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**SSUGT**
Siberian State University of
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# VELOCITIES VALIDATION IN THE NEW RUSSIAN REFERENCE FRAME GSC-2011

FIG Working Week 2016

CHRISTCHURCH, NEW ZEALAND 2–6 MAY 2016

Recovery from disaster

TS05B - National Datum. Paper 8288

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# REFERENCE FRAME GSC-2011

- ✓ Introduced alongside with PZ-90.11
- ✓ Centimeter-level agreement with ITRF2008 at epoch 2011.0
- ✓ Based on GNSS observation campaign 2010-2011
- ✓ Kinematic: typical velocities of ground points 2-7 cm/year
- ✓ NUVEL-1A tectonic plate motion model was used in adjustment
- ✓ Physically represented by the State Geodetic Network (SGN)

# STRUCTURE OF THE STATE GEODETIC NETWORK

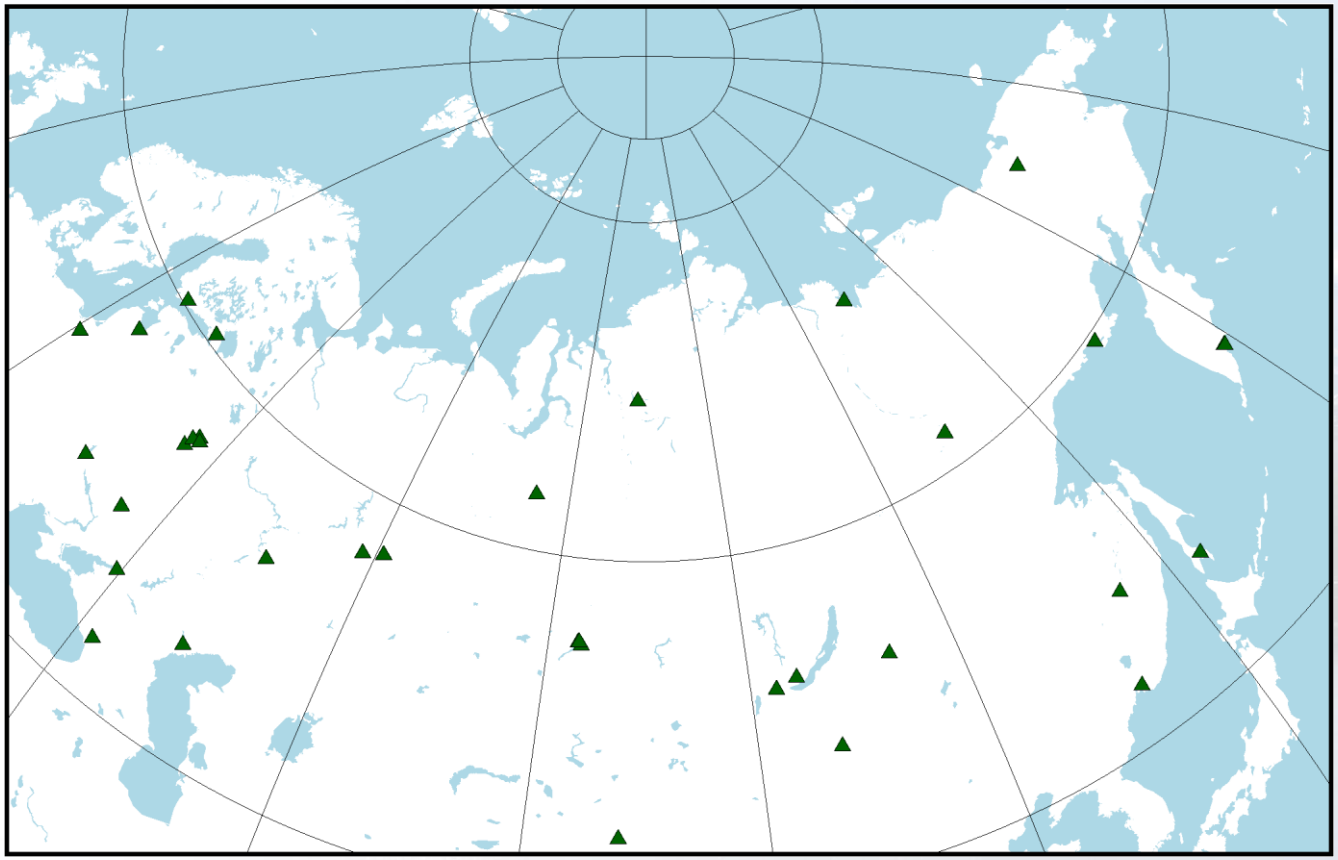
**State Geodetic Network**

- FAGS
- VGS
- SGS-1
- Old network 1-4 class

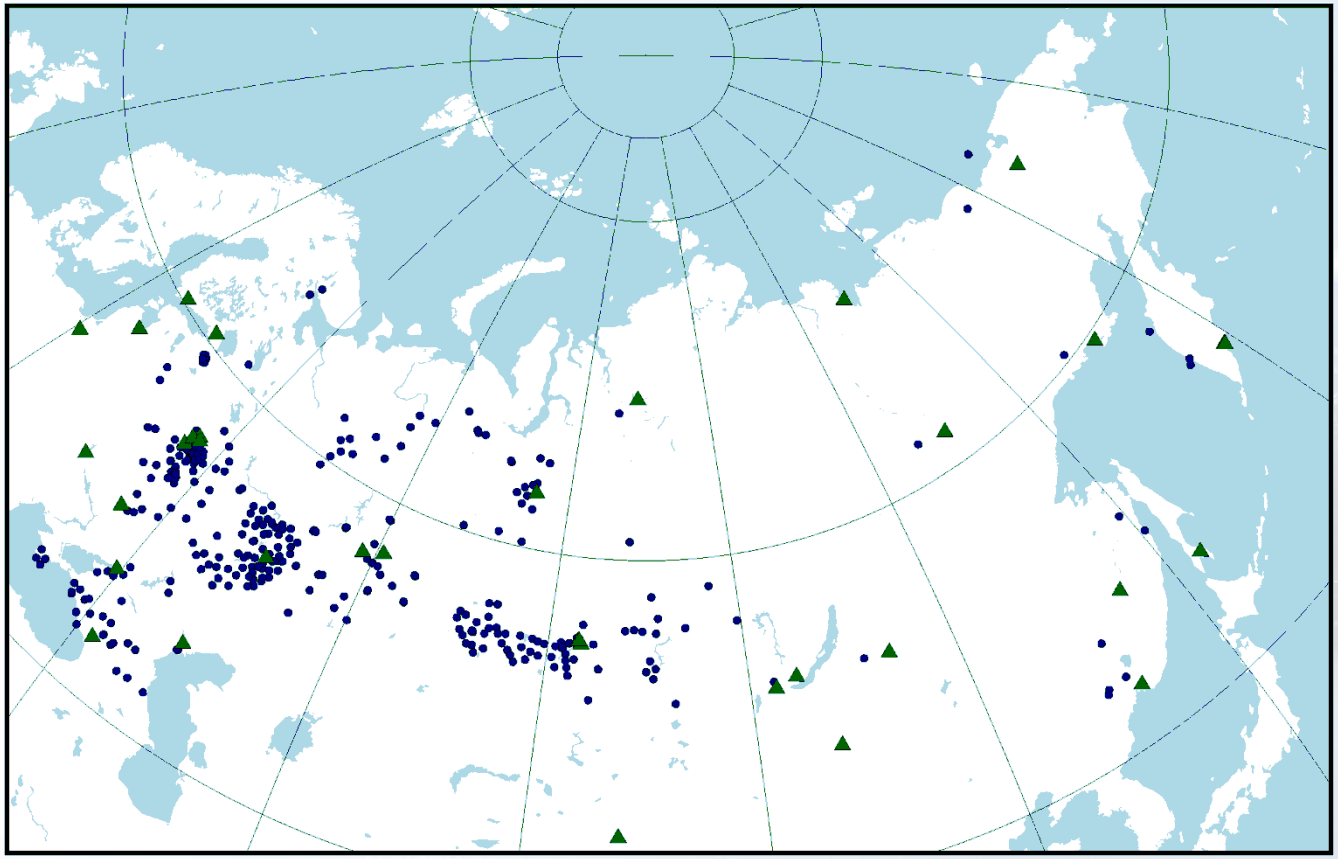
**46** Continuously Operating Reference Stations (**CORS**)
Only **33** GNSS stations to be available for civil users

