

# NICT小金井のローカルタイ測量 について

## Local Tie survey at NICT Koganei

M. Sekido<sup>1</sup>, T. Morinaga<sup>2</sup>, M. Satomura<sup>2</sup>,  
J. Nakazono<sup>1</sup>, R. Ichikawa<sup>1</sup>, H. Kunimori<sup>3</sup>

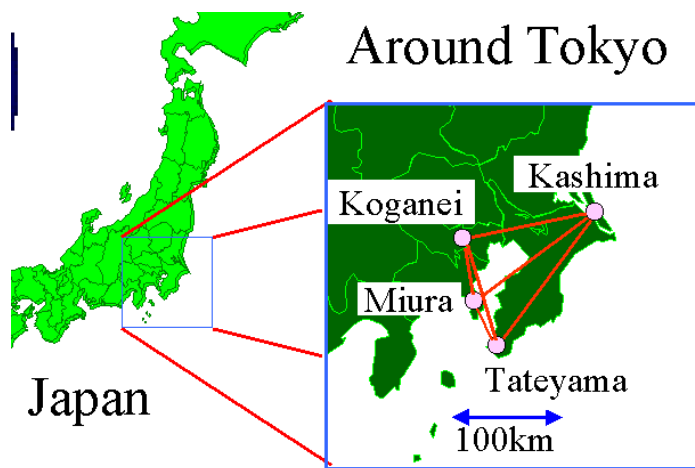
1:National Institute of Information and Communications Technology

2:Nippo Co. Ltd.

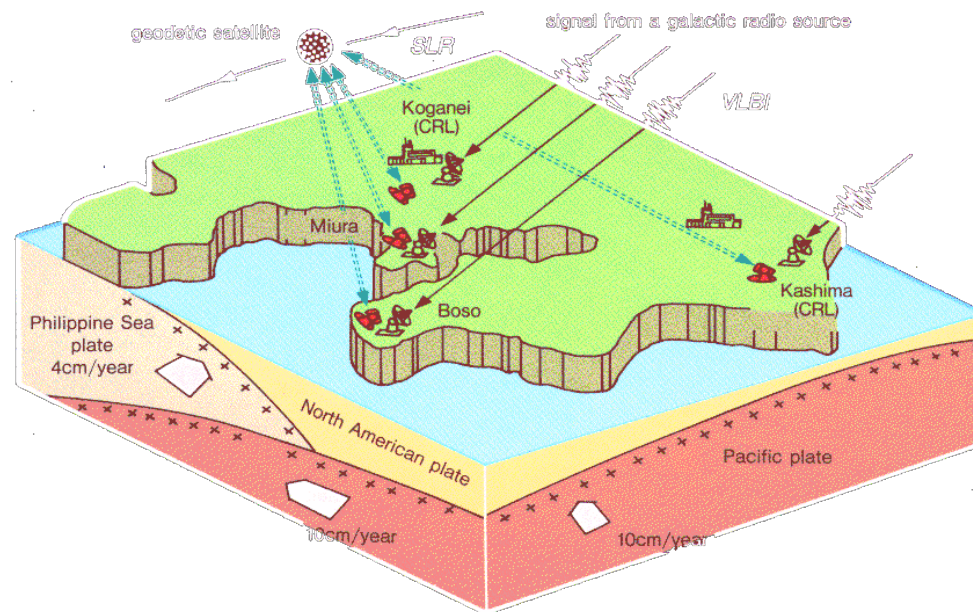
3:Astro Terrace Inc., Japan

# Local Tie of Reference point of Space Geodesy

- Currently, importance of local tie is widely accepted for improvement of the ITRF.
- Key Stone Project (KSP) started in 1993 recognized that, and permanent (short and long) pillars have been implemented.

