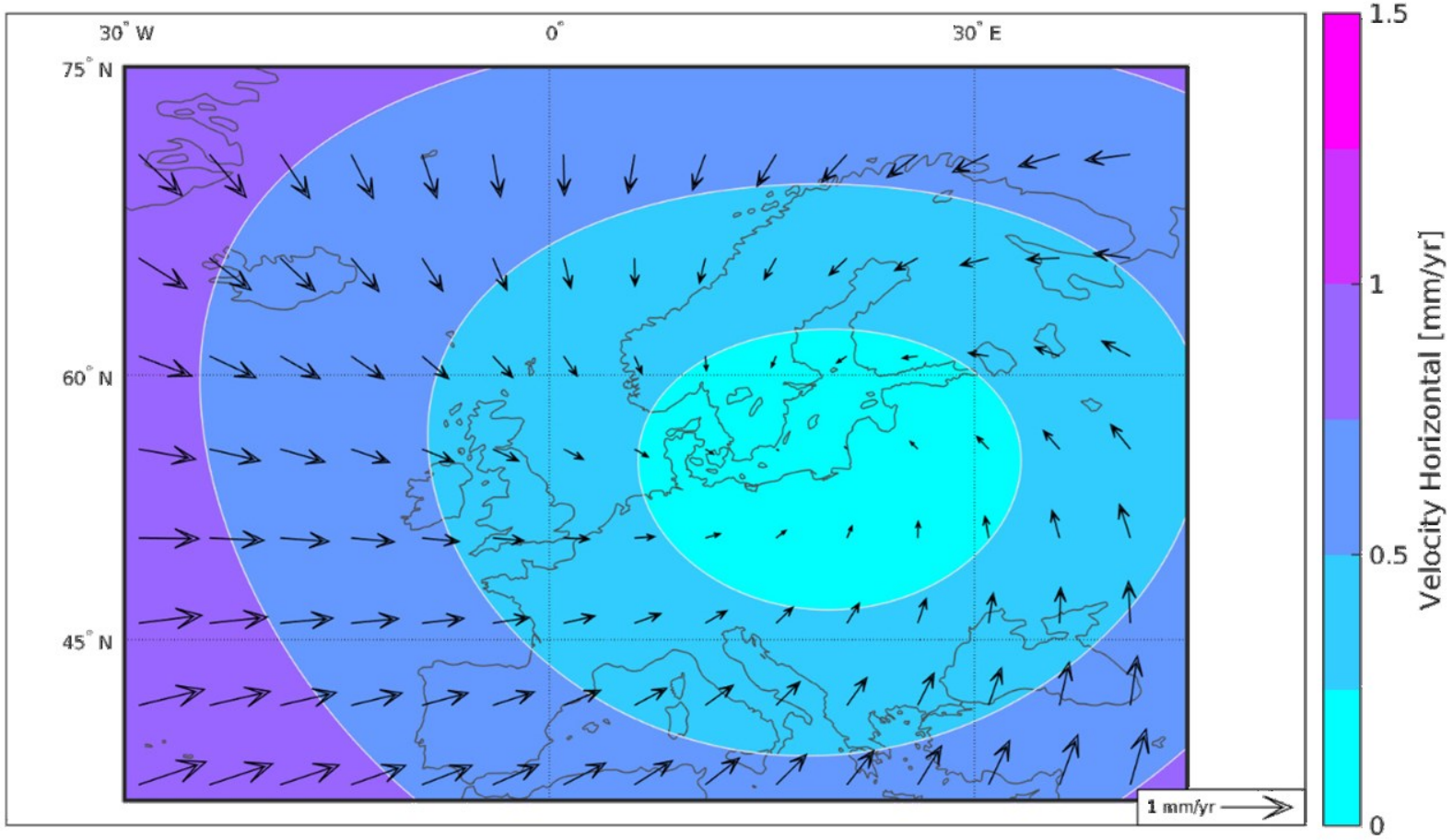

ETRF2014P - ETRF2000(R14) @ epoch 2027.5
30° W
0°
30° E
75° N
60° N
45° N
30
20
10
50 mm
120
100
80
60
40
20
0
Δ Horizontal [mm]



