



SLR-GNSS analysis in the framework of the ITRF2013 computation

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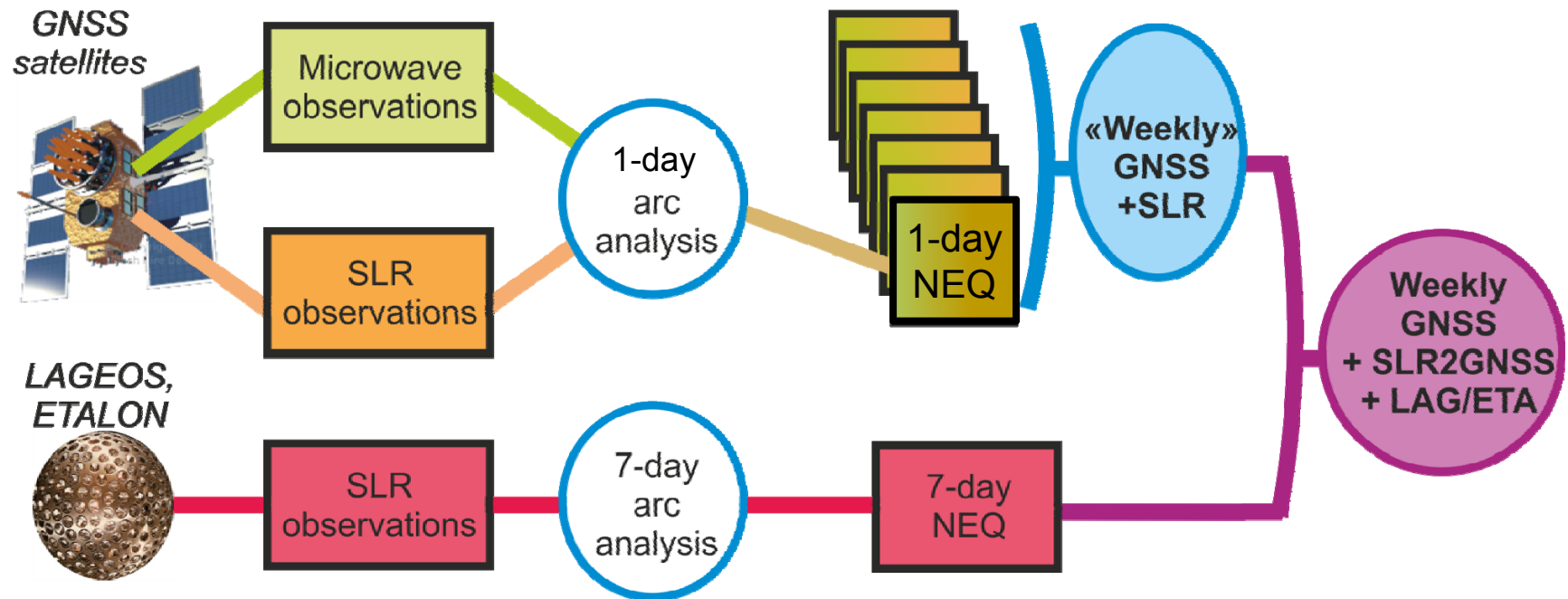
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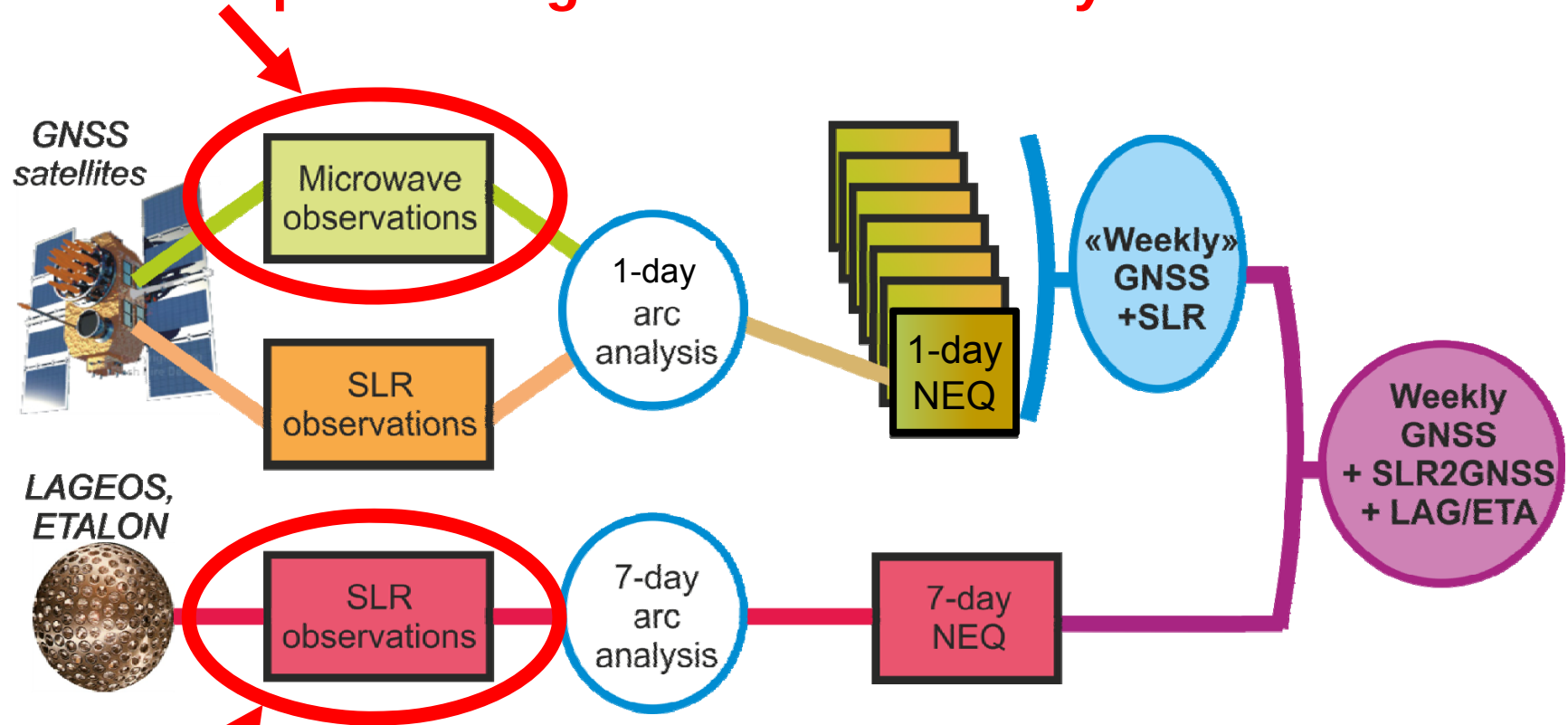
- ITRF2013 called for pre-combined solutions (for comparison purposes)
- SLR-GNSS combined solutions:
 - GPS / GLONASS: microwave observations
 - LAGEOS and Etalon: SLR observations
 - **GPS / GLONASS: SLR observations**
- Impact of datum definition on pre-combined solutions:
 - Geocenter
 - Scale
 - Earth Rotation Parameters (ERPs)