Nearly **288 000 "passive" reference points** (landmarks, pillars)

# 1st LEVEL OF THE STATE GEODETIC NETWORK



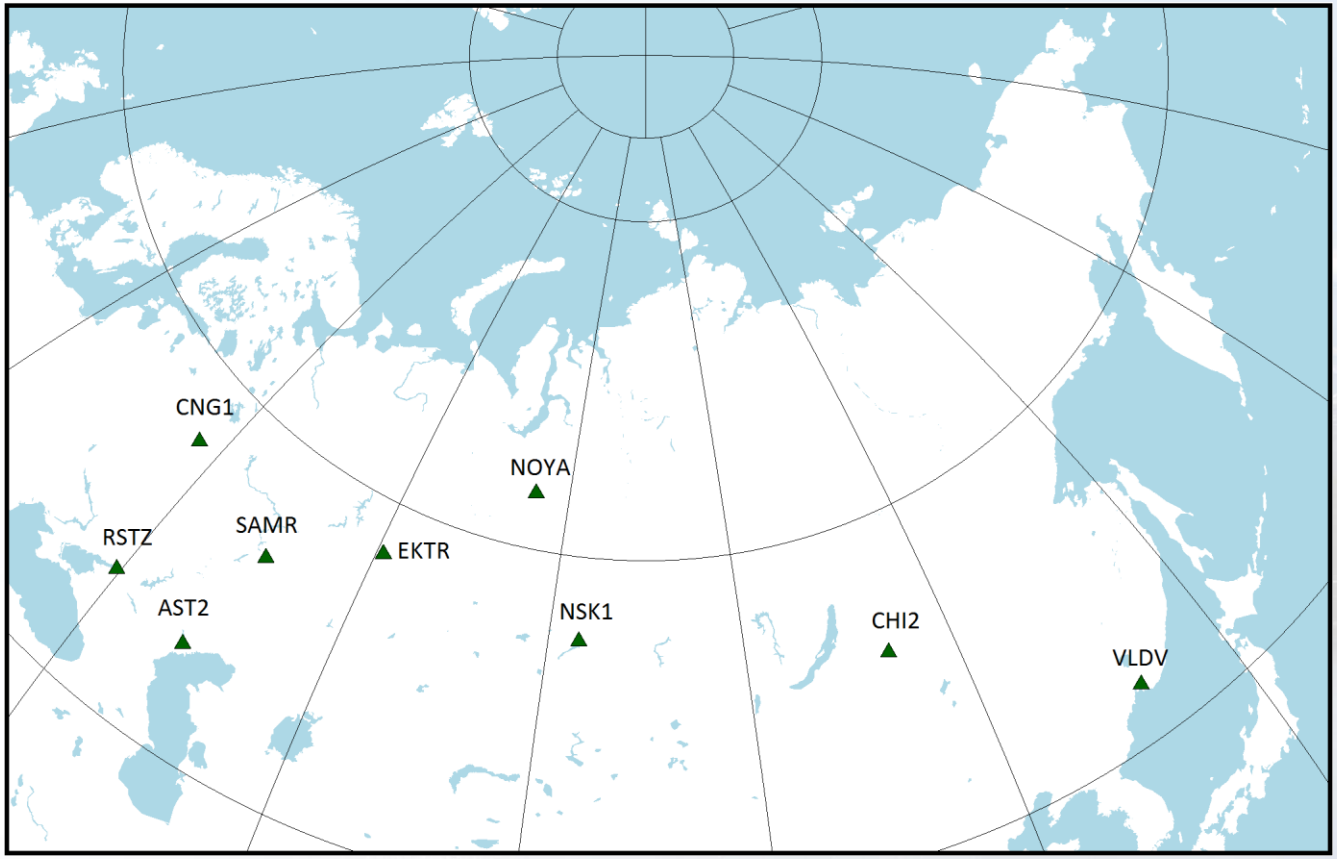
