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IfE Contributions to Swarm GPS Data Analysis

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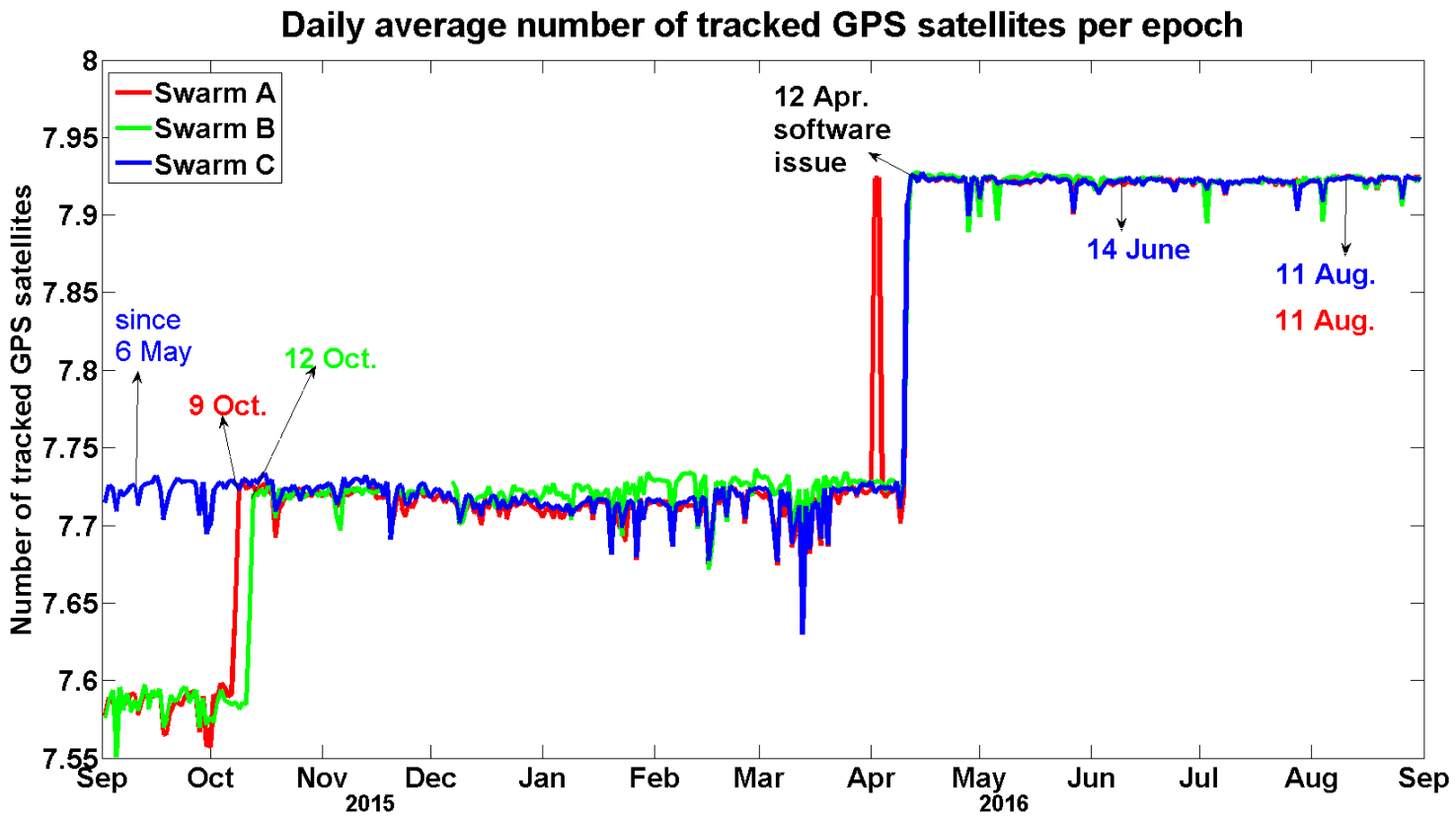
DynamicEarth SPP 1788