GNSS-SLR combination: Satellite co-location



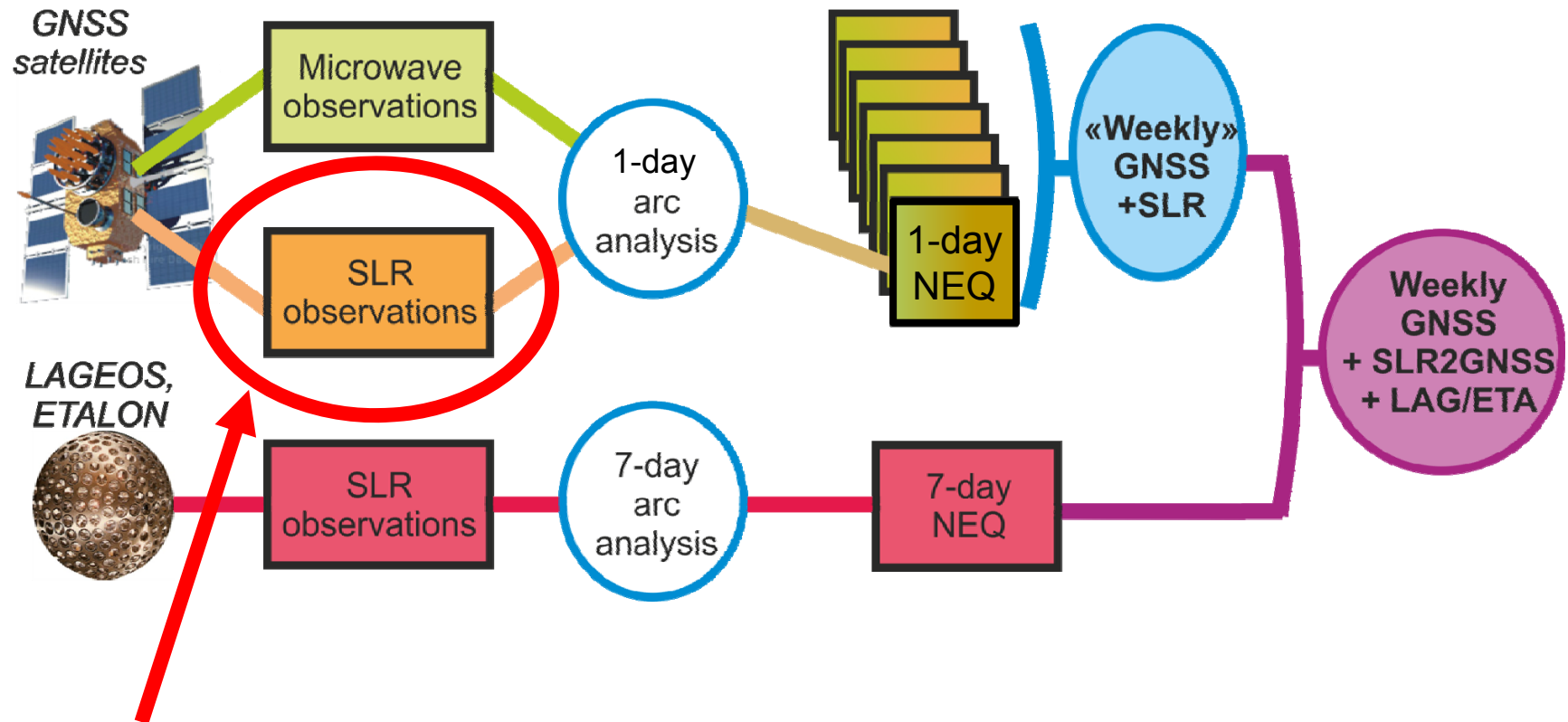
GNSS-SLR combination: Satellite co-location