# CORS NETWORKS



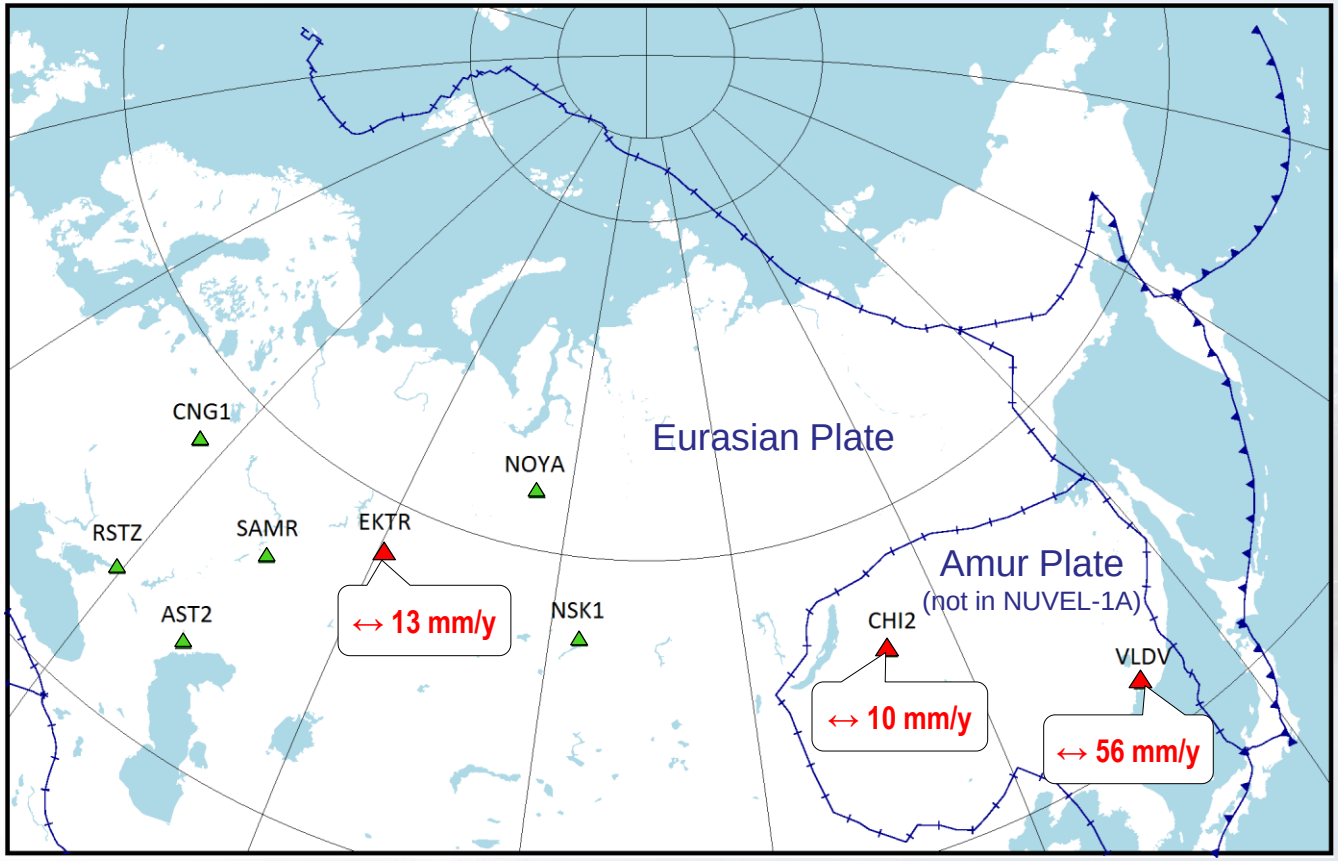
▲ CORS of the State Geodetic Network

● Regional CORS which