

# FIG WORKING WEEK 2017

Surveying the world of tomorrow -

Helsinki Finland 29 May - 2 June 2017

From digitalisation to augmented reality

Presented at the FIG Working Week 2017,  
May 29 - June 2, 2017 in Helsinki, Finland

## Assessment of the effects of combining multi-GNSS constellations on the solution accuracy and availability

By:

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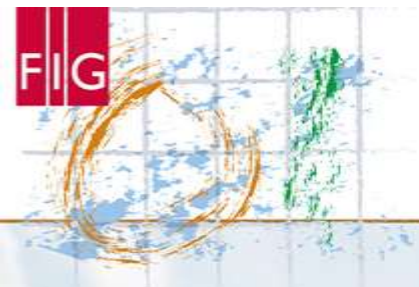
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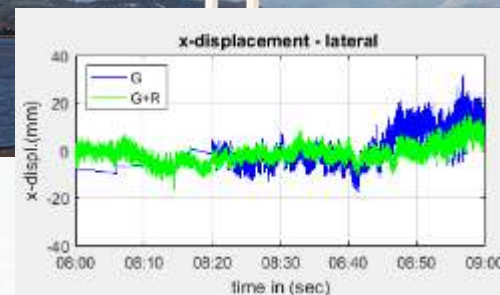
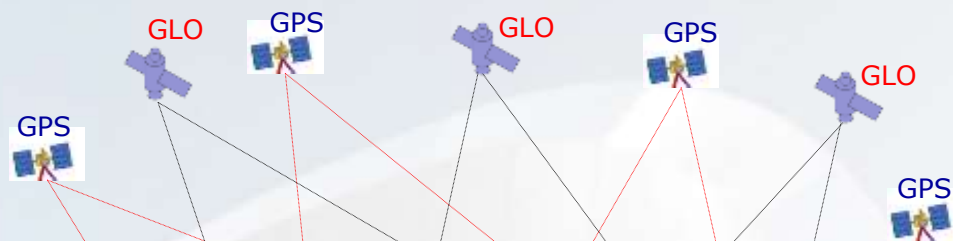
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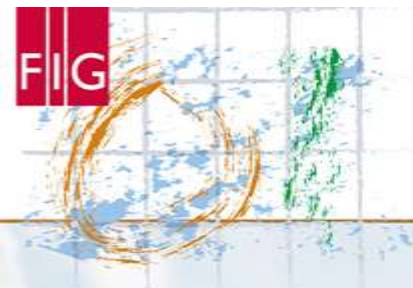
## ➤ Preface

## ➤ Define the problem

## ➤ Aims

- To assess the contribution of adding GLO or BDS const.
- Possibility of reduce the noise level
- Assess the improvement in positional accuracy
- Correlate the Geometry with the precision of noise





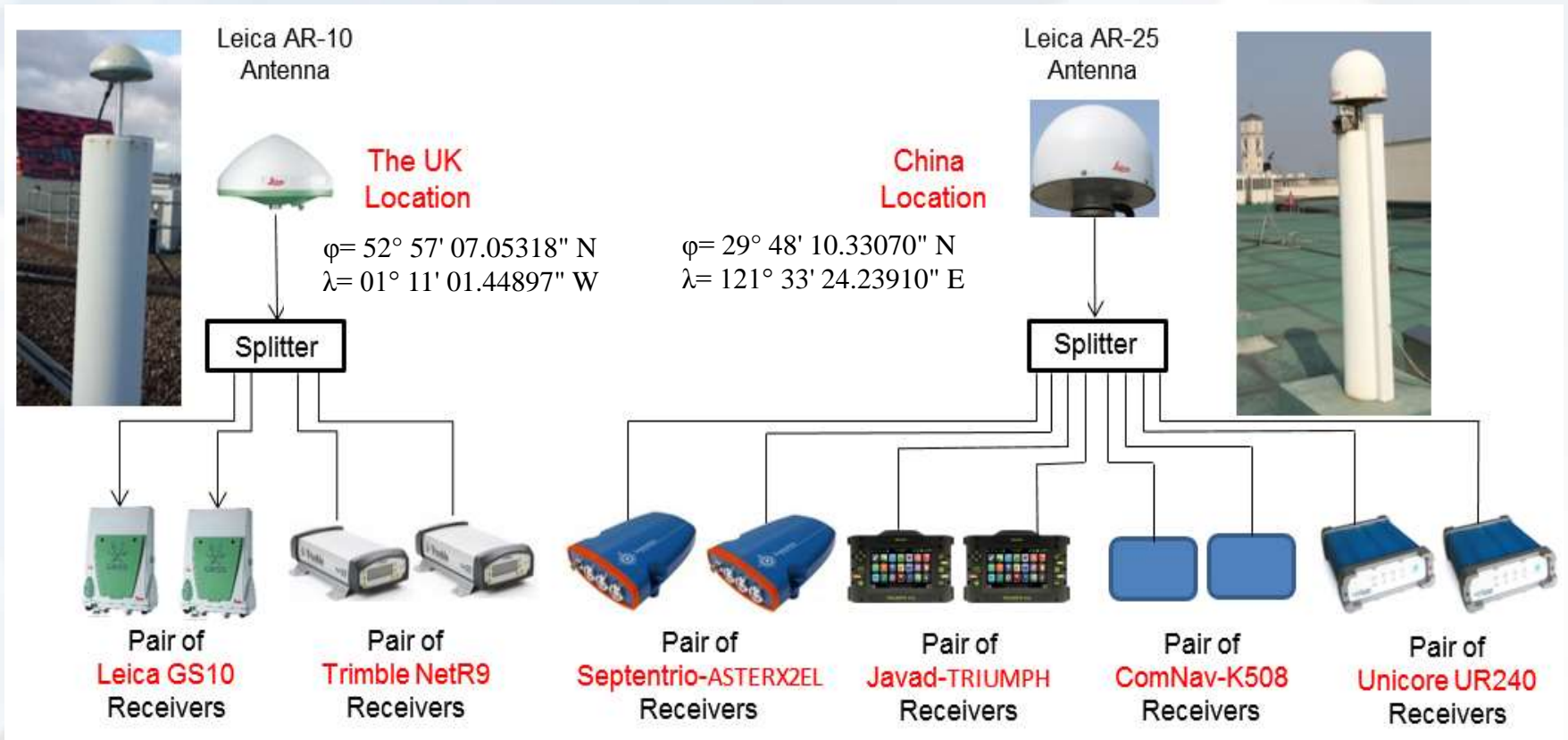
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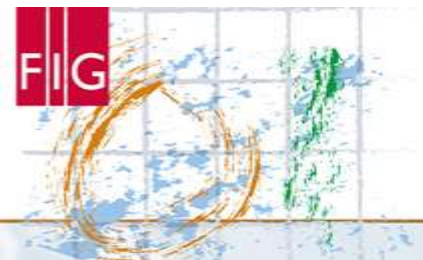
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- Zero baseline experiment setup