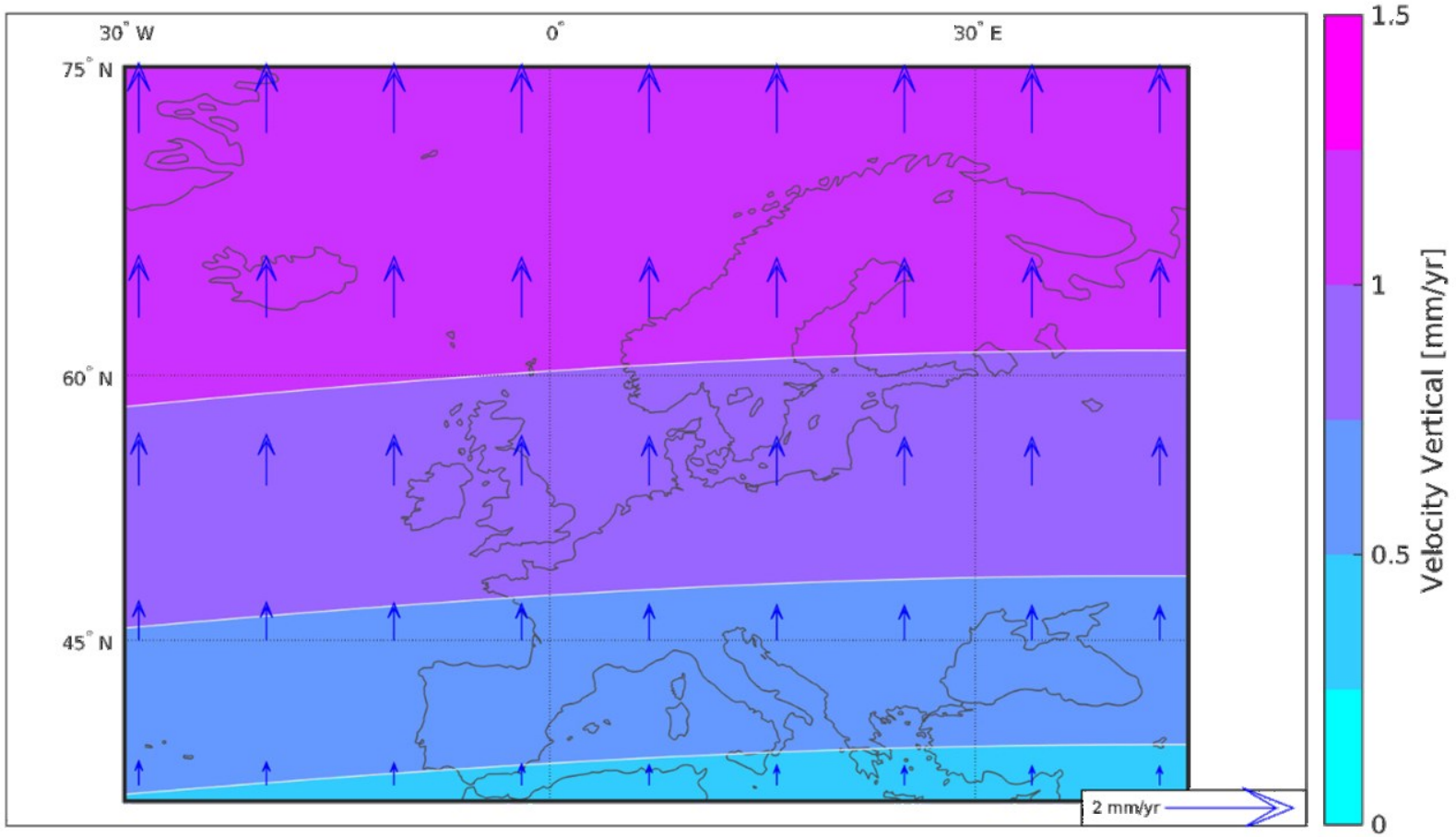

absolute: 73 mm Ireland – 87 mm Romania


ETRF2014PG - ETRF2000(R14) @ epoch 2027.5
30° W
0°
30° E
75° N
60° N
45° N
50
60
70
80
90
100
100 mm
120
100
80
60
40
20
0
Δ Horizontal [mm]


ETRF2014PG - ETRF2000(R14) @ epoch 2027.5
30° W
0°
30° E
75° N
60° N
45° N
50
60
70
80
90
100
Δ Horizontal [mm]
120
100
80
60
40
20
0




horizontal velocity difference




vertical velocity difference

# Conclusion



ETRF2014**P**: up to 3 cm change

ETRF2014**P-G**: up to 9 cm change

Mostly growing over time!

# Discussion



- ITRF converged of temporarily stabilised?

- What applications benefit from adaptation?
- Could these use ITRF2014 instead?

- What applications need unchanging coordinates?
- What is the tolerance for these?

- What do we want for long term ETRS89:

  close to zero velocities?

  no large jumps (not even once)?