IGS processing at the CODE Analysis Center

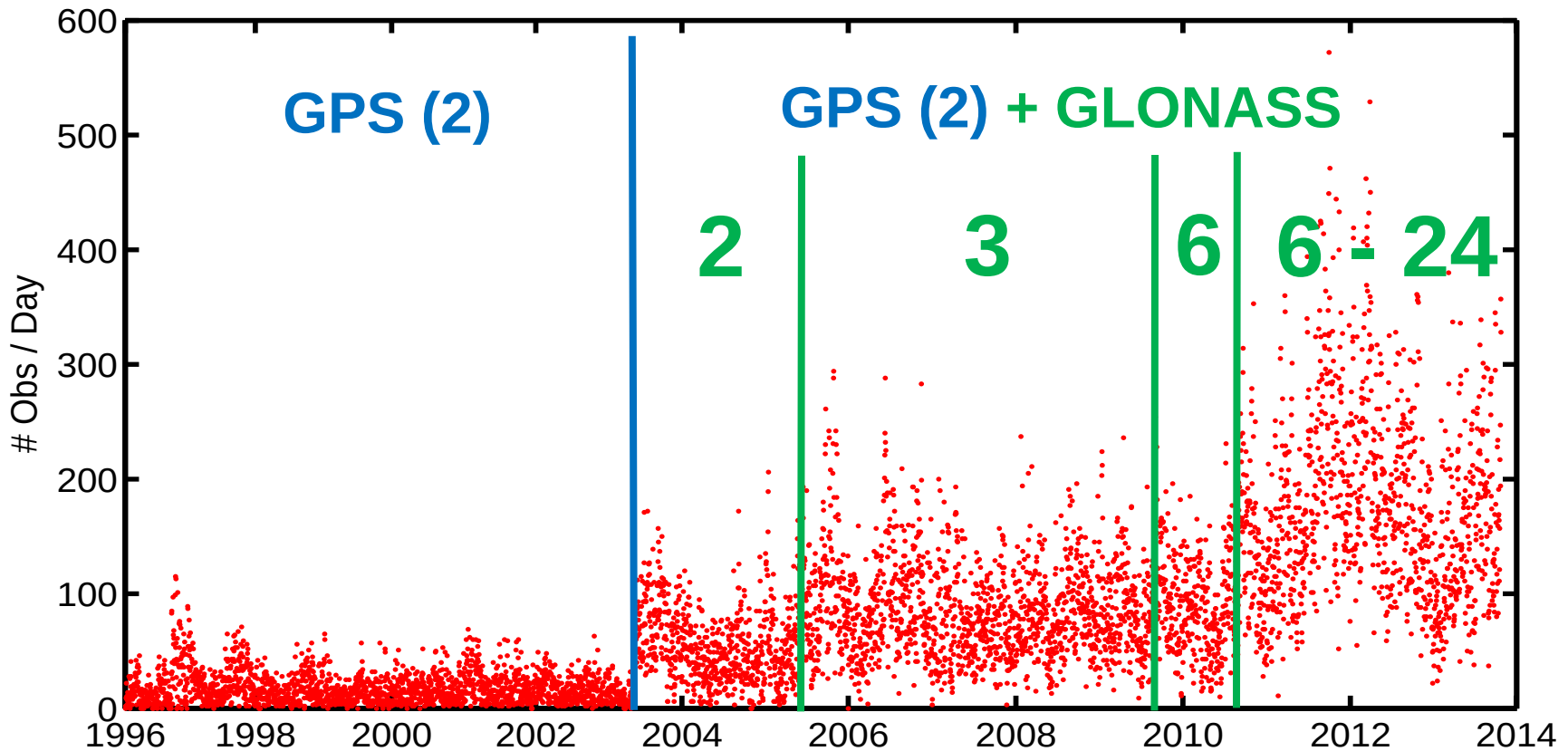


ILRS processing at the BKG Analysis Center

GNSS-SLR combination: Satellite co-location

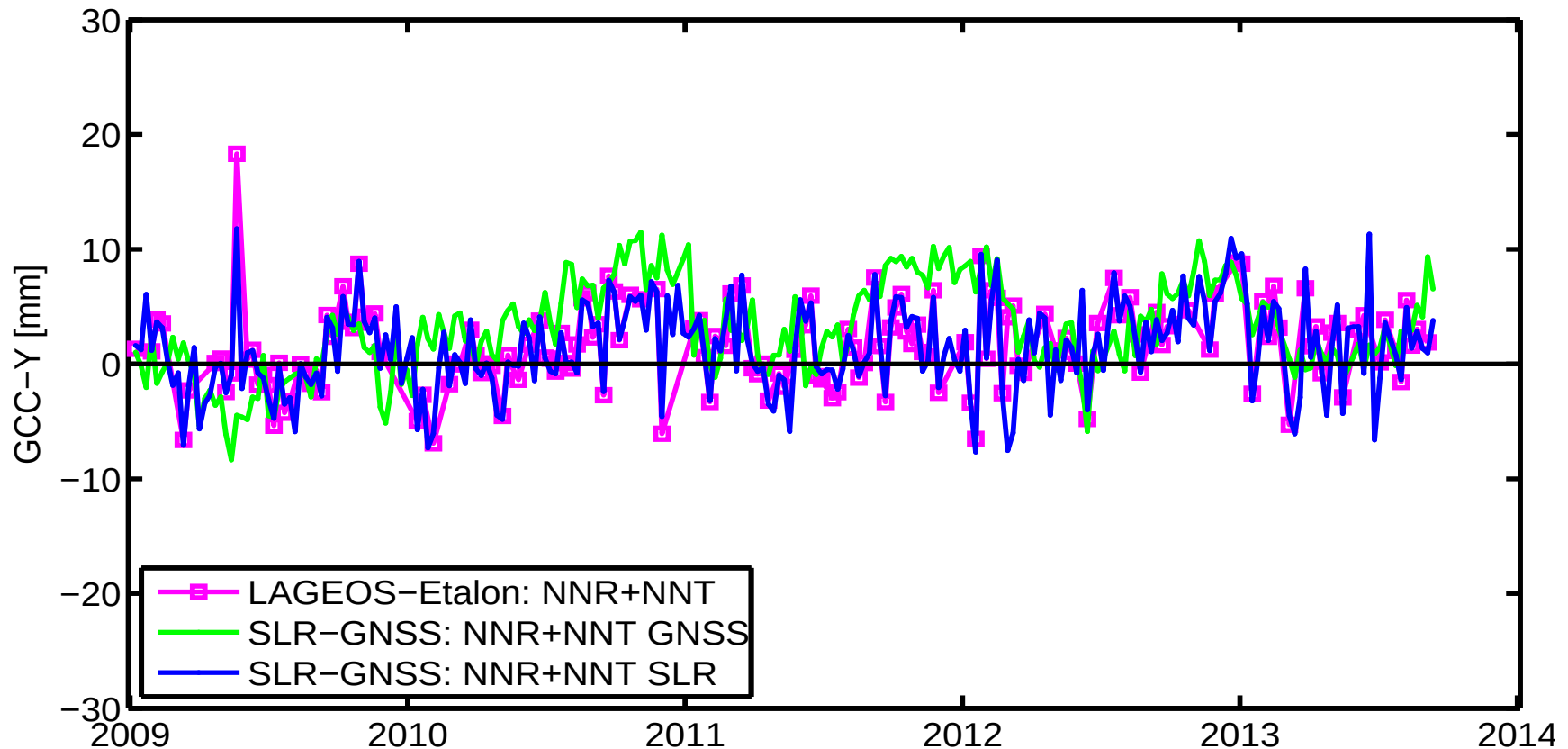


- Using **co-locations at GNSS satellites** for connecting both techniques