Structure

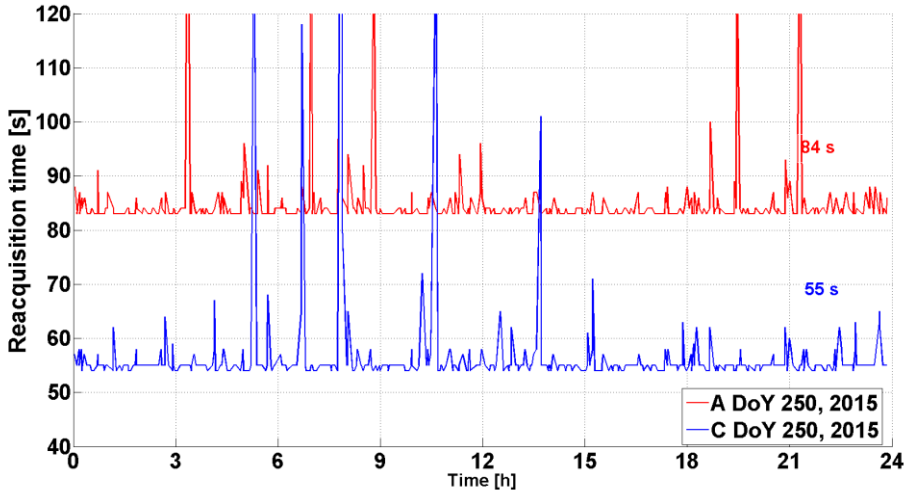
- 1. GPS tracking performance
- 2. Cycle slip
- 3. Covariance information

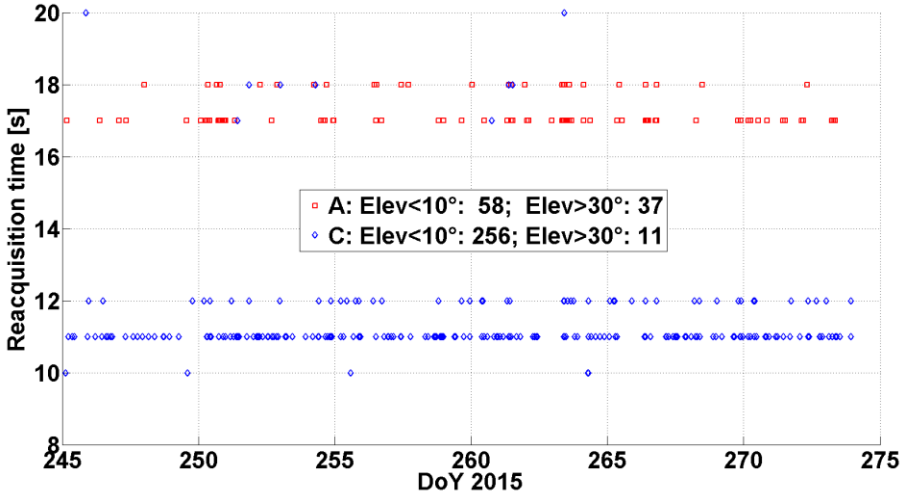
1. Tracking performance



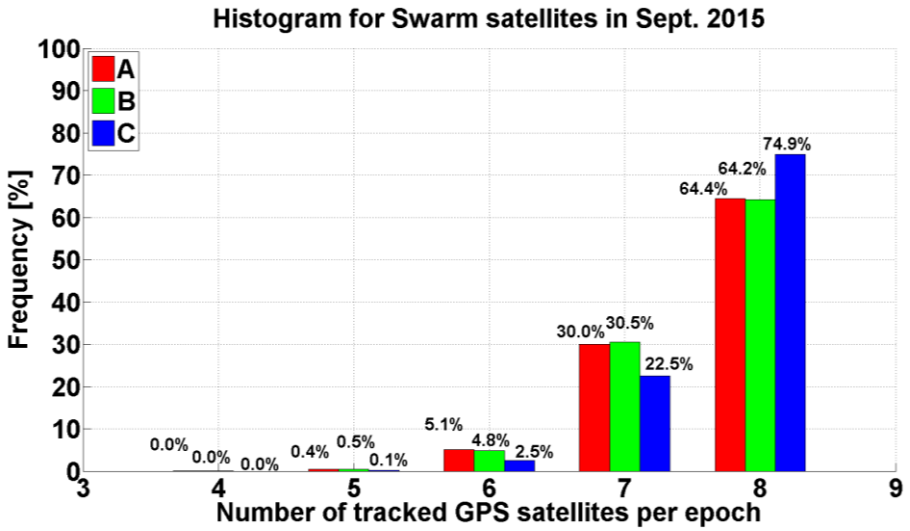
October, 2015: 7.58->7.72
April, 2016: 7.72->7.92
June, 2016: 7.92->7.92