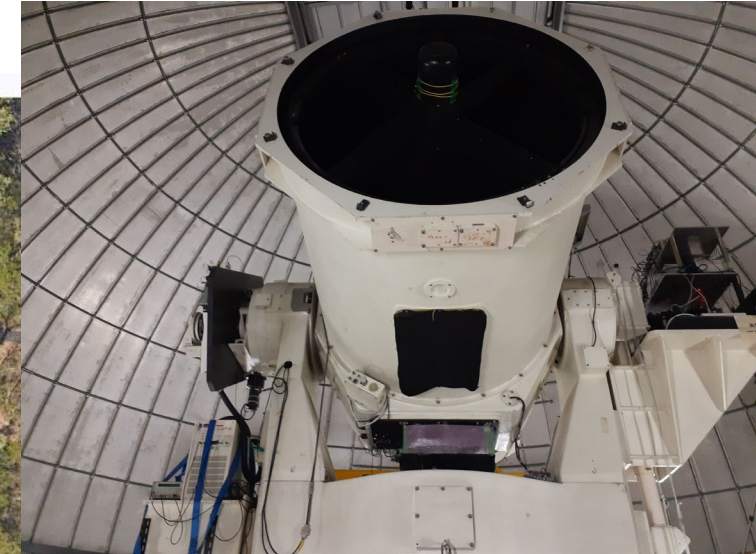
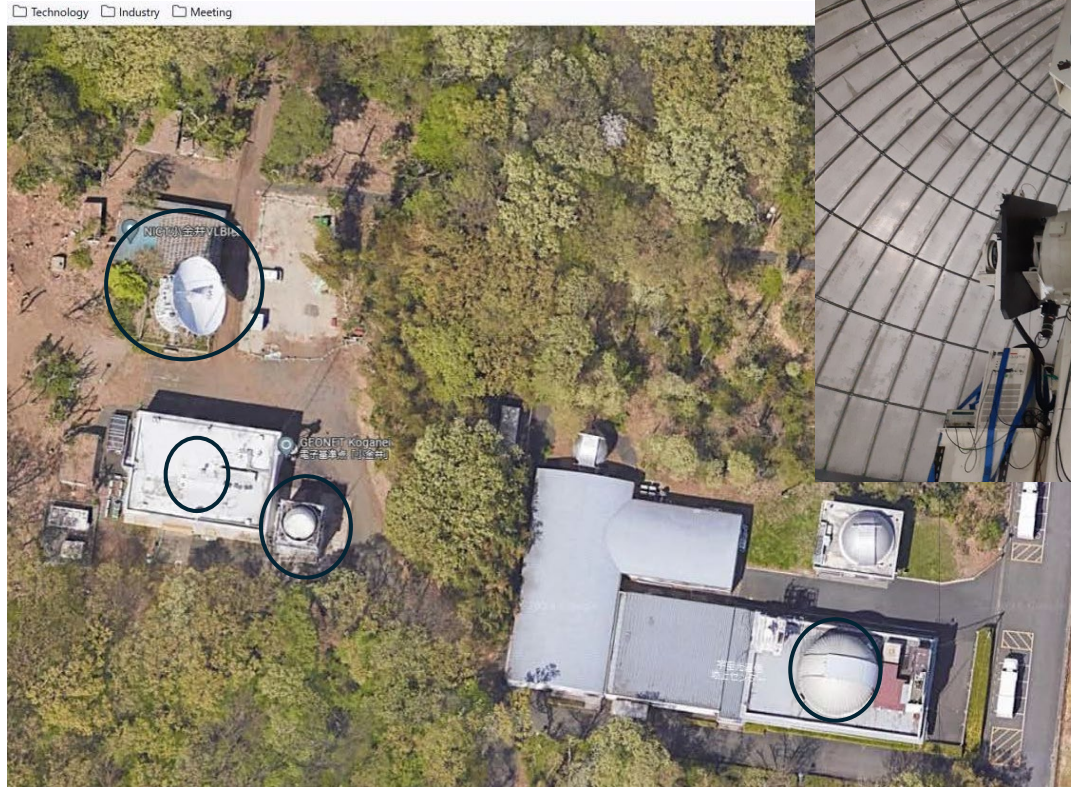


