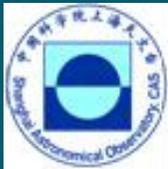




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# GNSS Bias analysis at Shanghai Astronomical Observatory

Junping Chen, Yueling Cao, Xiuqiang Gong, Xiao Pei,  
Nan Xing, Yibing Xie, Yize Zhang, Xiaogong Hu, Bin Wu

**Shanghai Astronomical Observatory**

[junping@shao.ac.cn](mailto:junping@shao.ac.cn)

[www.shao.ac.cn/shao\\_gnss\\_ac](http://www.shao.ac.cn/shao_gnss_ac)

2012 International GNSS Workshop, Olsztyn Poland, July 23-27, 2012



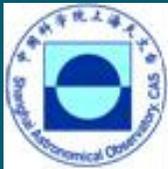
# Content

- **GNSS Analysis Center at SHAO**
- **Bias issues**
  - **COMPASS bias**
  - **GPS bias**
  - **GLONASS bias**
  - **GPS/GLONASS bias**
  - **GPS/COMPASS bias**
- **Conclusion**



# SHAO

- **Long history in Astronomical and Geodetic observations and research**
- **Coordinator of Chinese SLR network**
- **Station with co-location of GNSS/SLR/VLBI**
- **Analysis facilities for all three techniques**



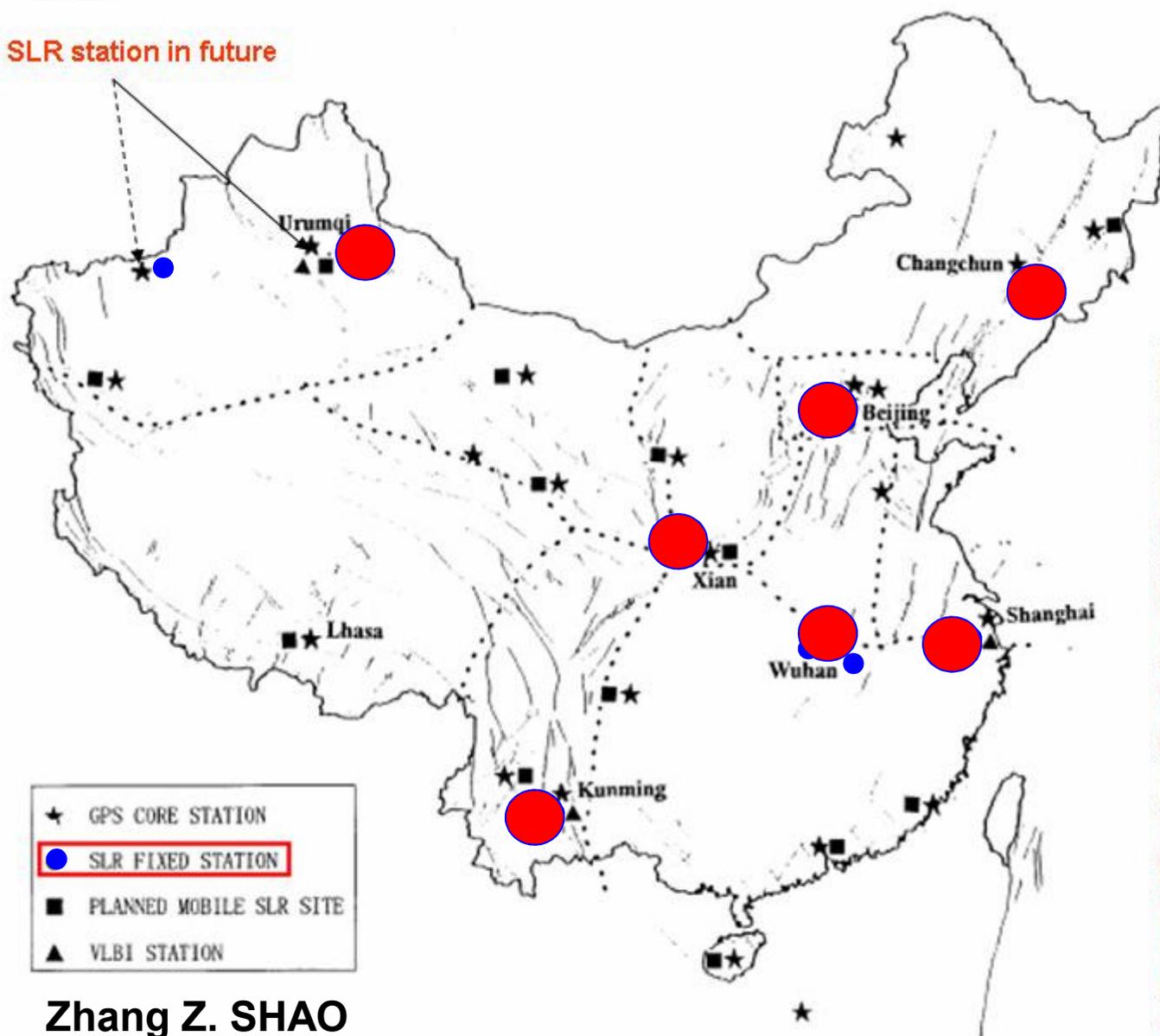
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# Coordinator of the Chinese SLR station

SLR station in future



San Juan SLR station in Argentina



Zhang Z. SHAO



# SHAO

- Long history in Astronomical and Geodetic observations and research
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- Analysis facilities for all three techniques



# ***GNSS/SLR/VLBI Co-located site***

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## ***SHA: GNSS data analysis at SHAO***

[\*http://www.shao.ac.cn/shao\\_gnss\\_ac\*](http://www.shao.ac.cn/shao_gnss_ac)

- **Data and Analysis Center for CMONOC network: Daily routine for global GNSS network + CMONOC** (Crustal Movement Observation Network of China)
- **Working towards GGOS-C**
- **In addition to current Compass efforts, towards post-processing Compass/Beidou Analysis center**