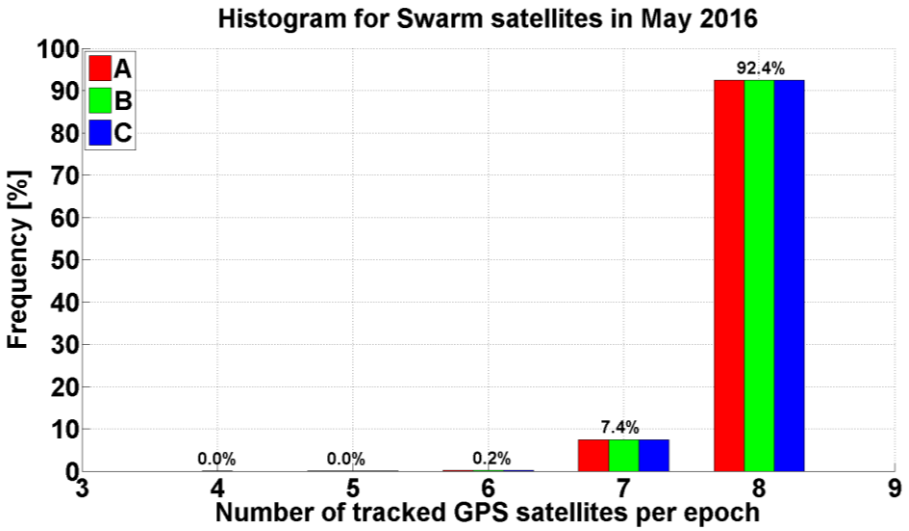
Reacquisition



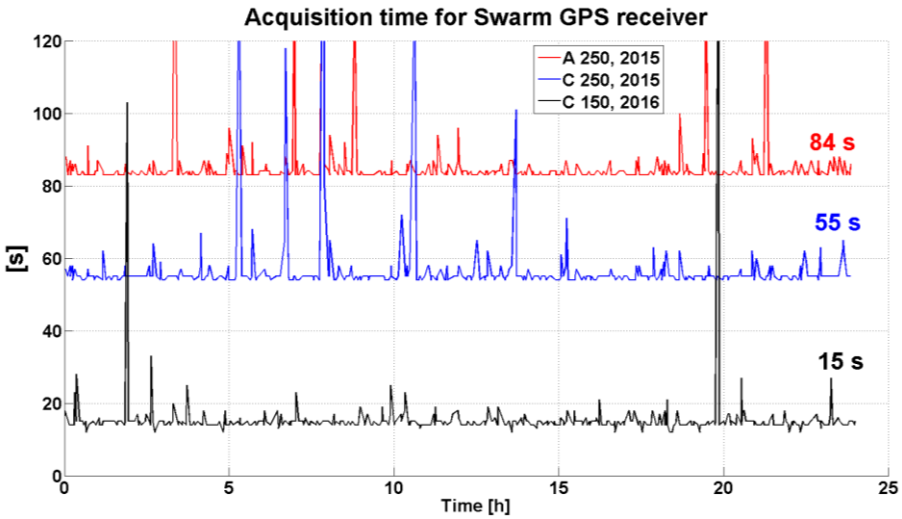


Histogram for tracked GPS satellites