KSP Project 1993-2001

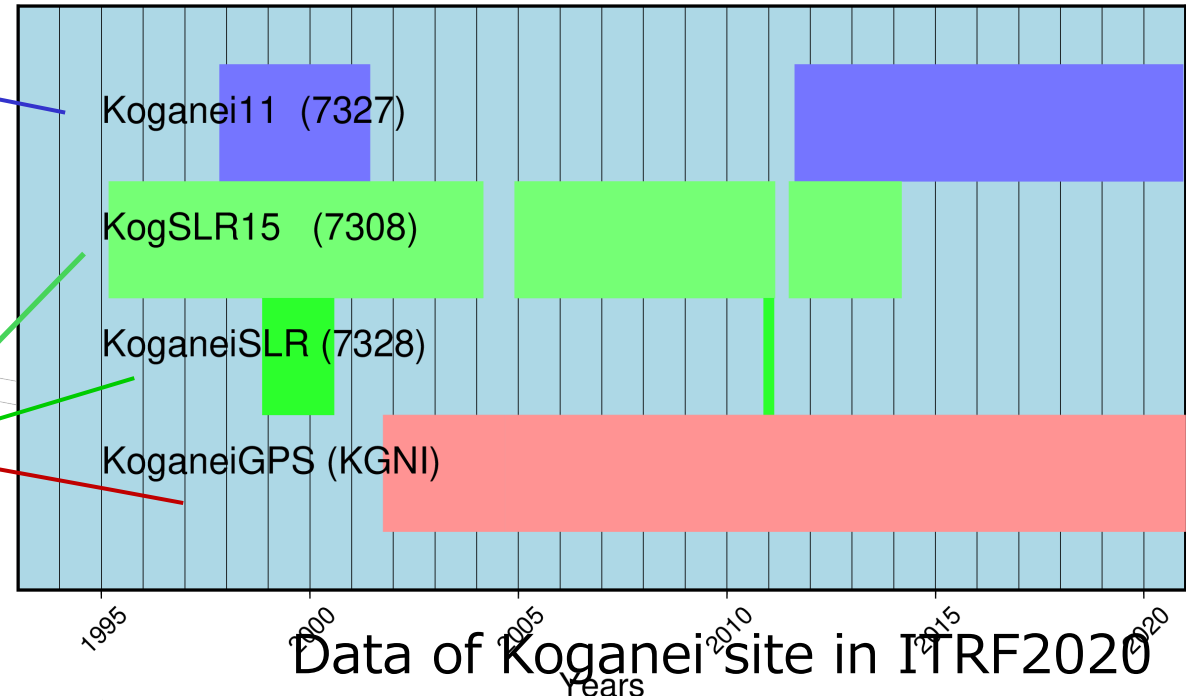