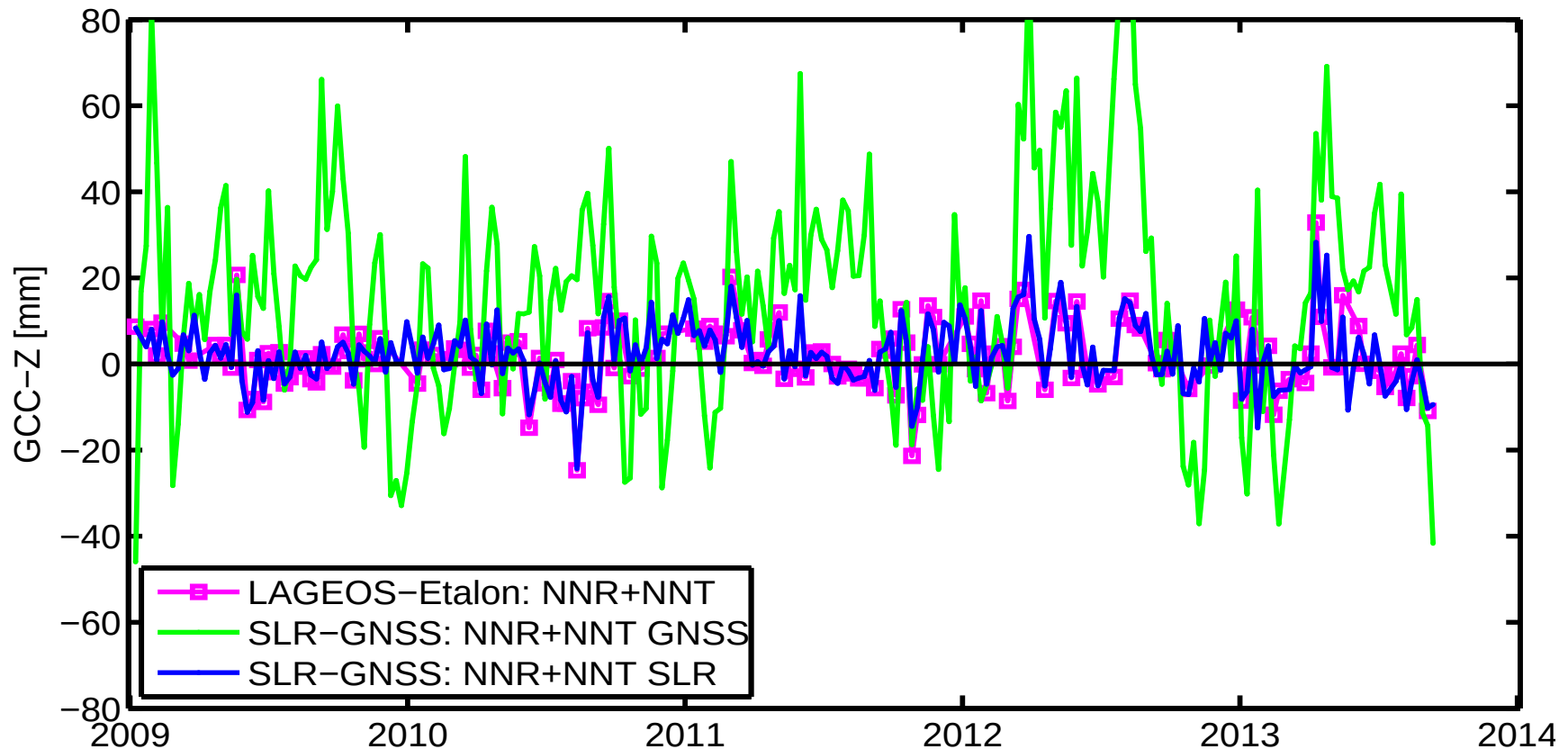


Studies presented here:
2009/Jan – 2013/Oct

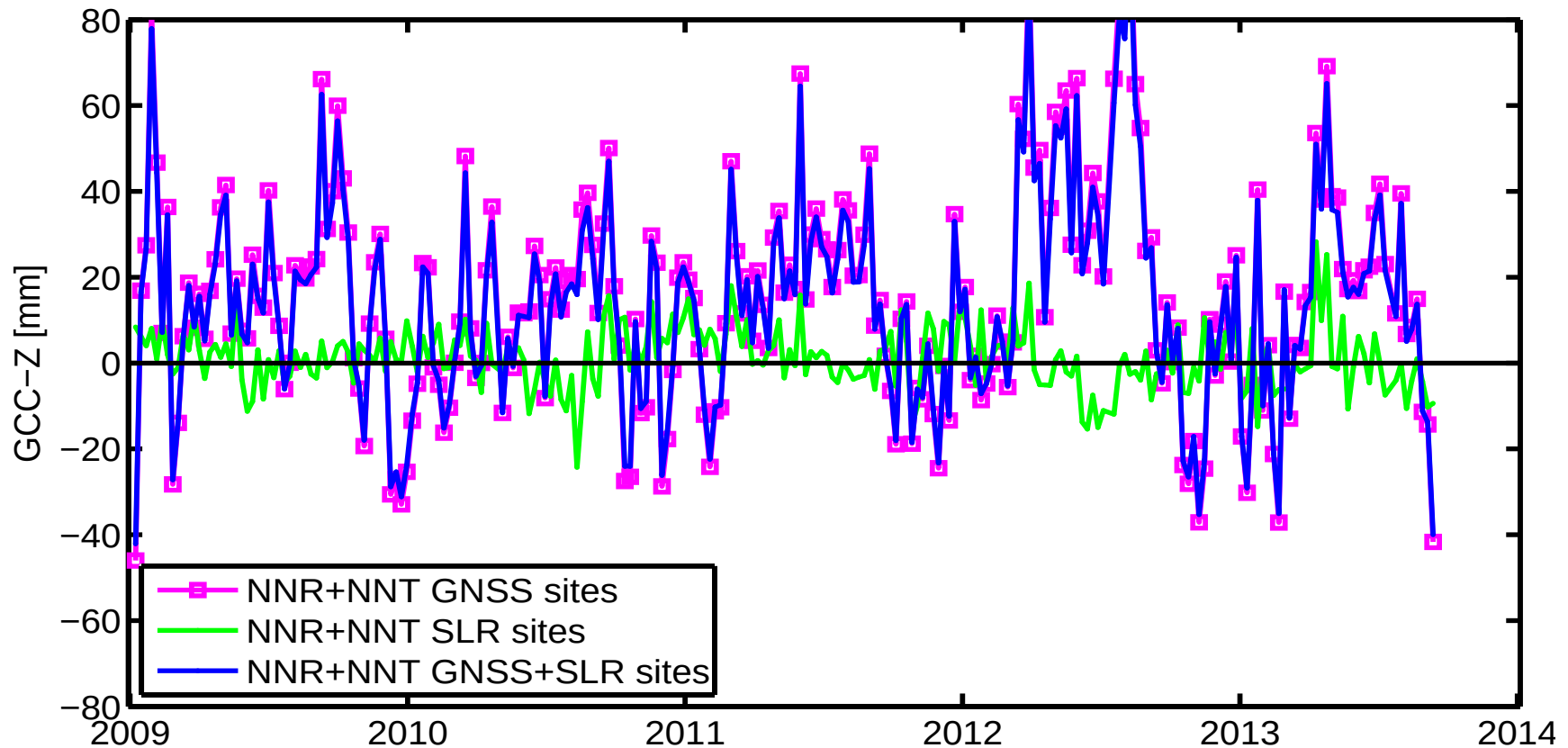
- 1) Use GNSS core network (~ 90 sites)
 - Dense network / many stations
 - (almost) identical network for each week
 - Orientation (= ERPs) should be defined well
 - Problems in geocenter may occur (artefacts from GNSS orbit modeling)
- 2) Use SLR core network (usually < 10 sites)
 - Sparse network
 - Changing network configuration from week to week
 - Orientation (= ERPs) may suffer
 - Geocenter should be unaffected by GNSS orbit modeling issues
- 3) Use combined GNSS+SLR core network
 - Benefit from GNSS (-> ERPs) and SLR (-> origin) ???
 - Not independent from local ties used in reference frame (ITRF2008)