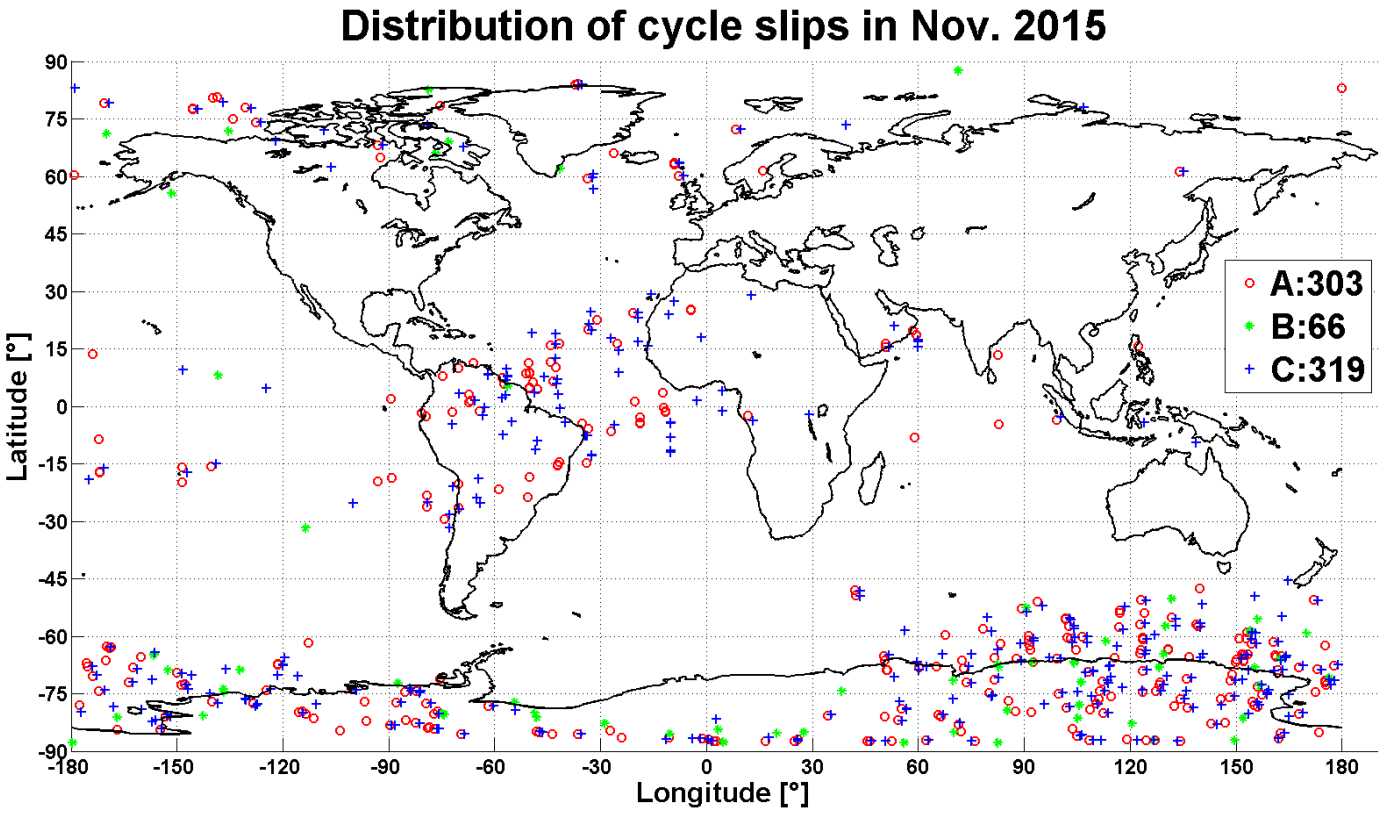




October, 2015: 64% → 75%
May, 2016: 75% → 92%
improvement due to the shortened acquisition time