belong to private organizations or local authorities

# INVESTIGATED REFERENCE POINTS



# HORIZONTAL VELOCITIES: GSC-2011 vs. ITRF2008



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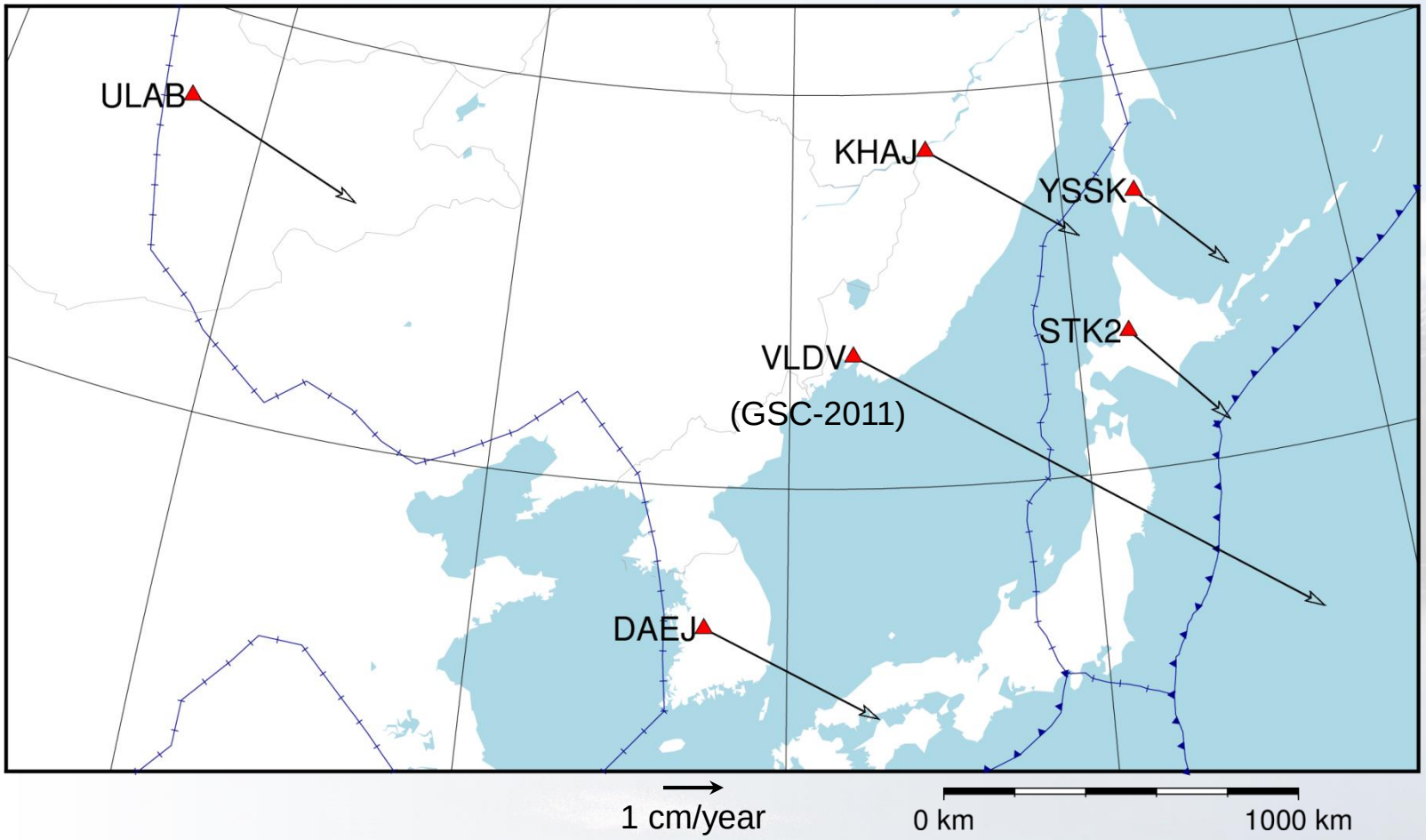
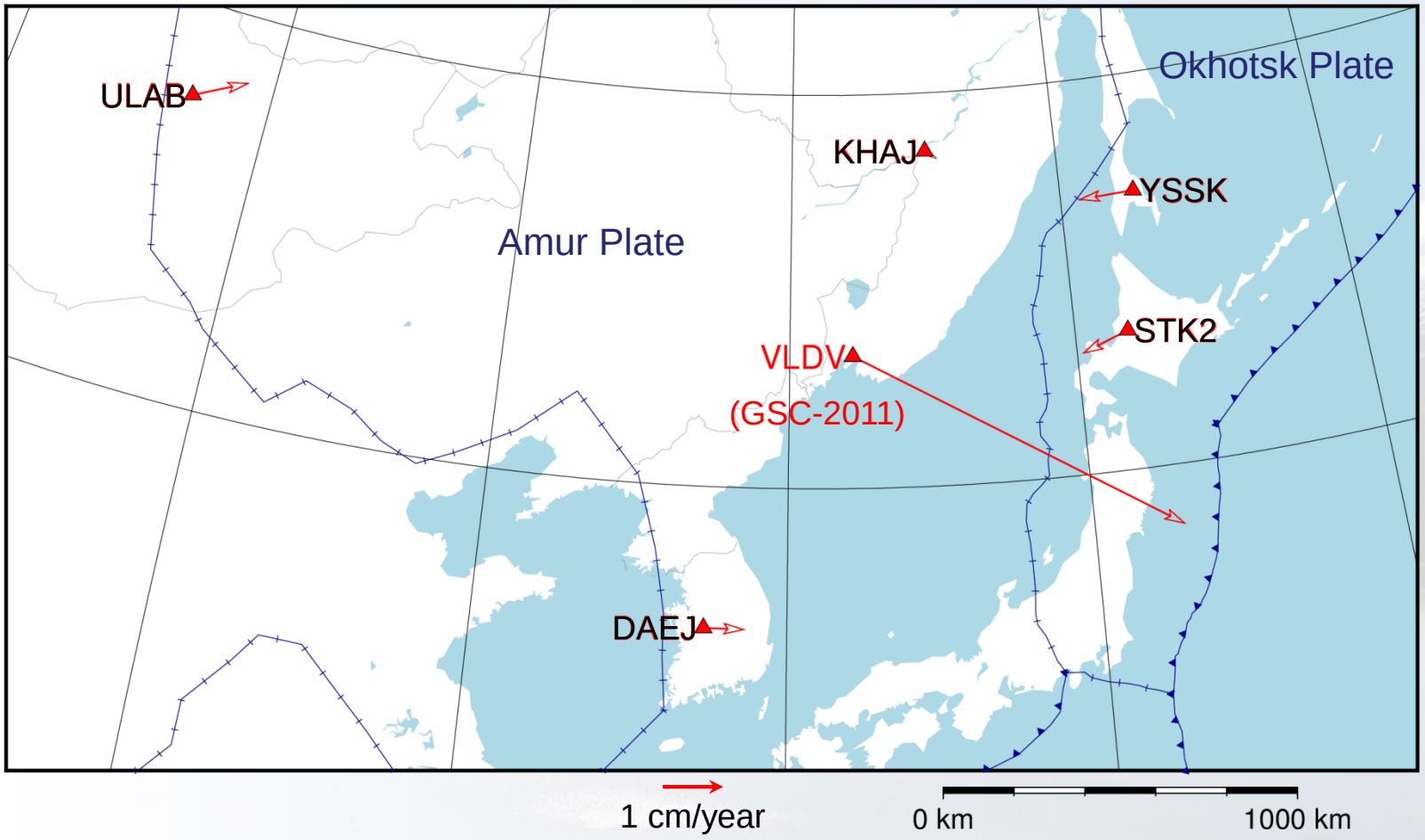