# Products of SHA: e.g. GNSS orbits

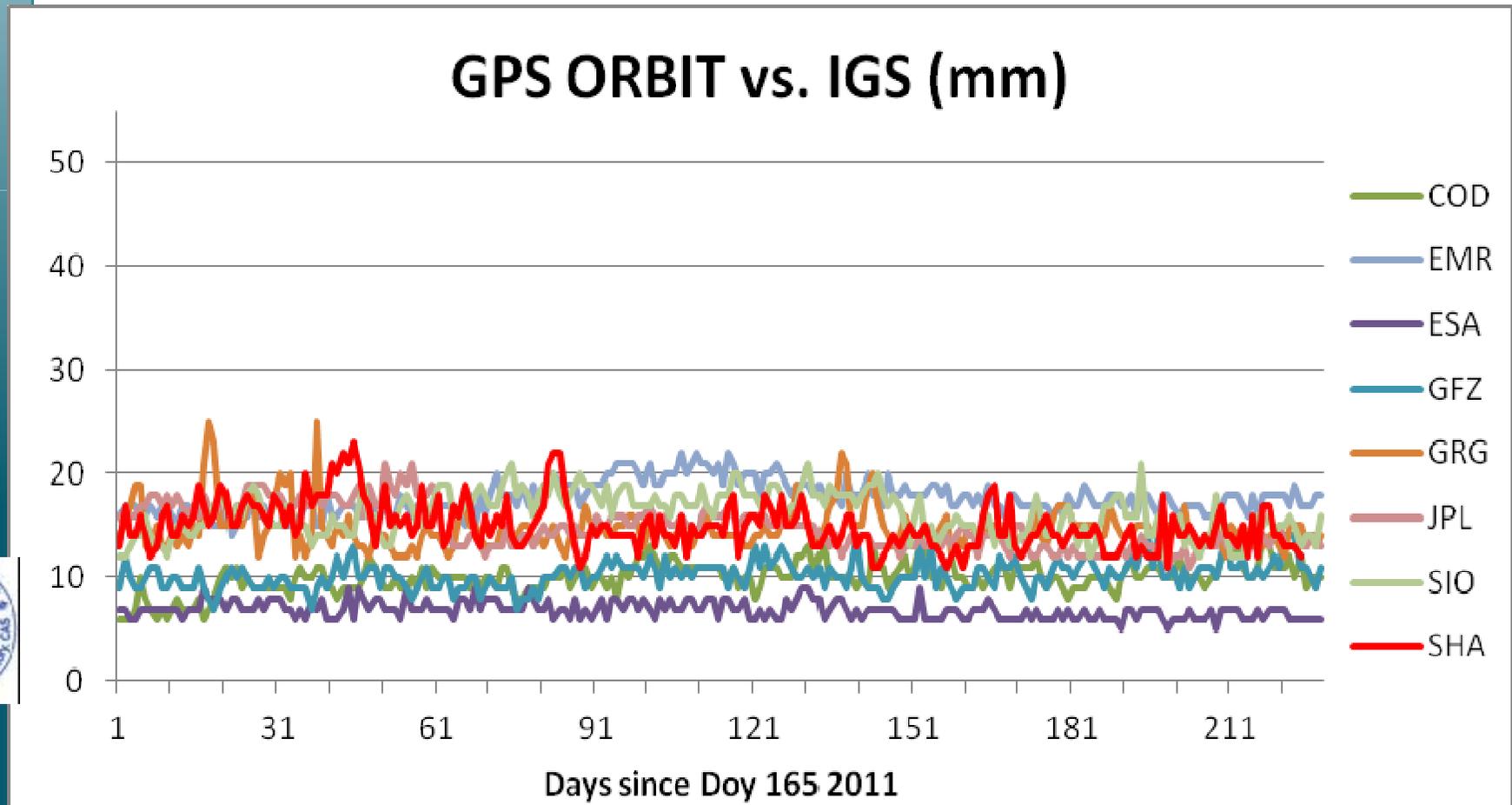
## GNSS Orbits

- GPS+GLONASS
- Compared to IGS
- **<2 cm for GPS; <5 cm for GLONASS**

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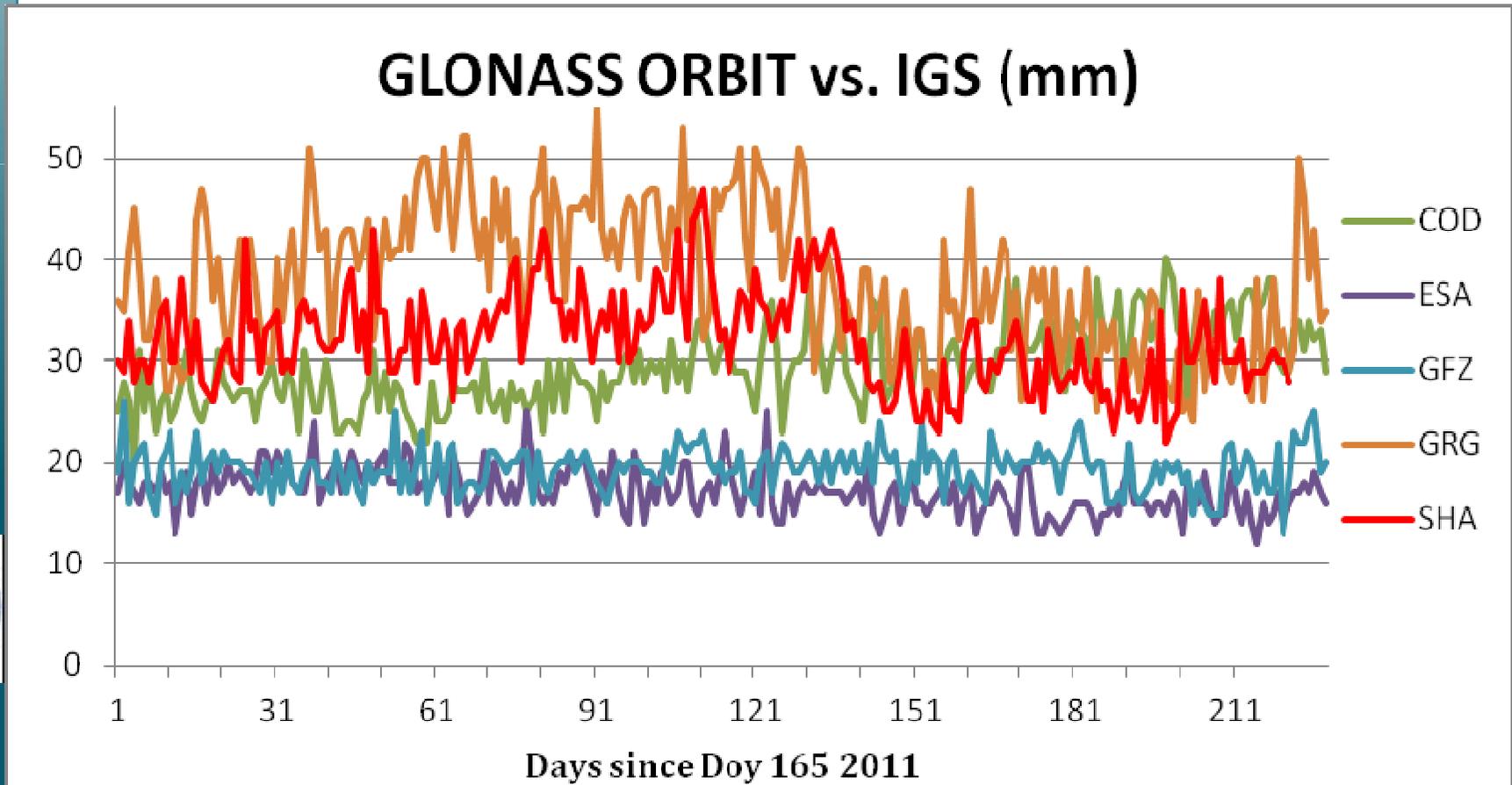


# Products of SHA: e.g. GNSS orbits

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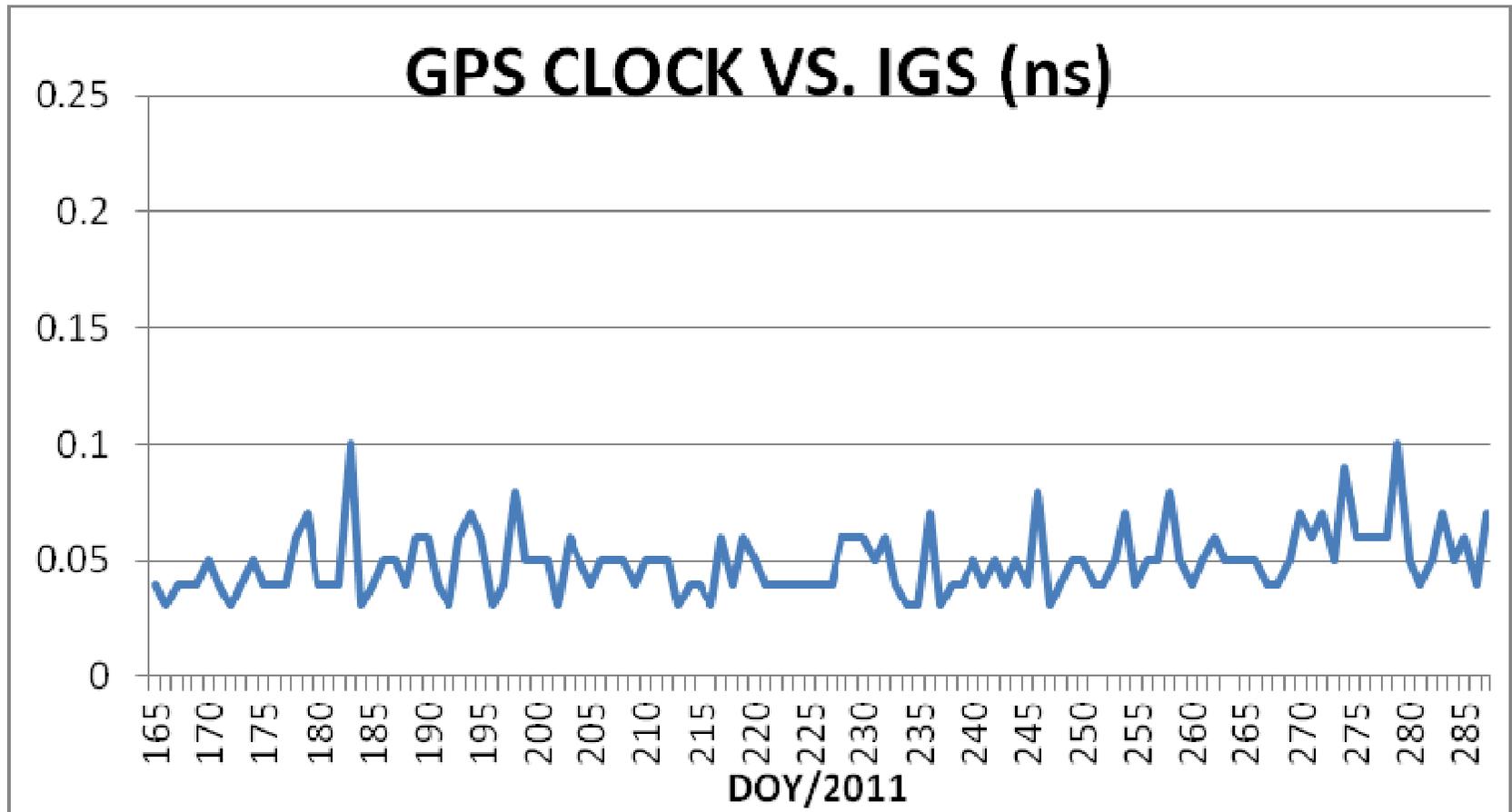