# Questions?

# Conclusion

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ETRF2014P @ 2017.5

- Absolute: 7 mm Romania – 27 mm Portugal
  0 mm Russia – 31 mm Iceland
- Relative: 35 mm Portugal – North Cape
  40 mm Iceland – Russia

ETRF2014P-G @ 2017.5

- Absolute: 73 mm Ireland – 87 mm Romania
  55 mm Iceland – 95 mm Russia
- Relative: 62 mm Ireland – Romania
  62 mm Iceland – Russia

# ETRF2014**P** & ETRF2014**P-G** velocity

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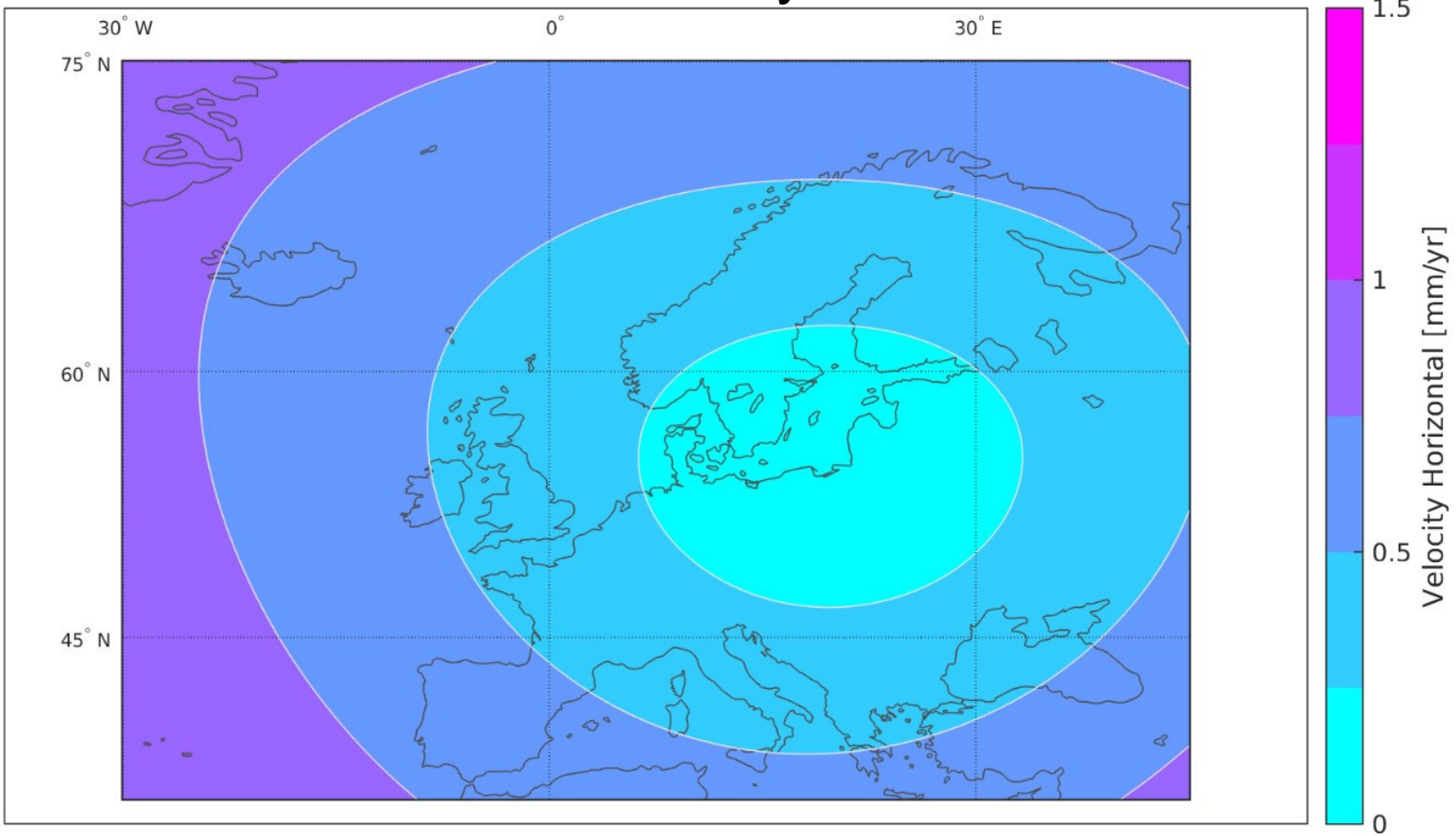
## horizontal velocity difference



# ETRF2014**P** & ETRF2014**P-G** velocity

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## vertical velocity difference