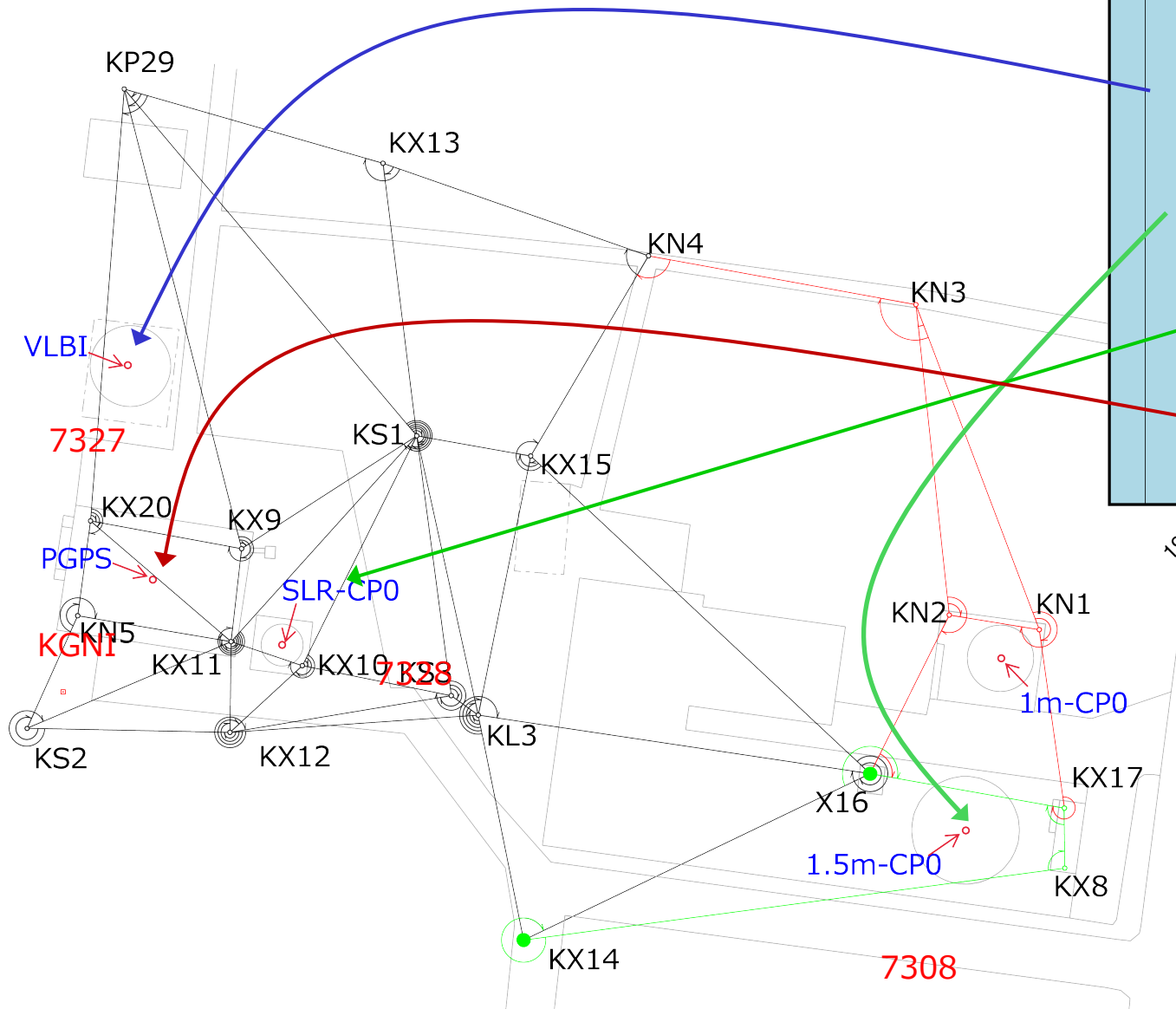