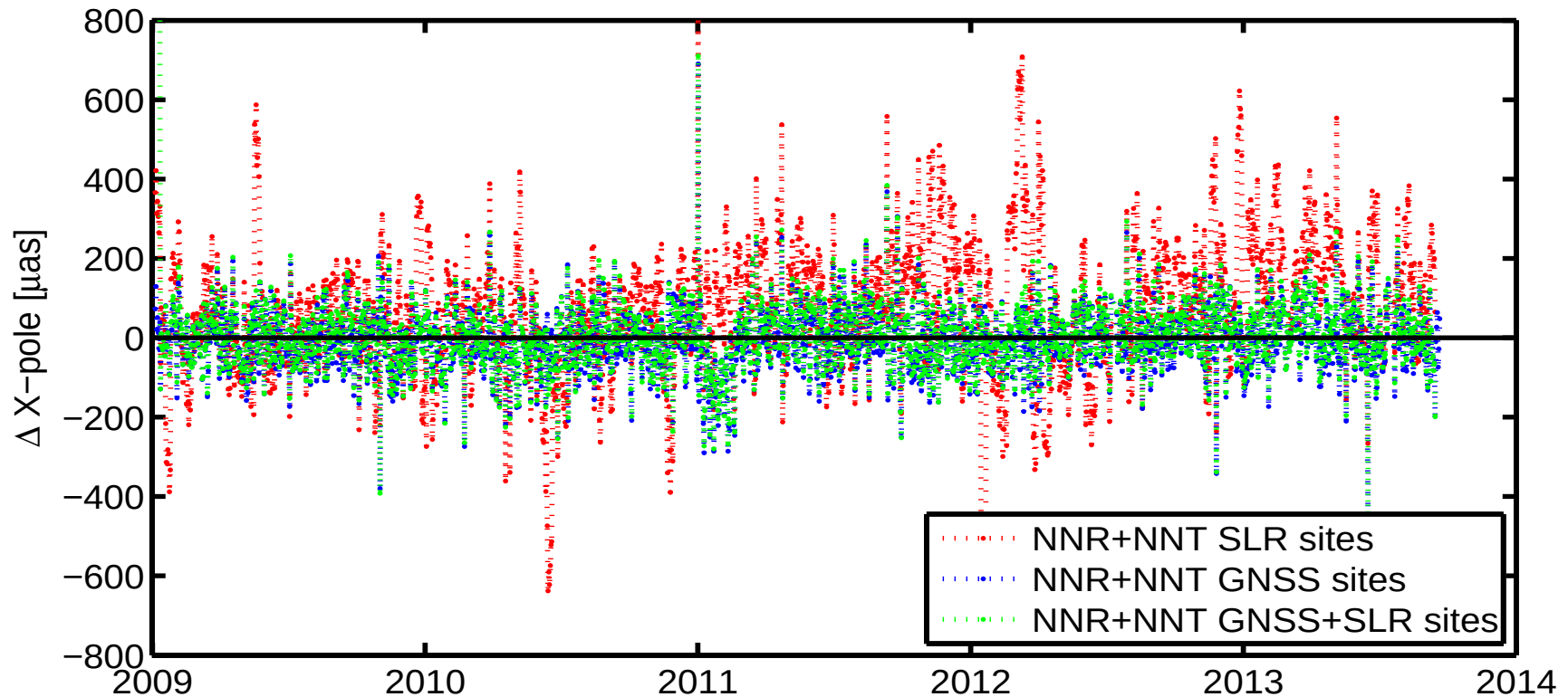
- Using **GNSS sites** shows slightly different signal than using **SLR sites**
- Using **SLR sites** reproduces **SLR-only solution**