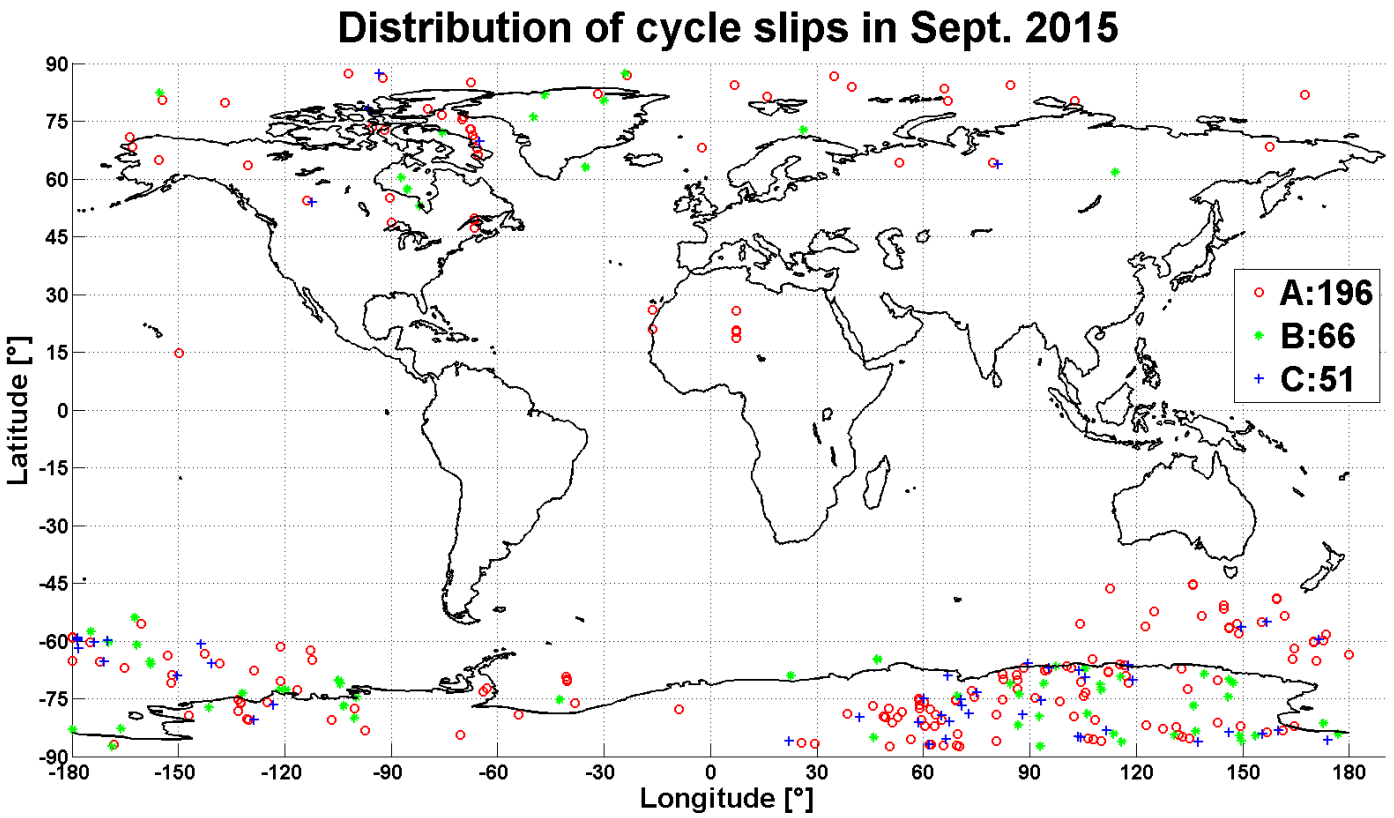


2. Cycle Slip



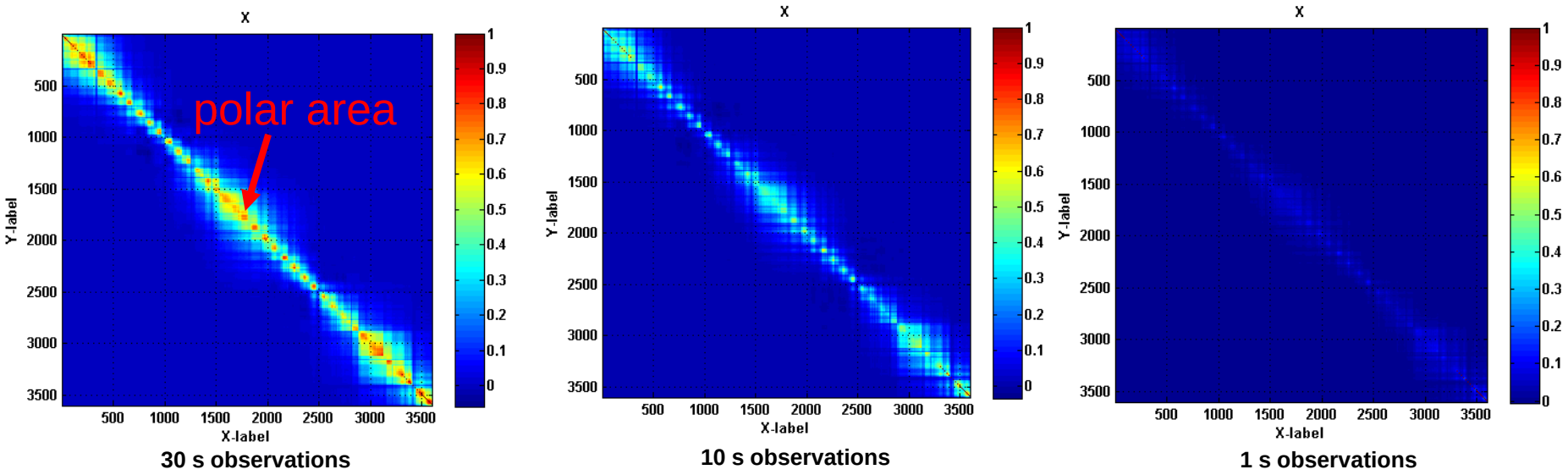
- at polar and equatorial areas
- Swarm A and C suffer from the cycle slips almost at the same time
- almost all the cycle slips occur on L_2