# Products of SHA: e.g. GNSS clocks

## GNSS clocks: 30 seconds

- GPS+GLONASS
- Compared to IGS
- **<0.05 ns for GPS**; <0.15 ns for GLONASS

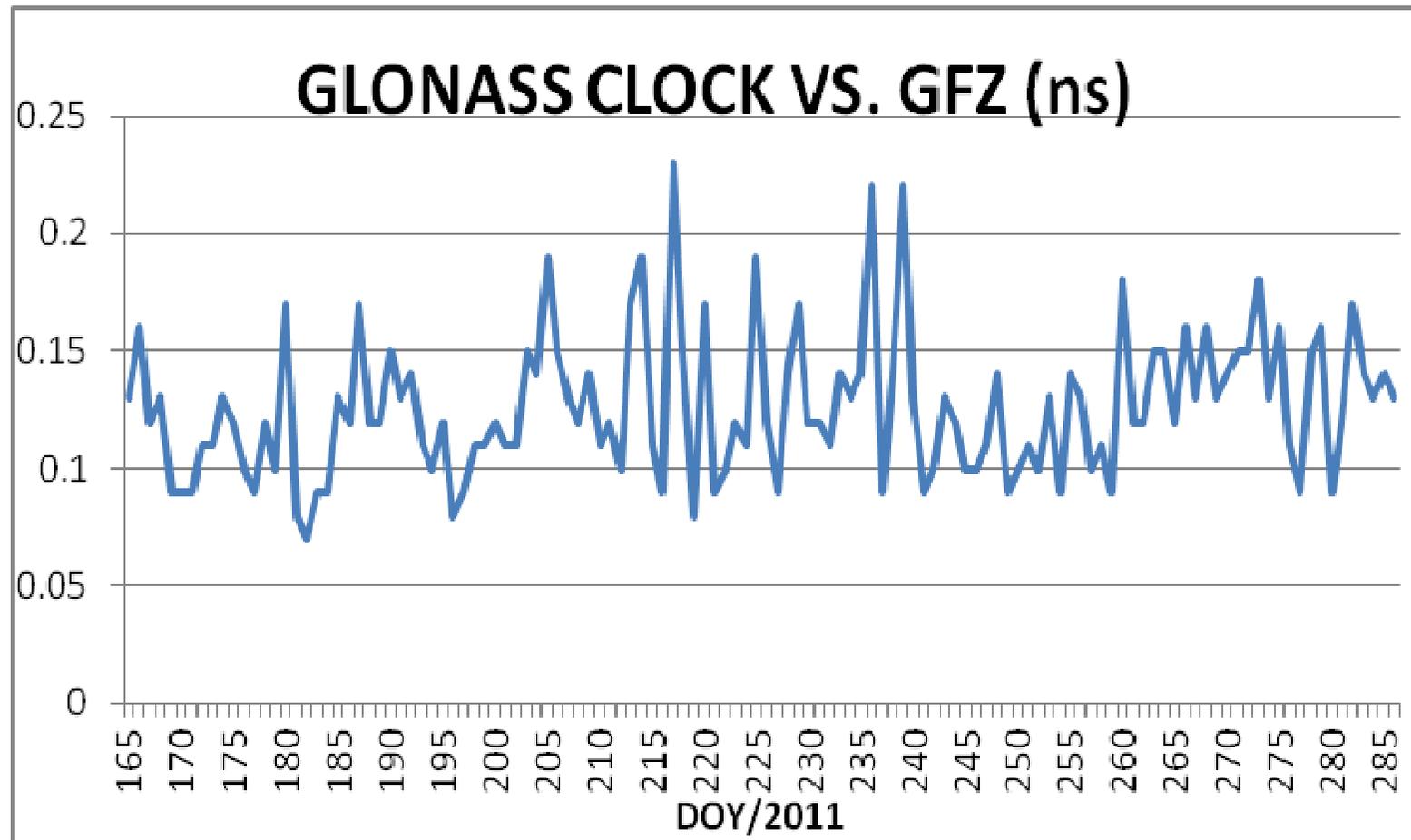




# Products of SHA: e.g. GNSS clocks

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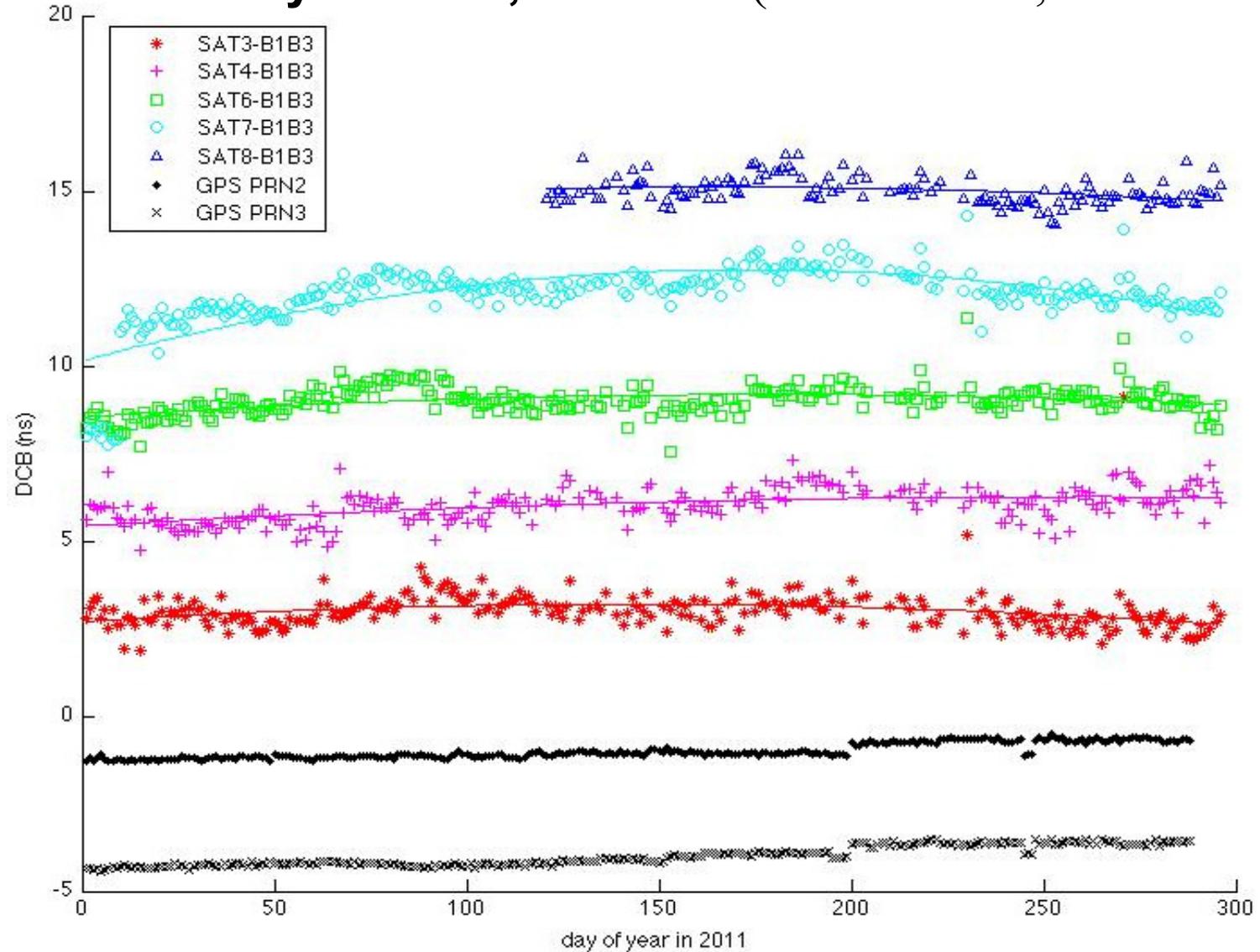
## *Bias Issues*

- **COMPASS bias**
- **GPS bias**
- **GLONASS bias**
- **GPS/GLONASS bias**
- **GPS/COMPASS bias**



# COMPASS bias

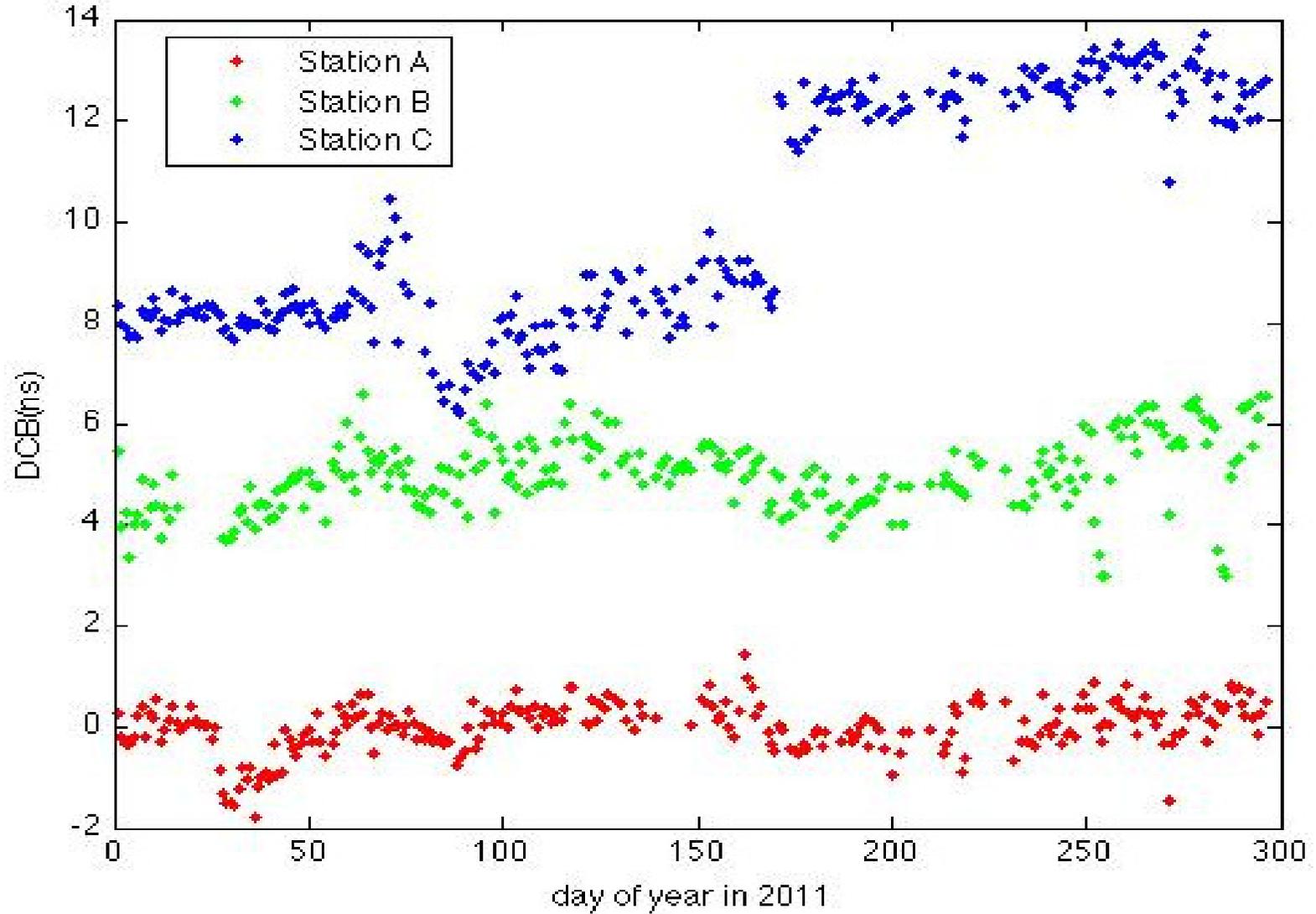
TGD : whole year 2011, 0.4-0.6ns ( GEO: 0.4ns, IGSO: 0.6ns )