# Local Tie surveys at Koganei site were conducted in 1996-1999 (KSP), 2013, and 2022

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# Survey (2022) points in Koganei site



# Equipment used for Local Survey in 2022

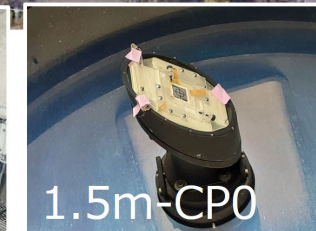
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Equipment	Model	Performance
GNSS Receiver	Trimble R12	Horizon: 3mm+0.1ppm Vertical: 3.5 mm +0.4 ppm
Leveling equipment	Trimble Navigation DiNi 0.3	0.3 mm (1km round)
Leveling bar	Tamaya LD-13S	Thermal exp. $0.2 \pm 0.03$ ppm/deg.
Total Station	Leica Nova MS60	Distance:1 mm Angle: 1 arc sec.

Survey was conducted by Nippo Co. Ltd. under the contract with NCIT

# Survey map at Koganei in 2022

©Google Map



# Preliminary results of 3D local tie analysis with pyaxis

## Input data:

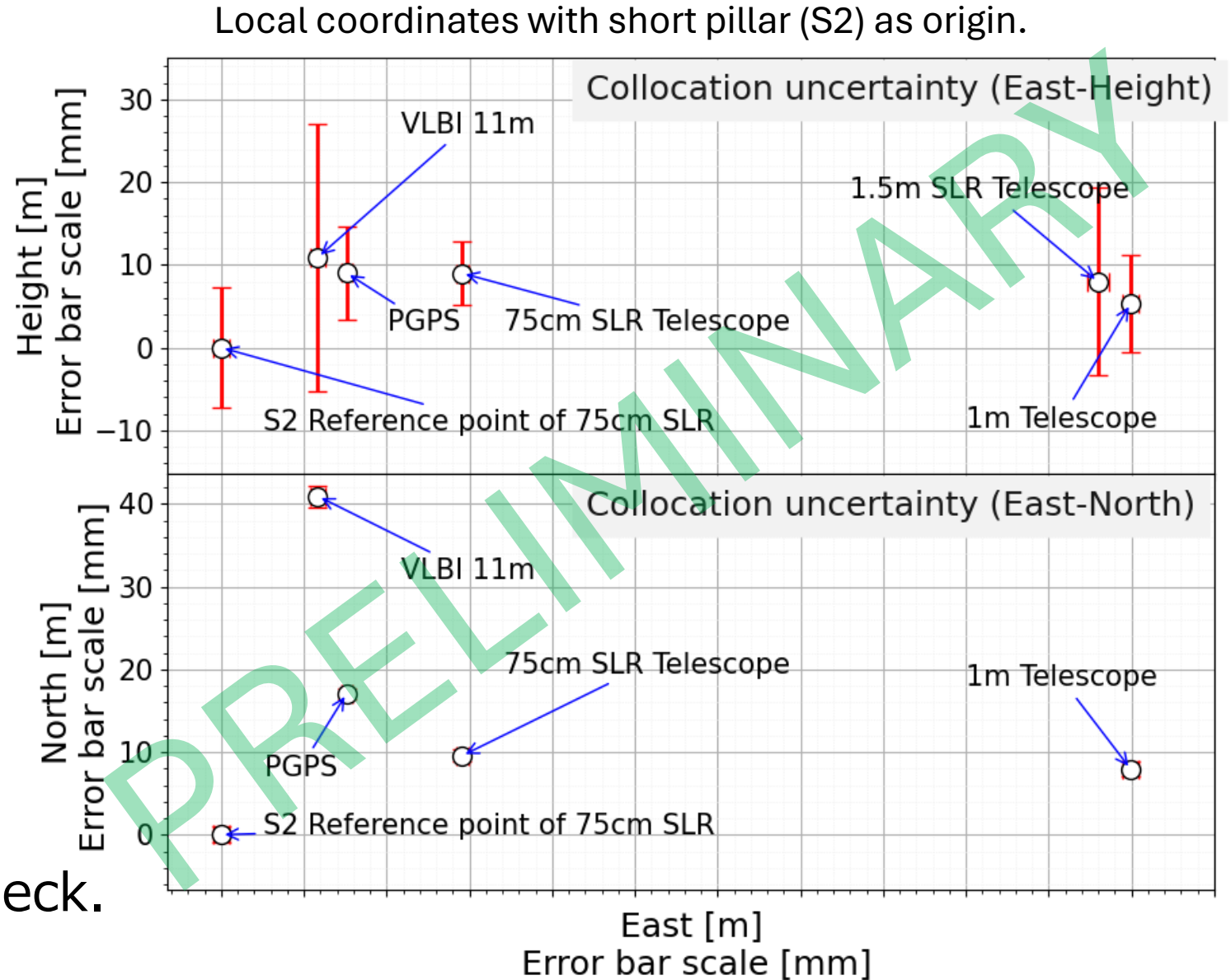
- TS(H-angle, Z-angle, Slant distance) (154 data set)
- Leveling (22 data)
- GNSS sinex file (4)
- Geoid gradient (1)