2. Cycle Slip



Number of cycle slips are significantly reduced after the update on Swam C

3. Covariance information



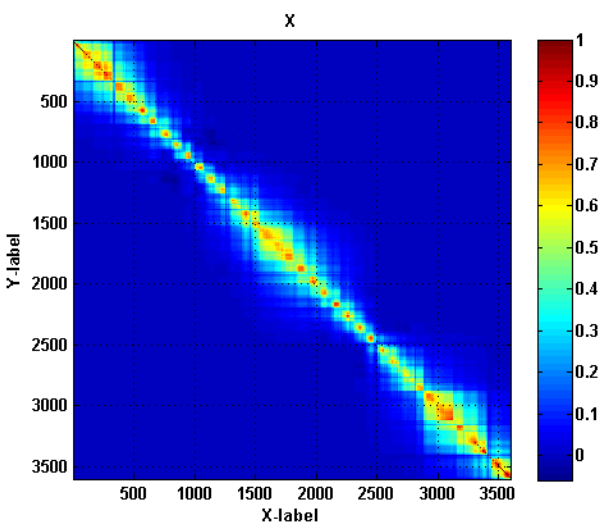
Computing covariance matrices for 30 hours PPP (30 s,10 s, 1 s data rate), shown here:

derived correlation matrices of X-component for common epochs (3600 epochs a 30 s on DoY 150, 2016 for Swarm C)

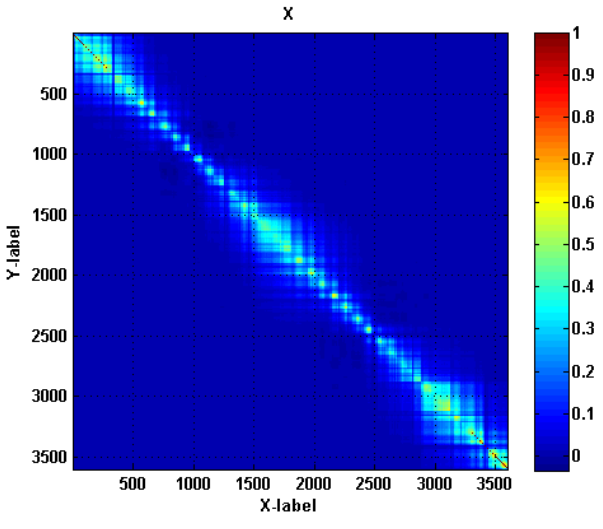
Results for 30 s data rate

- strong correlation (0.8), especially at polar areas
- correlation length: 0.5 hour (60 epochs) to 2.5 hour (500 epochs): probably due to ambiguity to observation ratio
- Changing correlation due to GPS constellation (12 hours)