# COMPASS bias

IFB: whole year 2011, 0.6-0.9ns



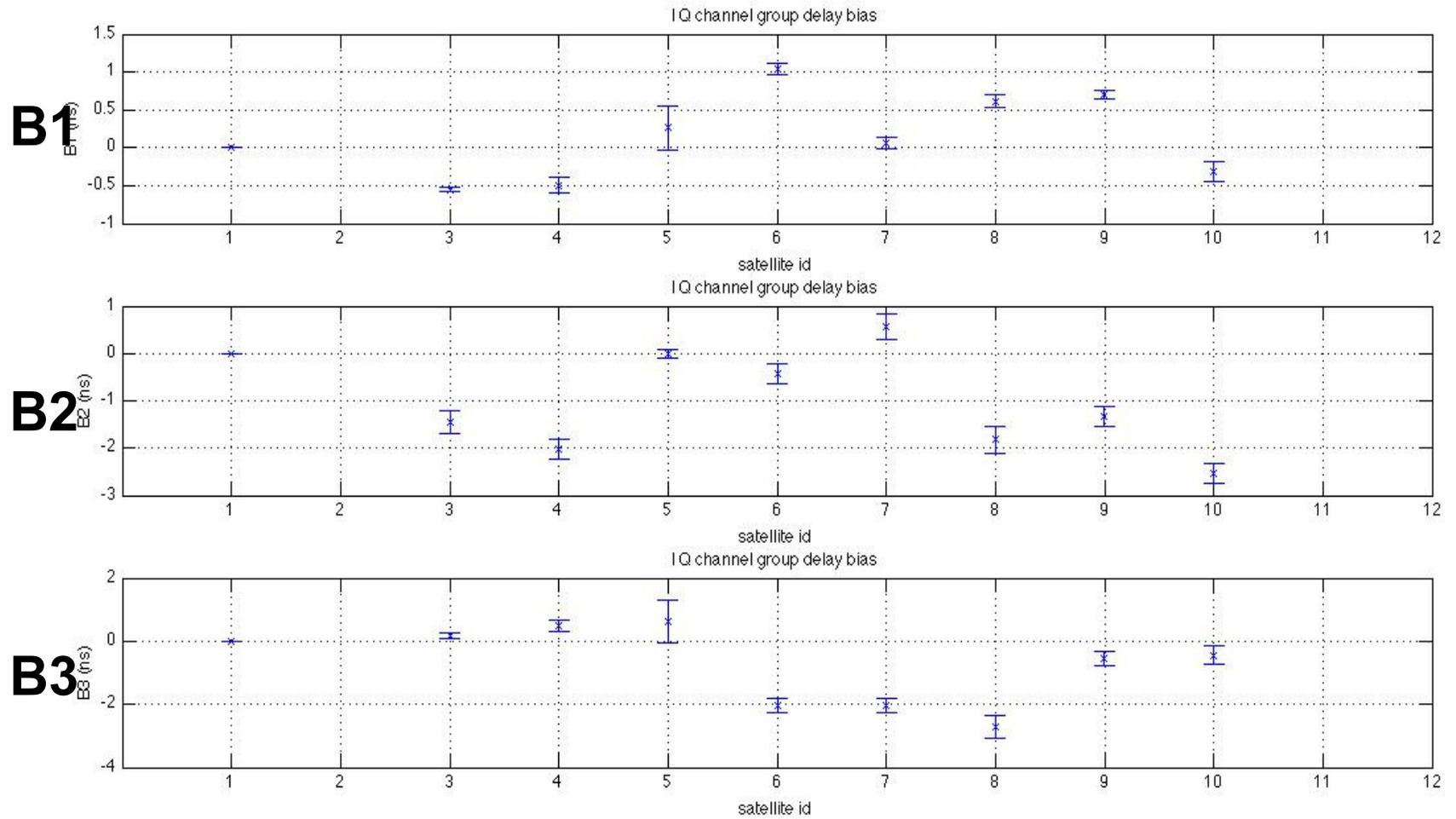


# COMPASS bias

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## Bias in I/Q channel



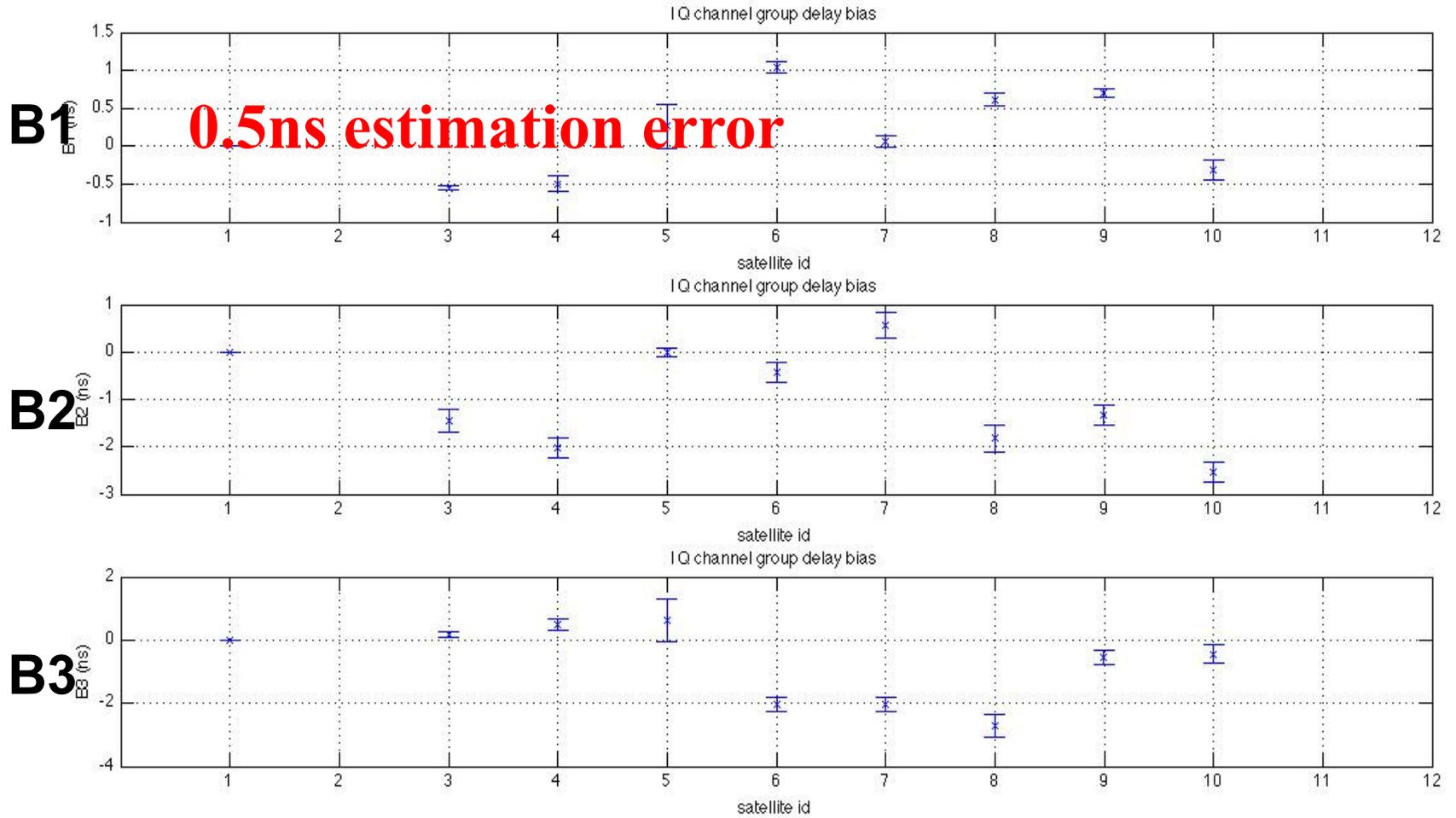


# COMPASS bias

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## Bias in I/Q channel

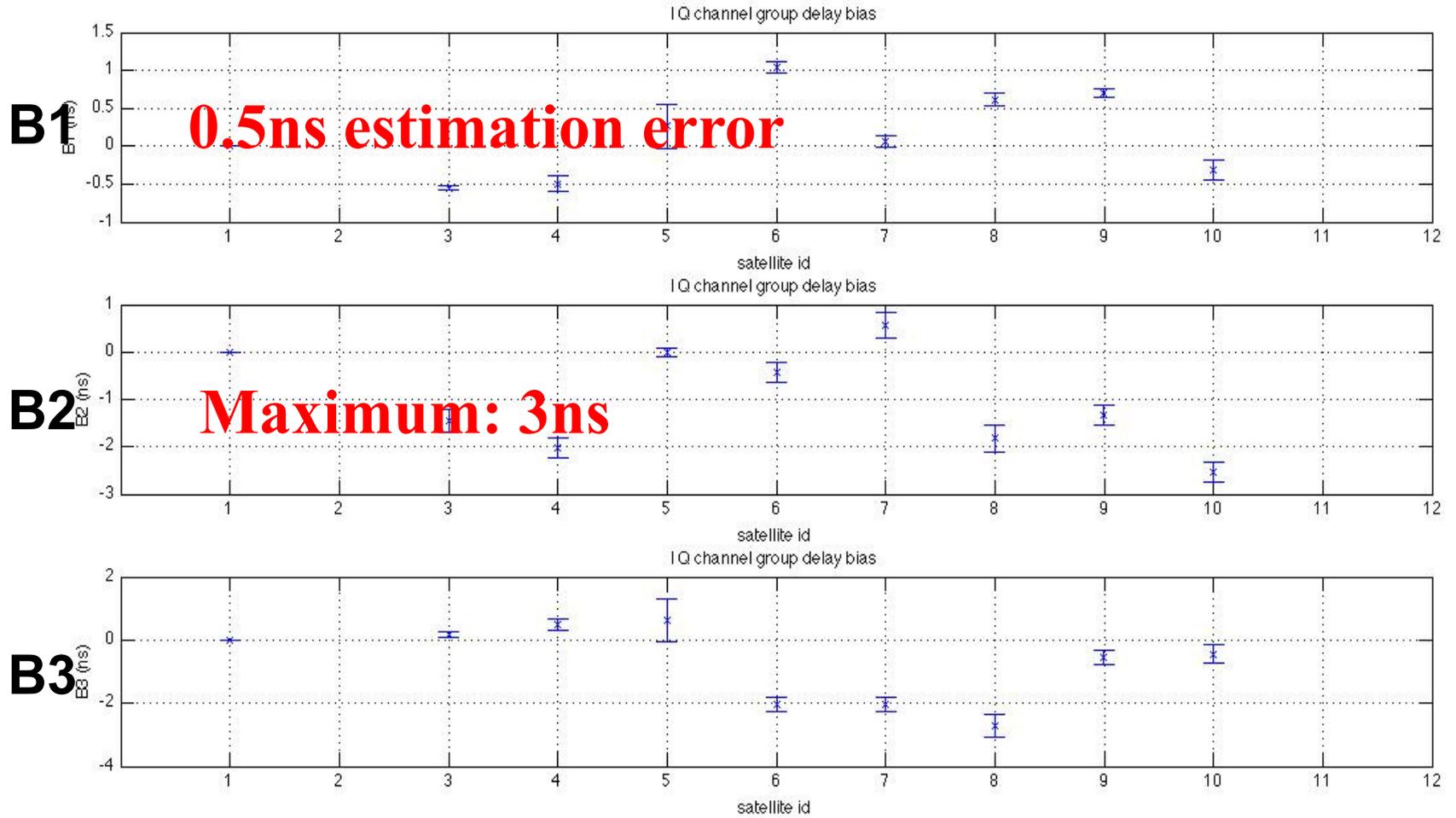