# RELATIVE HORIZONTAL VELOCITIES

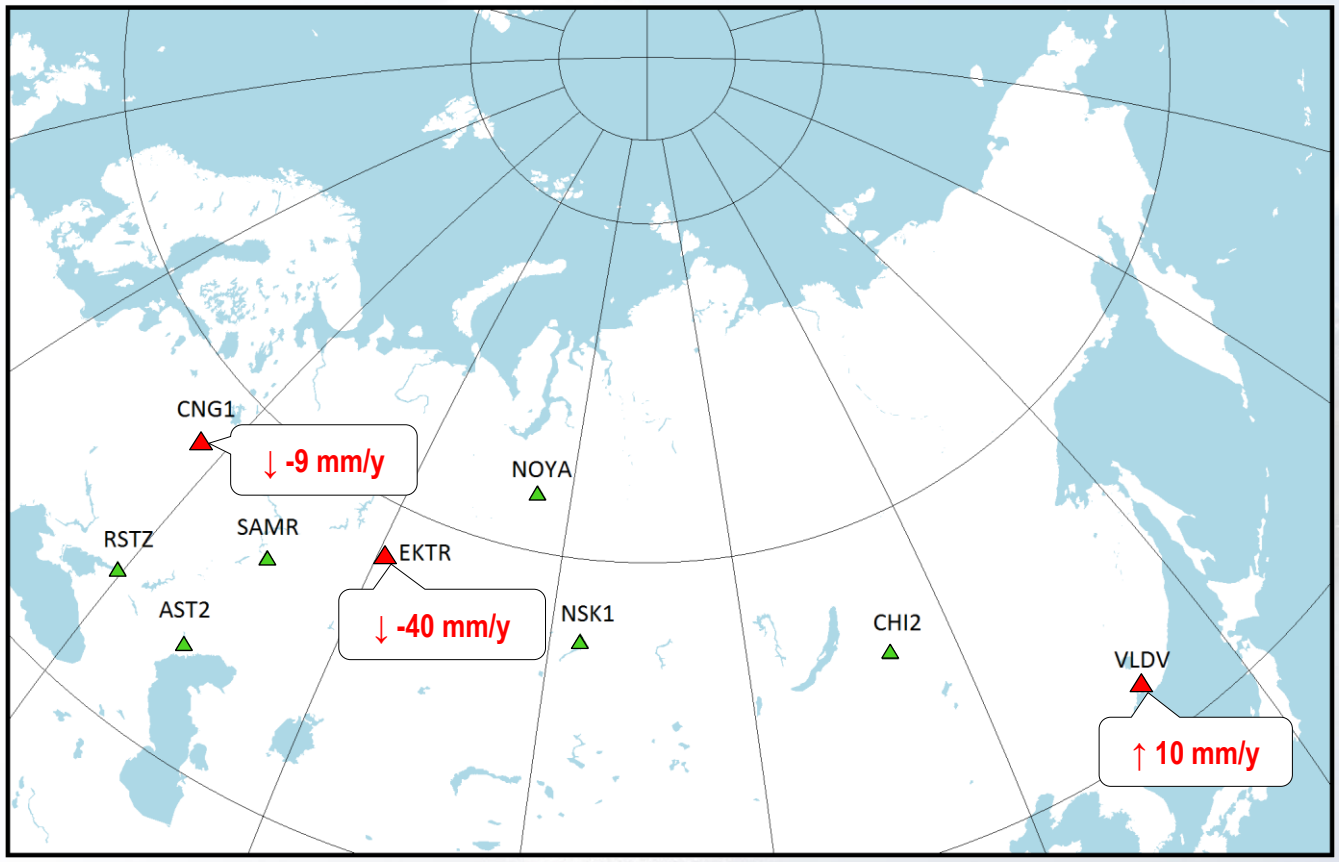


# VELOCITY VALIDATION:
# GSC-2011 vs. Velocity Estimate for the Closest Local Station

**VLDV – VLAD**
Distance 37 km

| Station | Data source | Velocity, mm/y | | |
|---|---|---|---|---|
| | | $V_E$ | $V_N$ | $V_U$ |
| **VLDV (GSC-2011)** | GSC -2011 | 70 | -38 | 10 |
| **VLAD (SmartNet)** | PPP time-series (6 months) | 21 ± 7(95%) | 2 ± 6 (95%) | -35 ± 12 (95%) |

# VERTICAL VELOCITY DEVIATION
# GSC-2011 vs. ITRF2008



# VELOCITY VALIDATION:
# GSC-2011 vs. Velocity Estimate for the Closest Local Station

**EKTR – EKAT**
Distance 4 km

| Station | Source | Velocity, mm/y | | |
|---|---|---|---|---|
| | | $V_E$ | $V_N$ | $V_U$ |
| **EKTR** (GSC-2011) | GSC-2011 | 14 | -2 | -39 |
| **EKAT** (SmartNet) | PPP time-series (6 months) | 16 ± 5 (95%) | 12 ± 6 (95%) | -55 ± 18 (95%) |

# CONCLUSION

- Significant inconsistencies with ITRF in vertical and horizontal velocity components are detected.
- Cause is unknown: local geodynamic processes or data processing issues?
- GSC-2011 dataset needs to be thoroughly checked before its introduction.
- Vertical and horizontal deformation models are needed.
- Non-SGN CORS to be used also for deriving deformation models.

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## AKNOWLEDGEMENT

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THANK YOU FOR YOUR ATTENTION!

QUESTIONS?