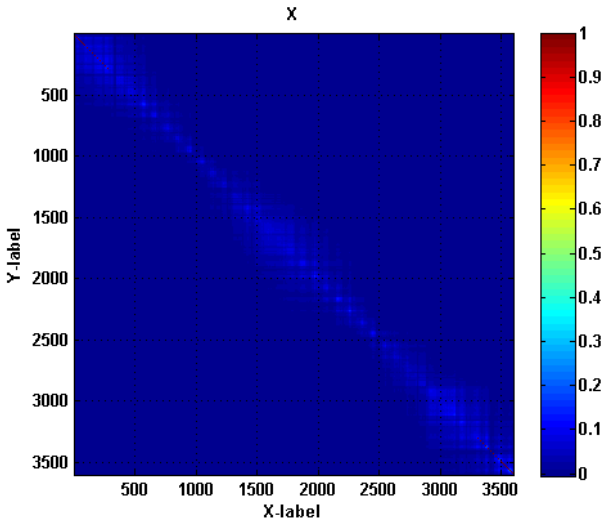
3. Covariance information



30 s observations



10 s observations



1 s observations

Results for 10 s data rate

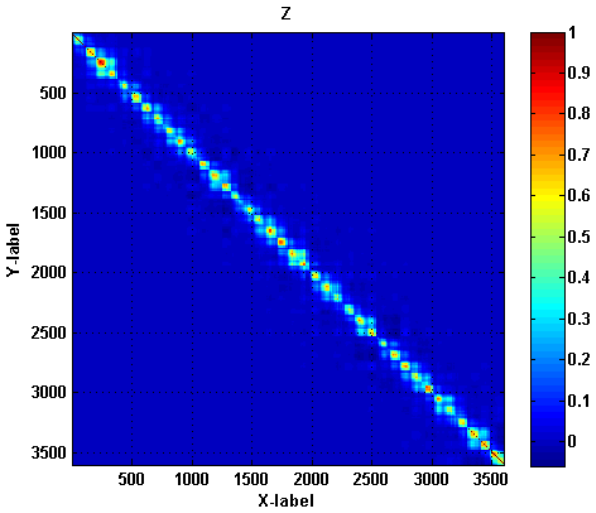
- strong correlation (0.4)
- similar pattern

Results for 1 s data rate

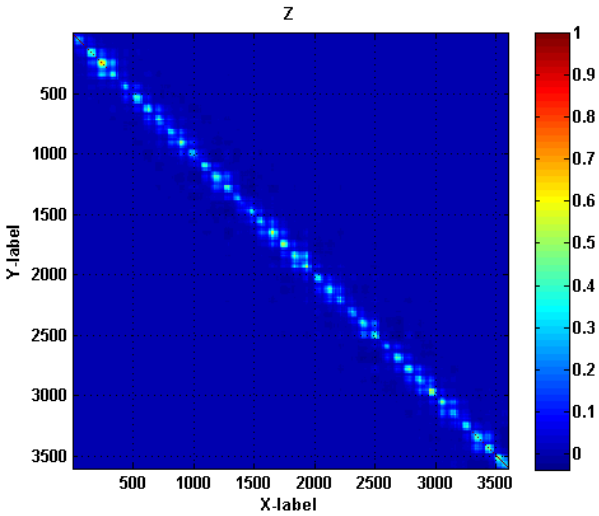
- weak correlation (0.1)
- similar pattern

decreased correlation with increasing data rate

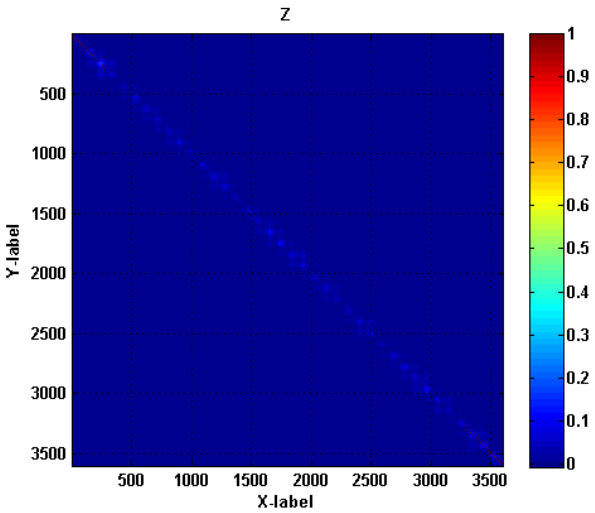
3. Covariance information



30 s observations



10 s observations



1 s observations

- weaker correlation (0.5) in Z-component
- shorter correlation length: 0.5 hour (60 epochs) to 1 hour (100 epochs)

Conclusions

- more satellites after the update
- fewer cycle slip after the update → impact of ionosphere on GPS receiver
- correlation due to ambiguity → impact on gravity field recovery should be further investigated

Thank you for your attention

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