# COMPASS bias

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## Bias in I/Q channel



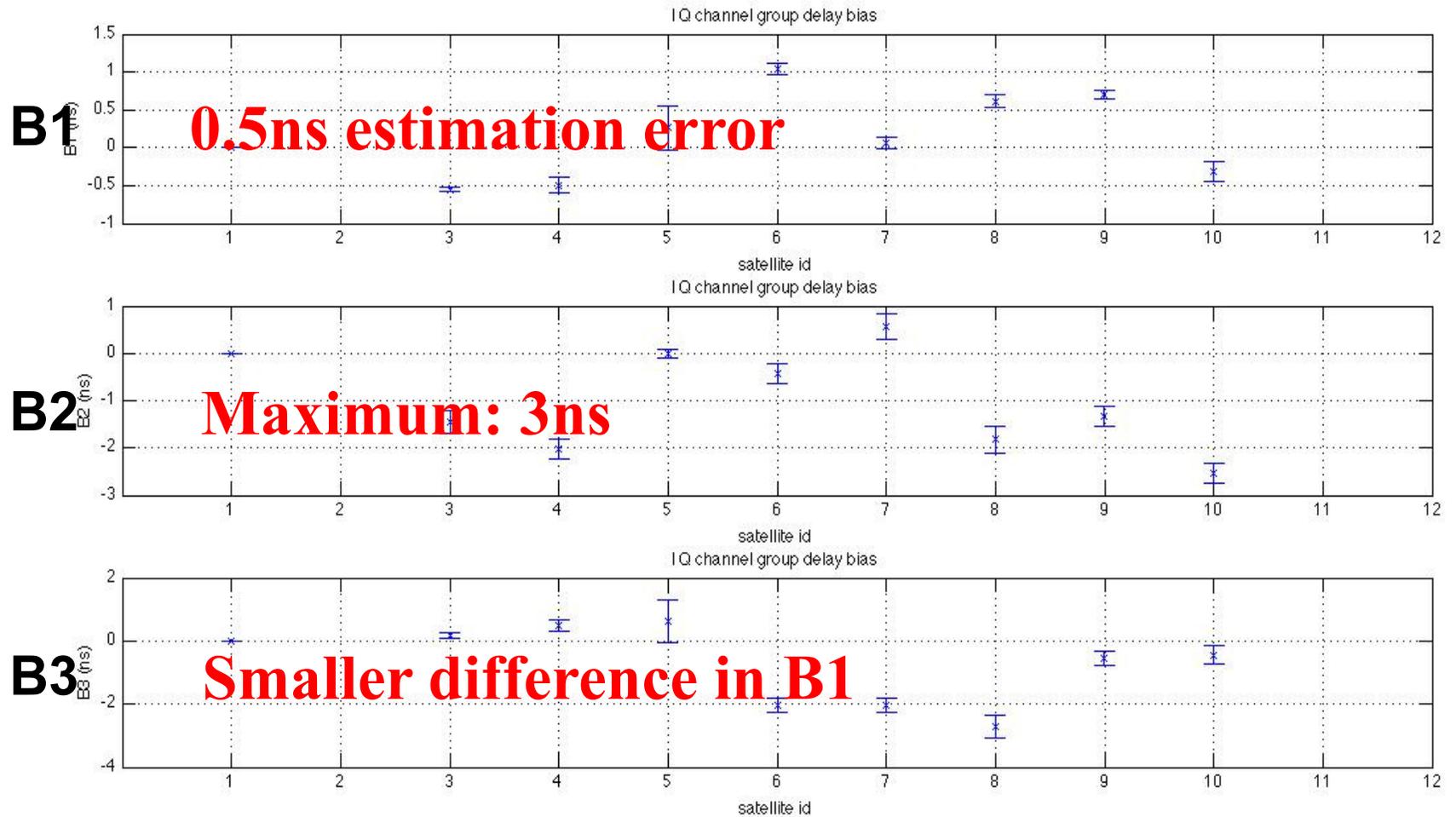


# COMPASS bias

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## Bias in I/Q channel



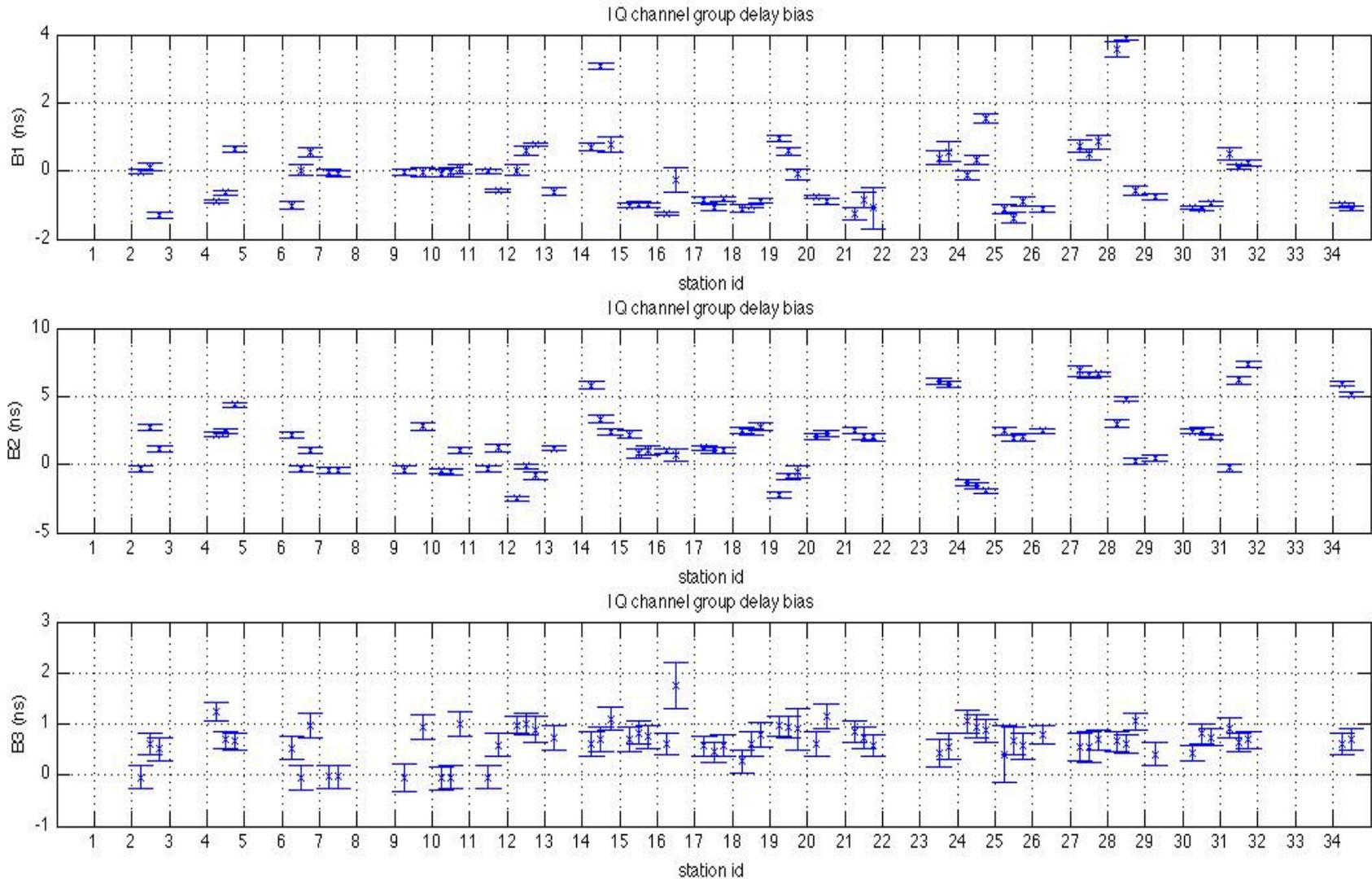


# COMPASS bias

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## Bias in I/Q channel

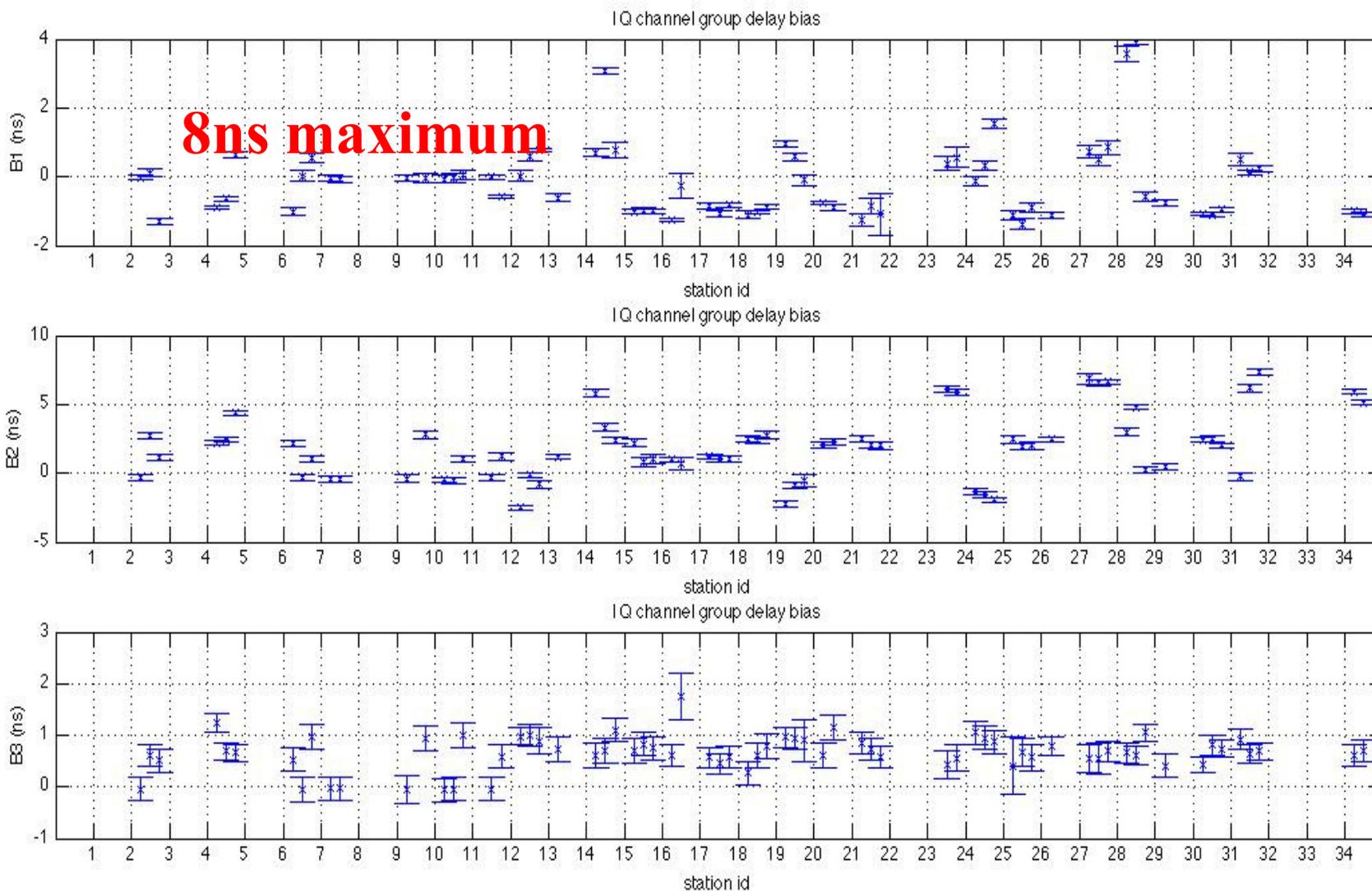