## Output:

- sinex file
- Residual

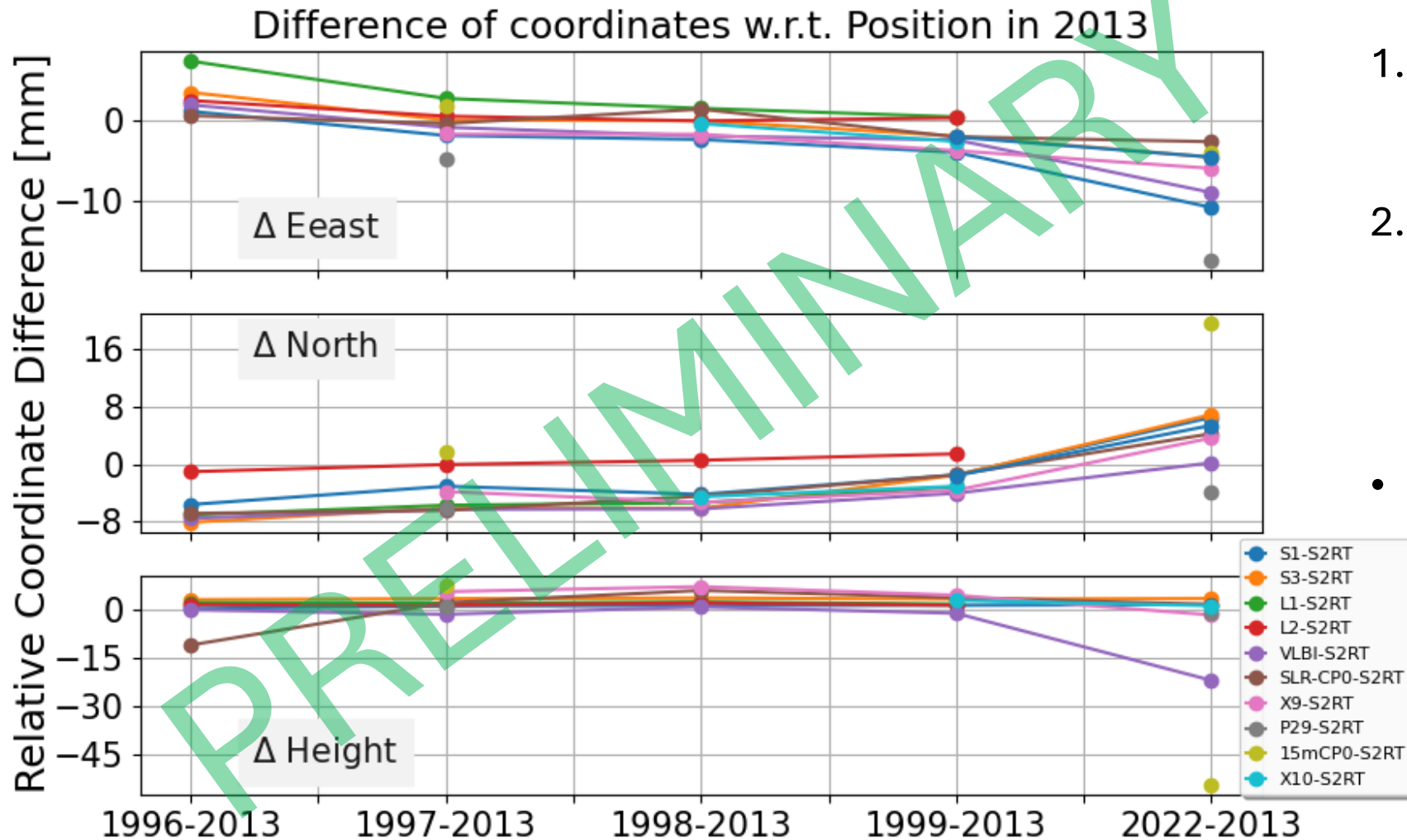
## Remarks:

- Horizontal unc.  $< 1\text{mm}$
- Vertical unc.  $\sim > 10\text{mm}$
- We must do further data check.



# Consistency/Repeatability with other measurements

Relative coordinates differences of 1996~1999 and 2022 w.r.t. 2013



1. Survey for 1996-1999 and 2013 were conducted by company K.K.
  2. Survey in 2022 was conducted by N.P. TS and Leveling data were jointly analyzed with pyaxis only for this survey
- Relative coordinates of reference points before 2022 are within 10 mm. However, those in 2022 were < 5 cm.



# Acknowledgements

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- We thank to Land Information New Zealand (LINZ) for allowing us to use pyaxis software.
- We used “Online GPS Processing Service” of Geoscience Australia for generating solution in SINEX format from GNSS RINEX file.
- We greatly appreciate to Mr. Hiroyuki Yoshifuji, and people of space geodesy group of GSI for kindly supporting us learning how to use pyaxis software.
- We thank to Mr. Shinichi Ueda of Nippo Co Ltd. for support. Geodetic local tie surveys in 2013 and 2022 were conducted by support of Space Communication System laboratory.