- Using **GNSS sites** shows clearly different signal than using **SLR sites: draconitic year**
- Using **SLR sites** reproduces **SLR-only solution**



- Using **GNSS+SLR sites** for datum definition does not improve situation: GNSS is still dominating
- GNSS orbit modelling issues propagate into combination

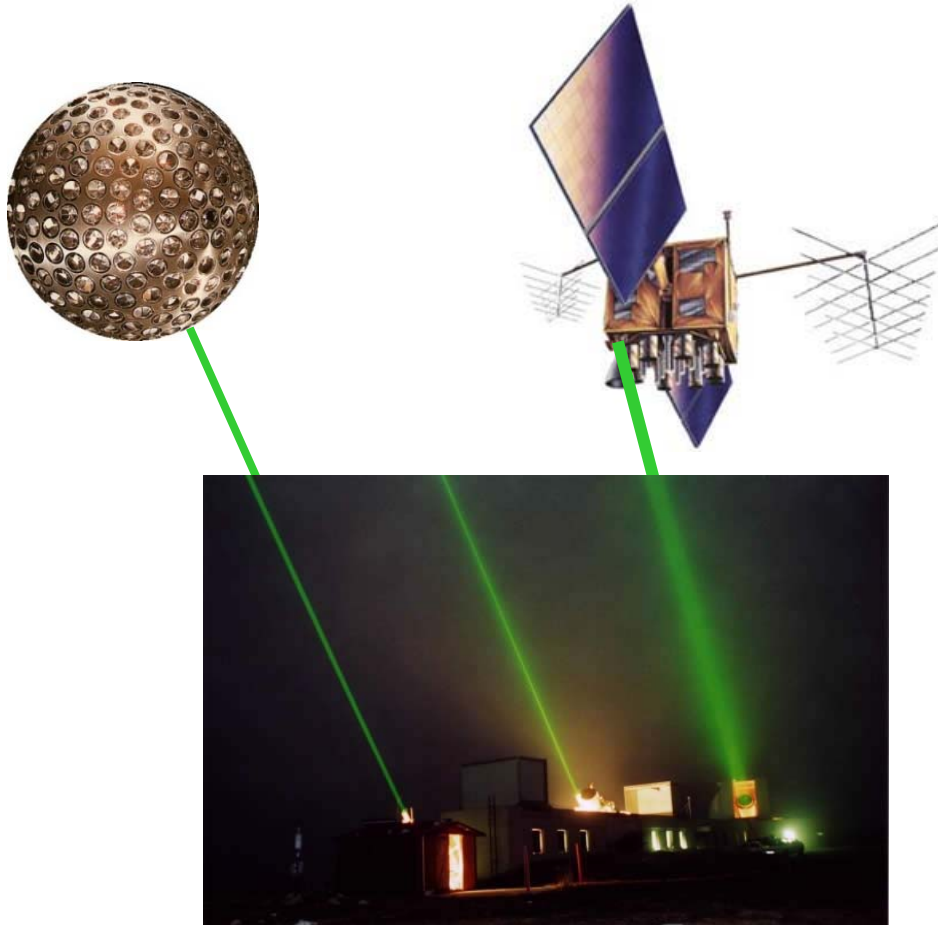


- Using **SLR core sites** results in noisier time series than using **GNSS core sites**
- Using **GNSS+SLR sites** slightly better than GNSS-only

- Weekly pre-combined GNSS-SLR solutions using satellite co-locations were studied
 - SLR observations to GPS/GLONASS are additionally used (compared to „standard“ ITRF contributions)
- **Geocenter coordinates** are highly influenced by GNSS orbit modelling as soon as GNSS core network is included in datum definition
- **ERPs** are more stable if dense GNSS core network is included in datum definition
- **Scale** is independent of the set of core sites used (not shown here)

- There is no set of core sites that is optimal for all parameters of interest
- GNSS orbit modelling (solar radiation pressure) is still a big issue:
 - Using 3-day orbits (instead of 1-day orbits) would help already
 - Constraining of once-per-rev parameters reduces the impact on geocenter
- The increased amount of SLR tracking to GLONASS helps to strengthen the connection via satellites

Thanks for your attention!



***DFG Forschergruppe
Referenzsysteme***

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