# COMPASS bias

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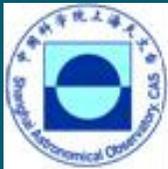
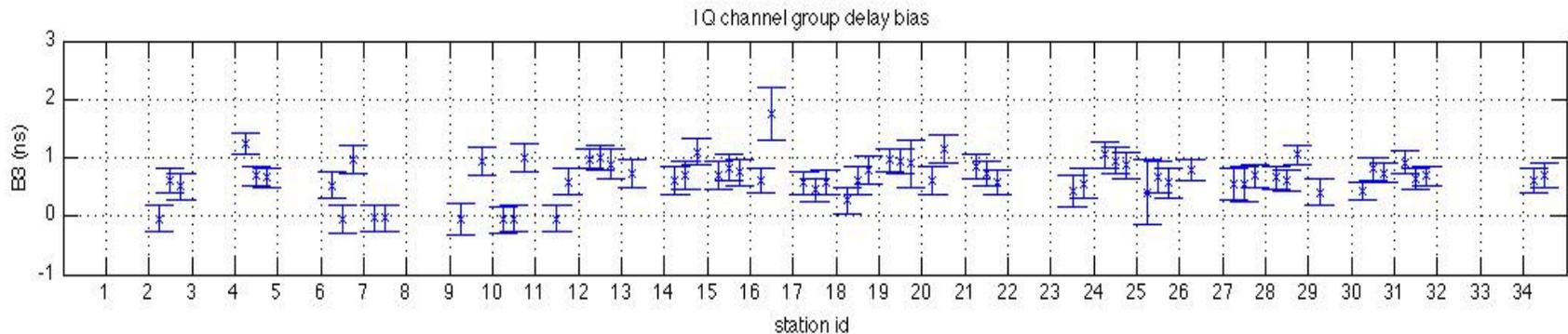
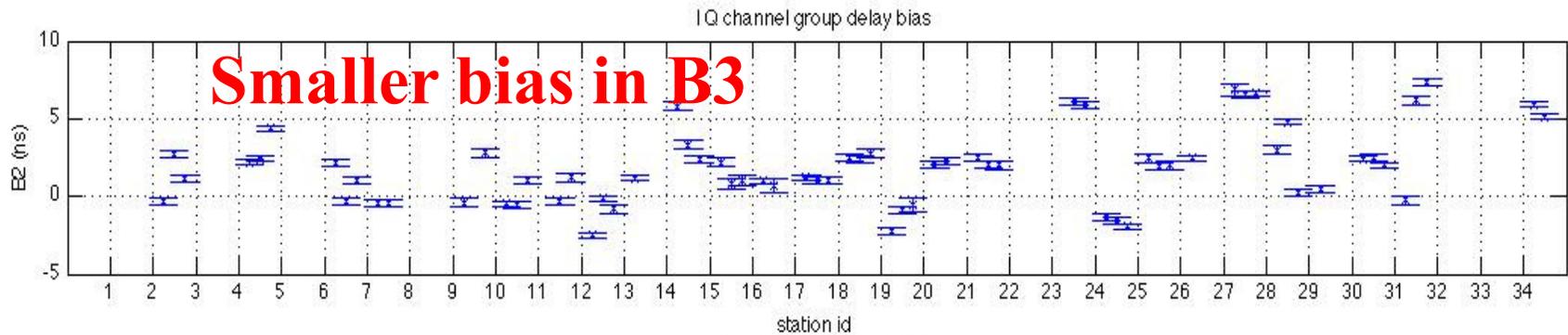
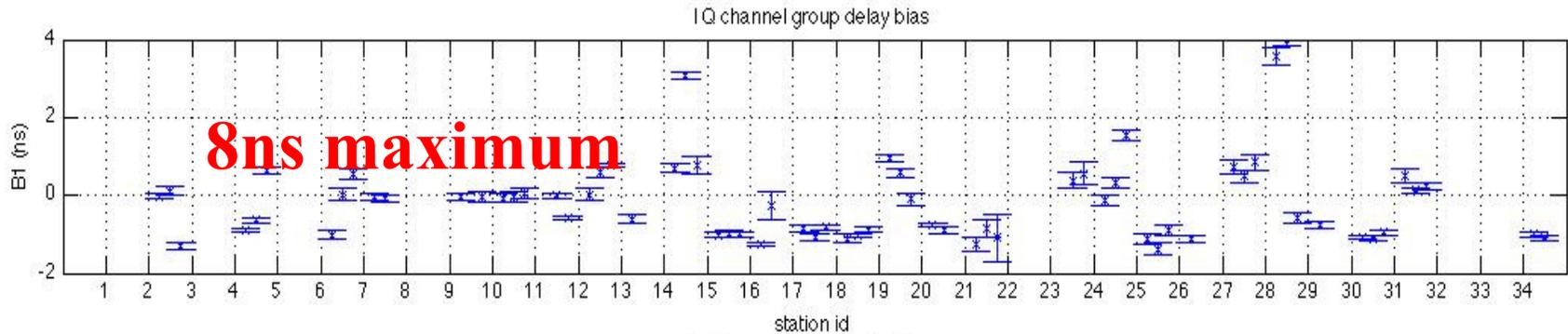




# COMPASS bias

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## Bias in I/Q channel



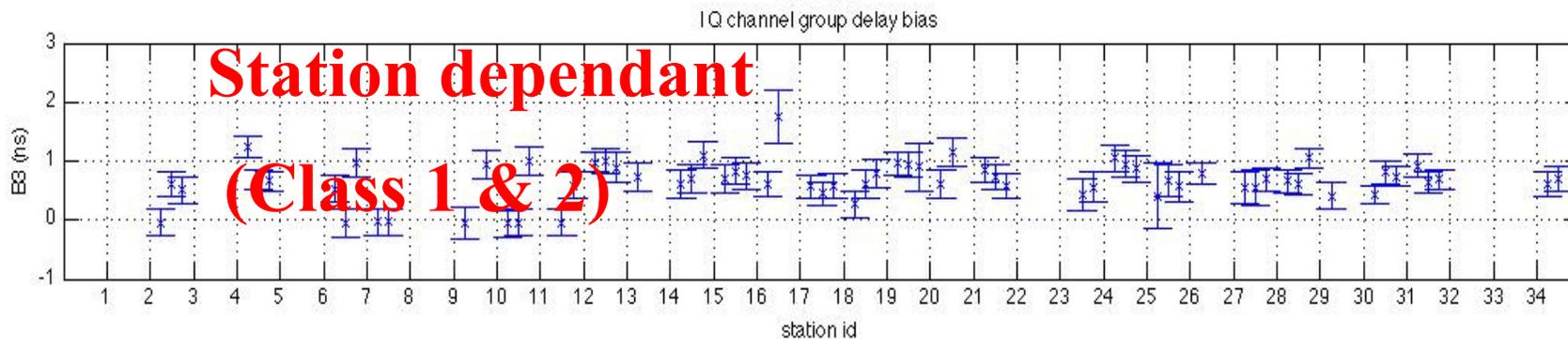
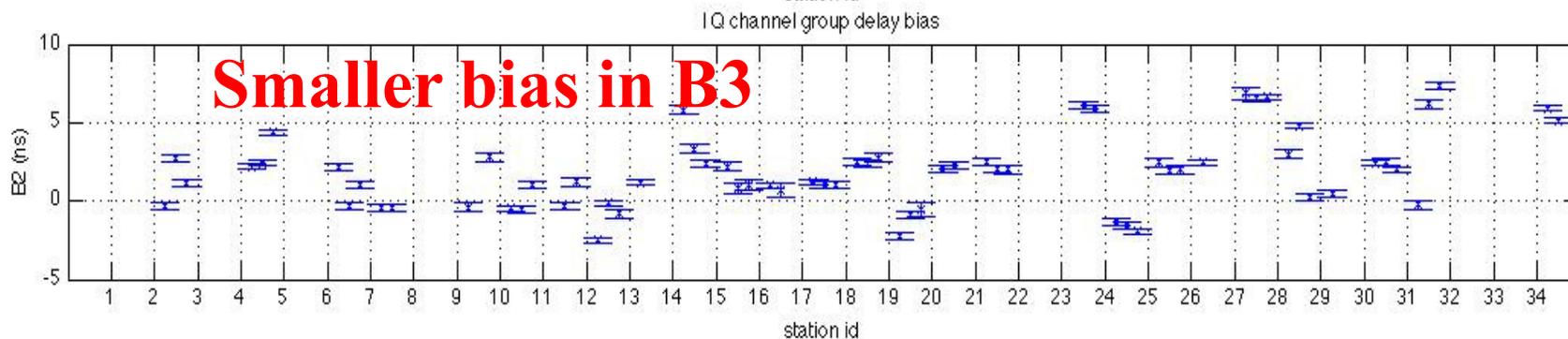
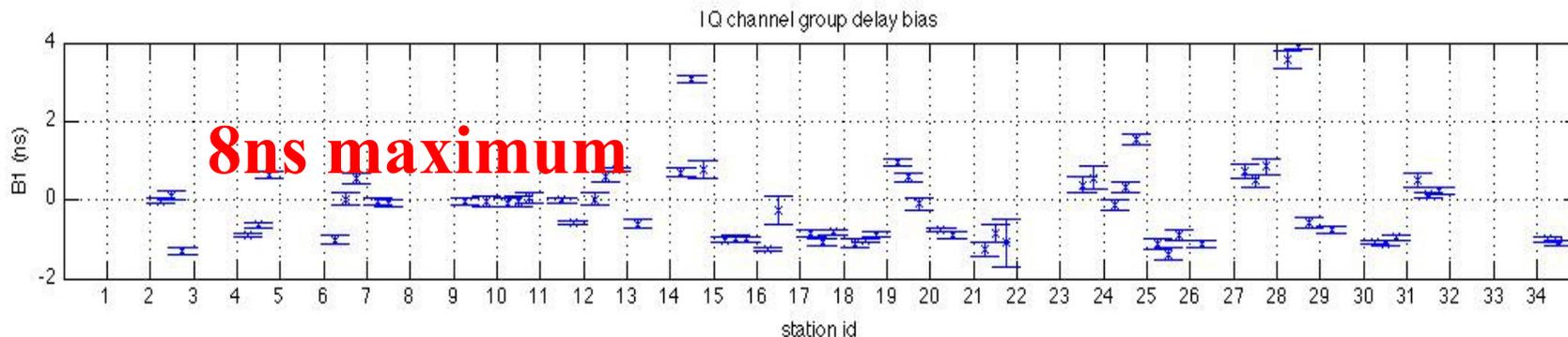


# COMPASS bias

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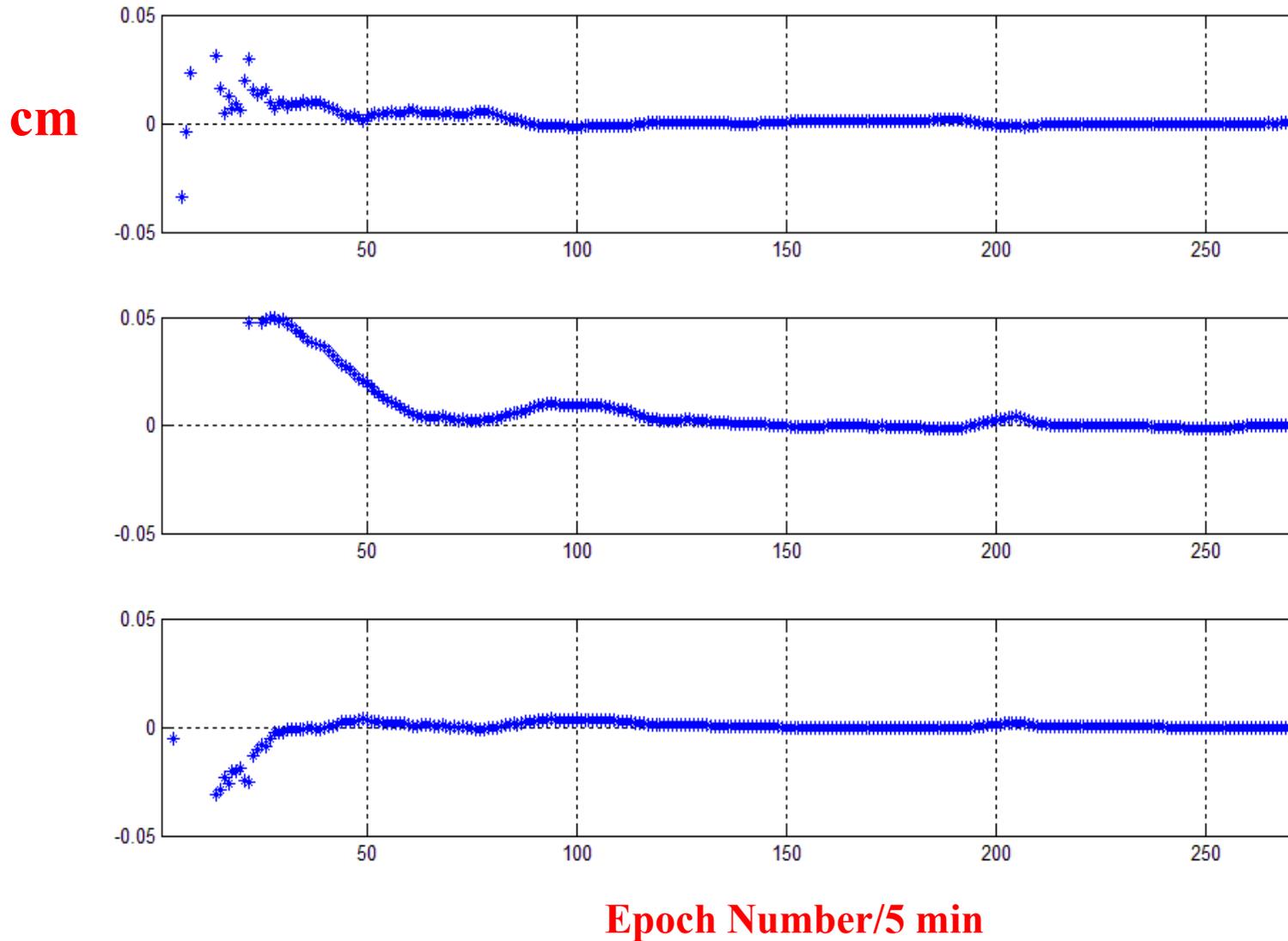


## Bias in I/Q channel





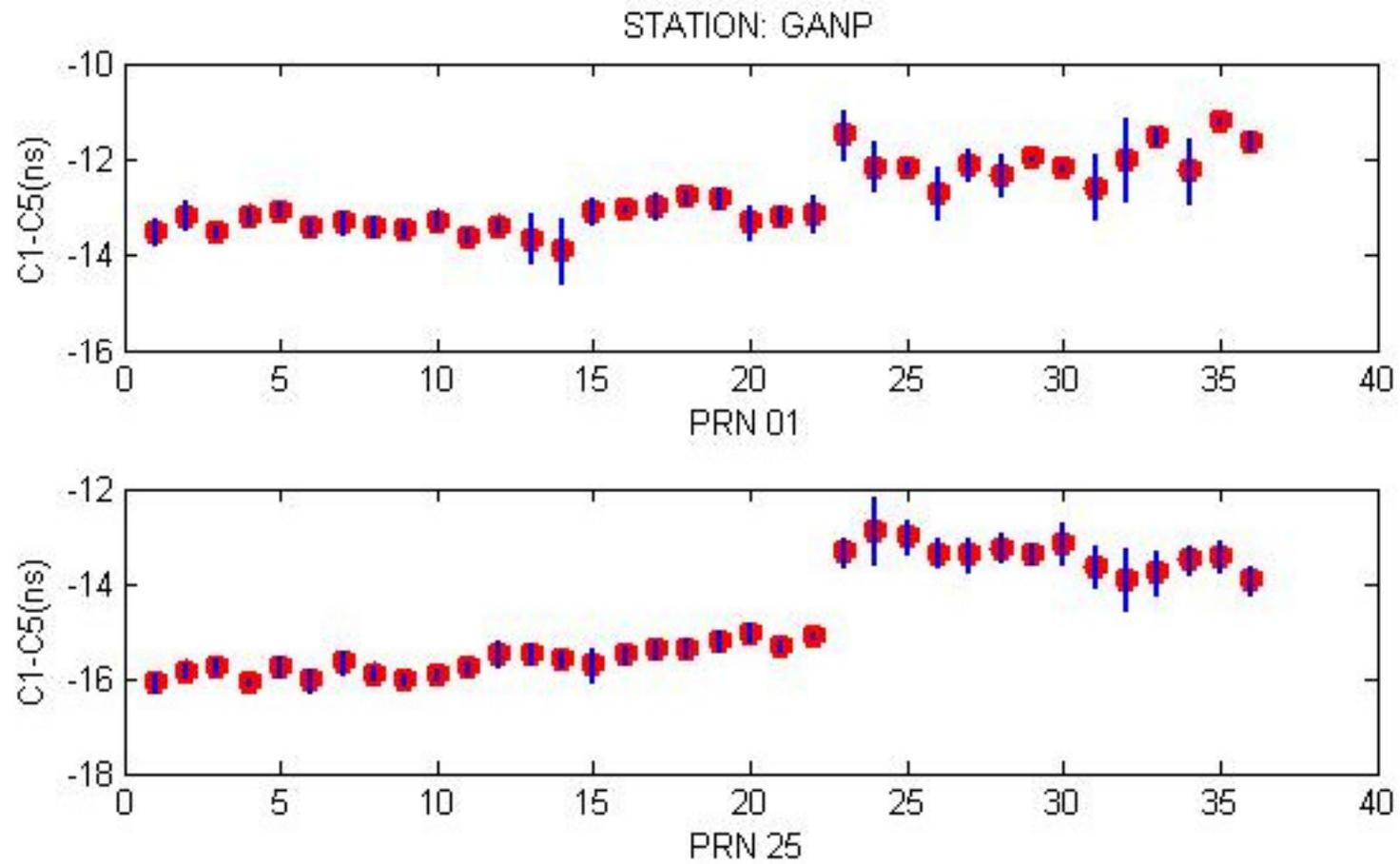
# COMPASS Positioning Performance





# GPS bias

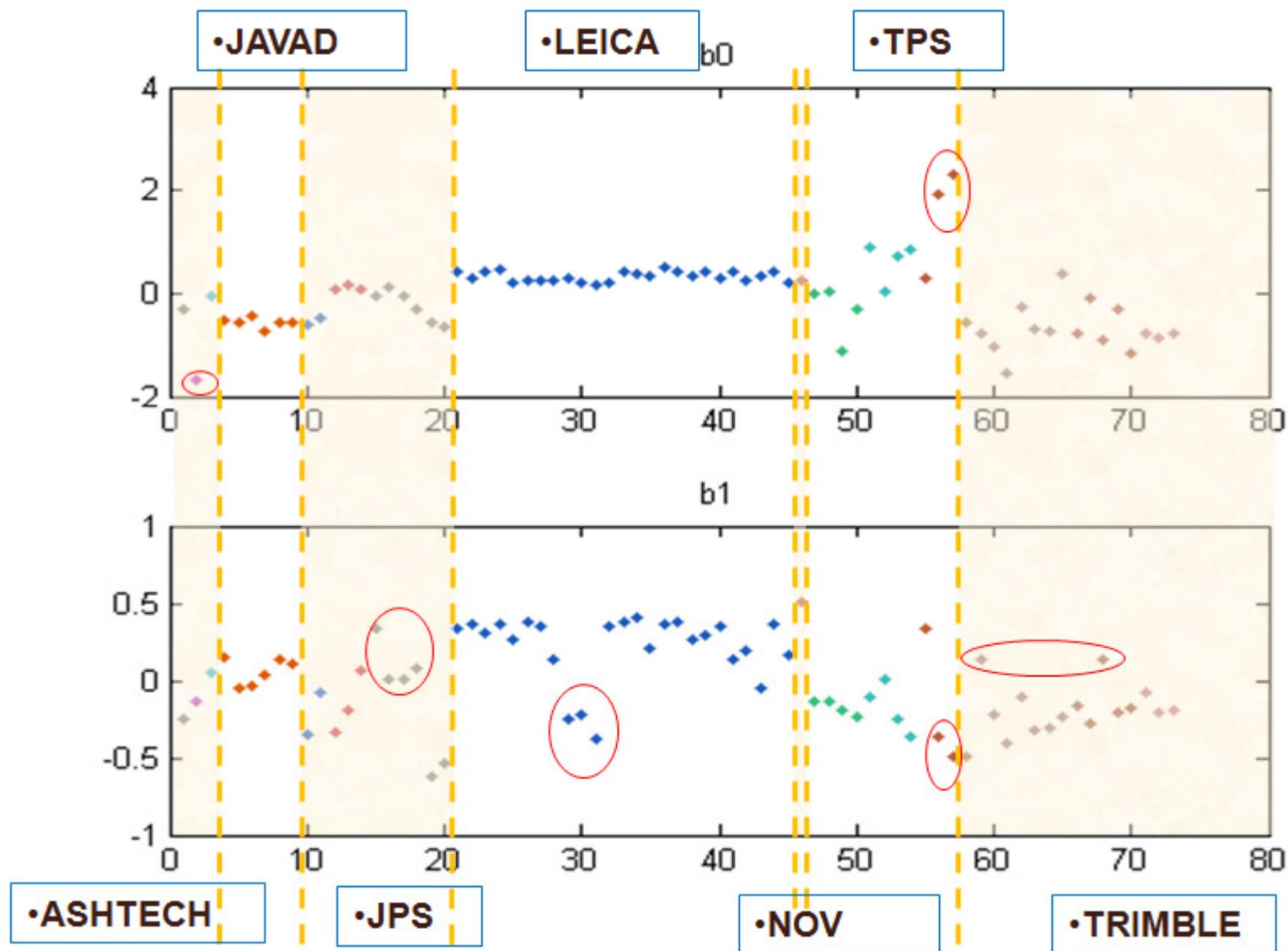
GPS C1C5 DCB (Each point stands for the mean of 5 days)





# GLONASS bias

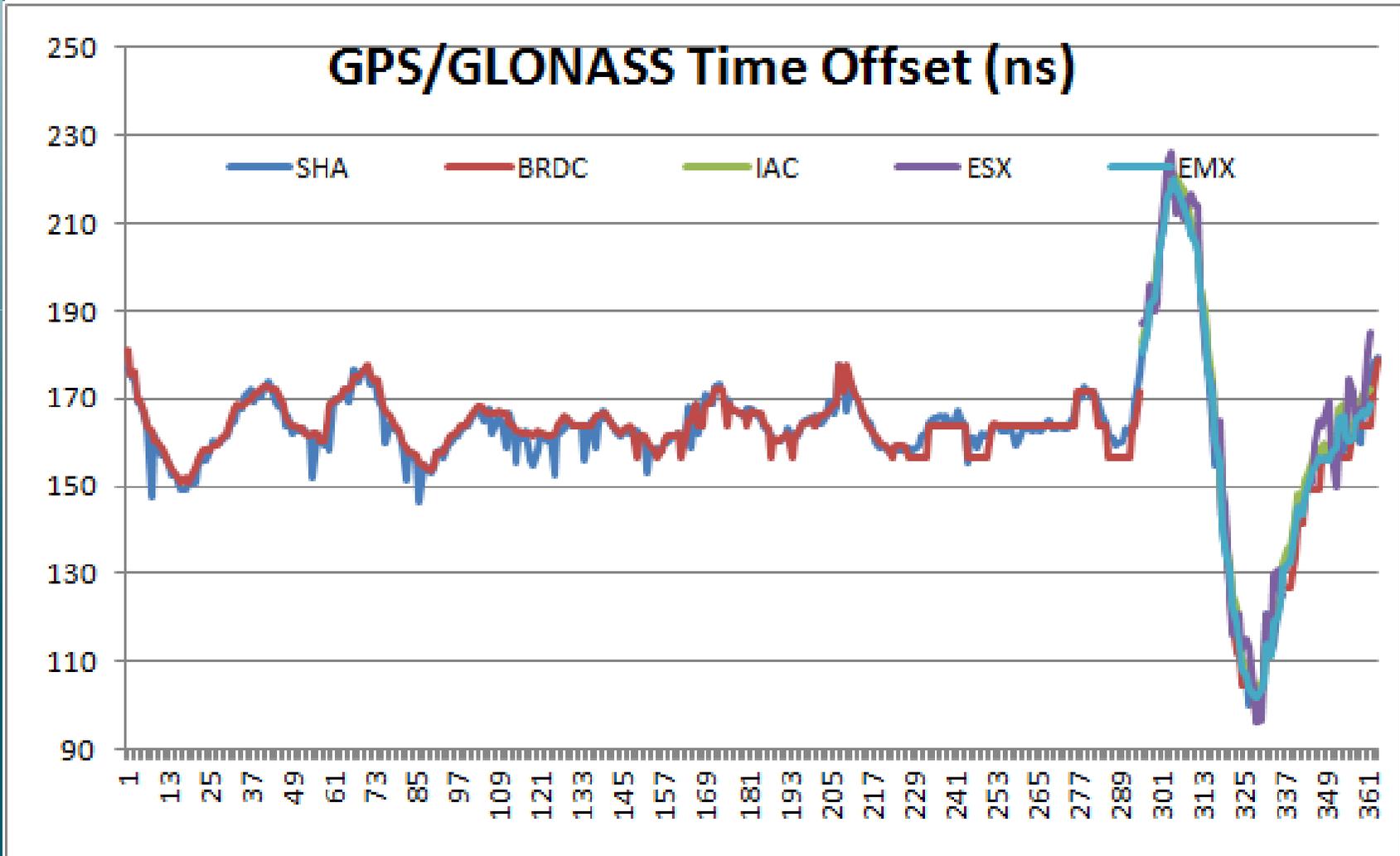
## Inter Frequency Bias





# GPS/GLONASS bias

## GPS/GLONASS ISB (TO)

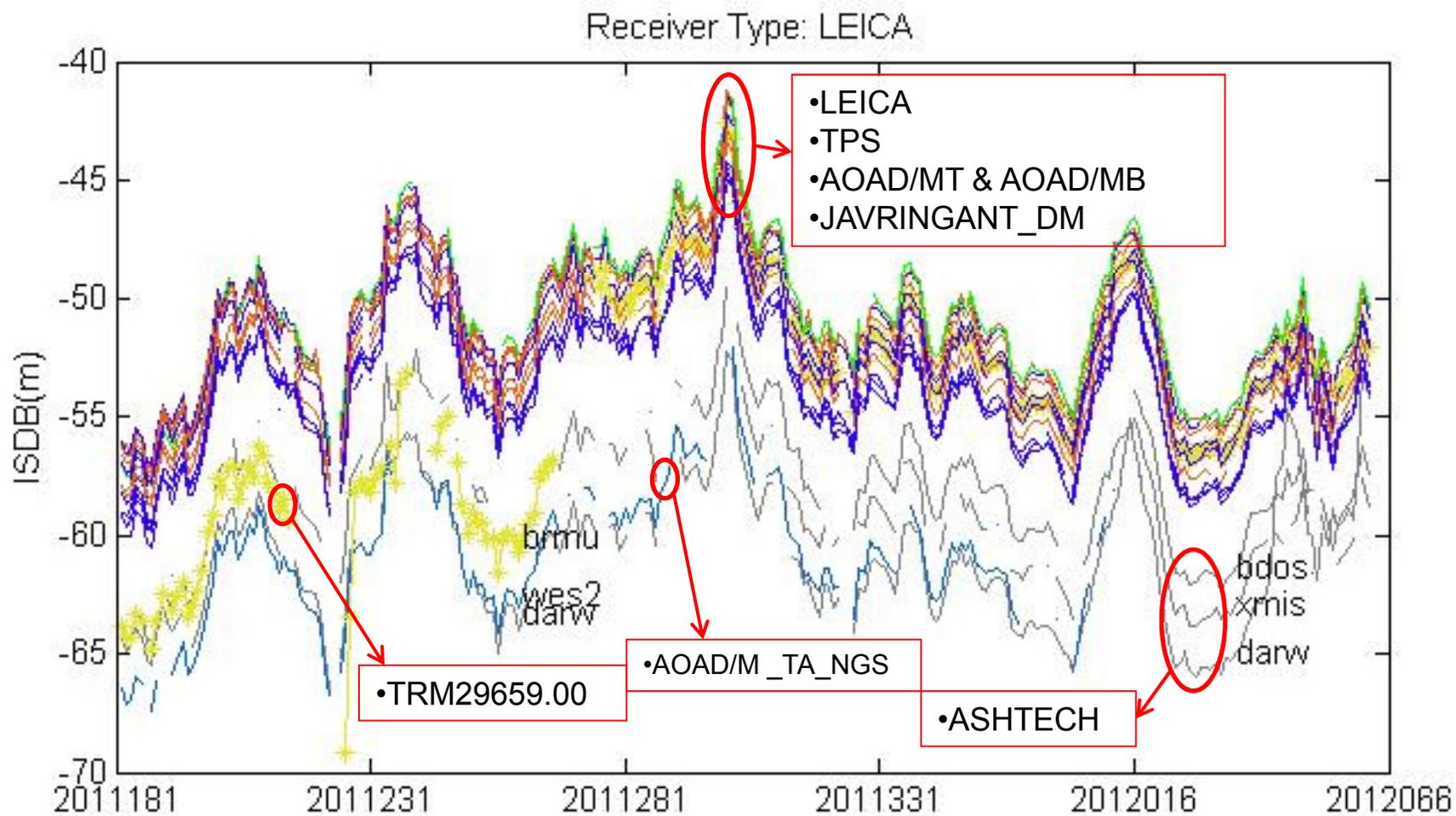




# GPS/GLONASS bias

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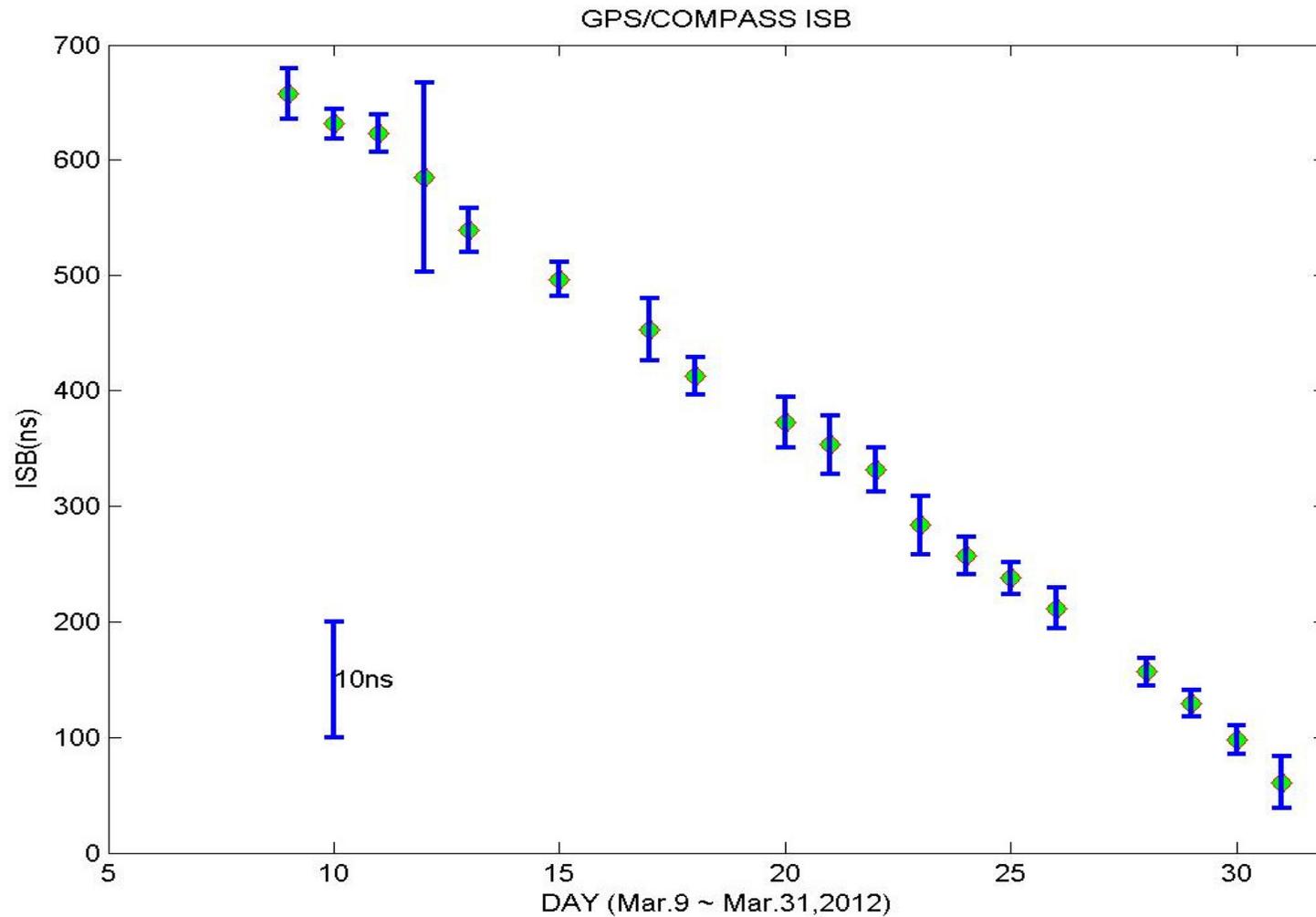
## GPS/GLONASS ISB (Station-wise)





# GPS/COMPASS bias

## GPS/COMPASS ISB (Station-wise)





## *SHA: GNSS data analysis at SHAO*

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- **Routine GNSS Data Analysis**
- **Towards Compass/Beidou Analysis center**
- **GNSS bias provided for users**  
**Served as corrections, especially for navigation!**



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***Thank you for your attention!***