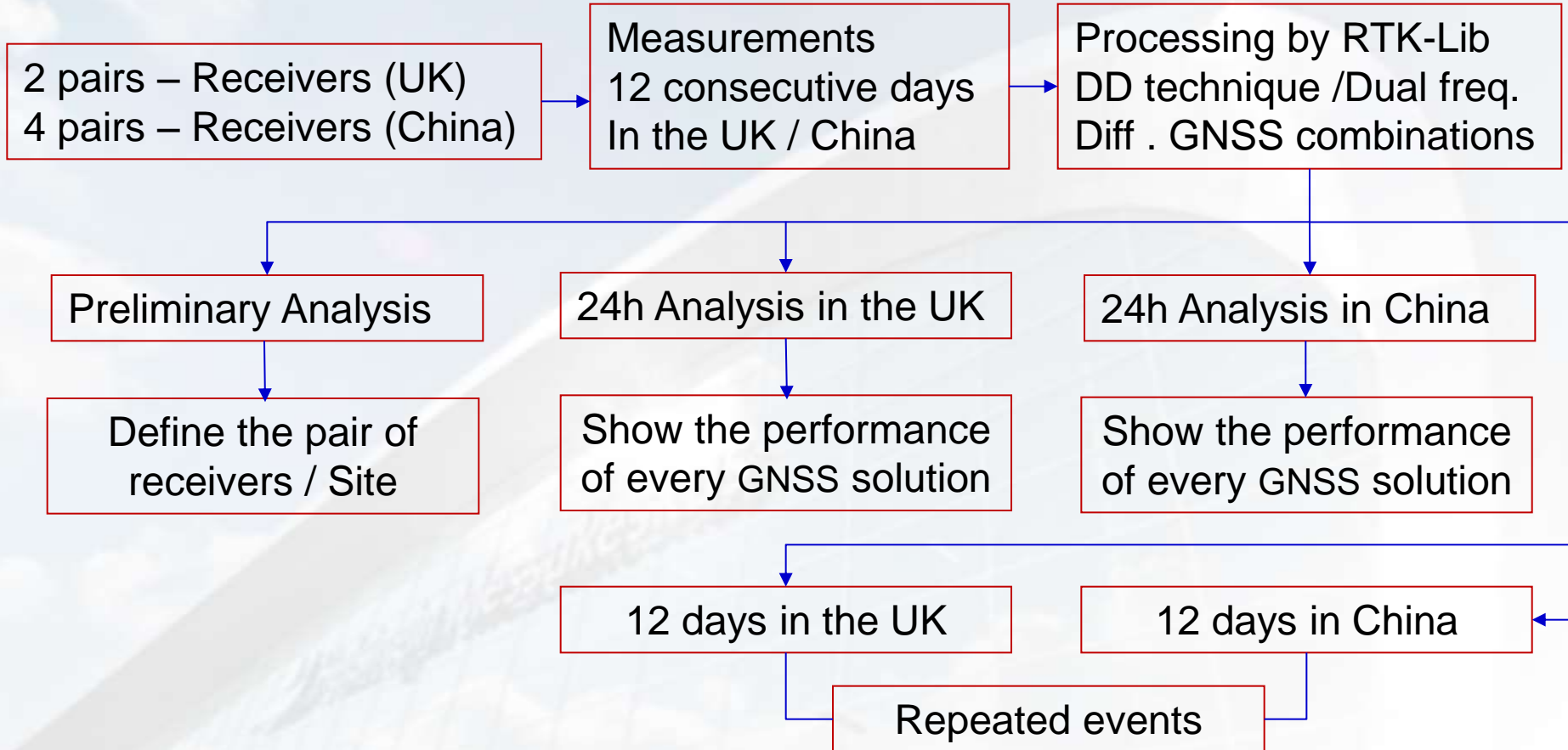
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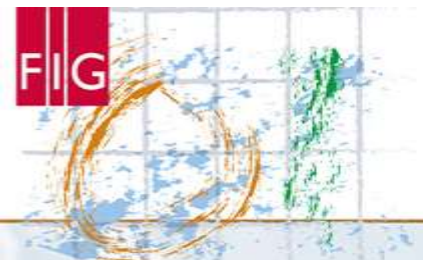
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## • Procedure





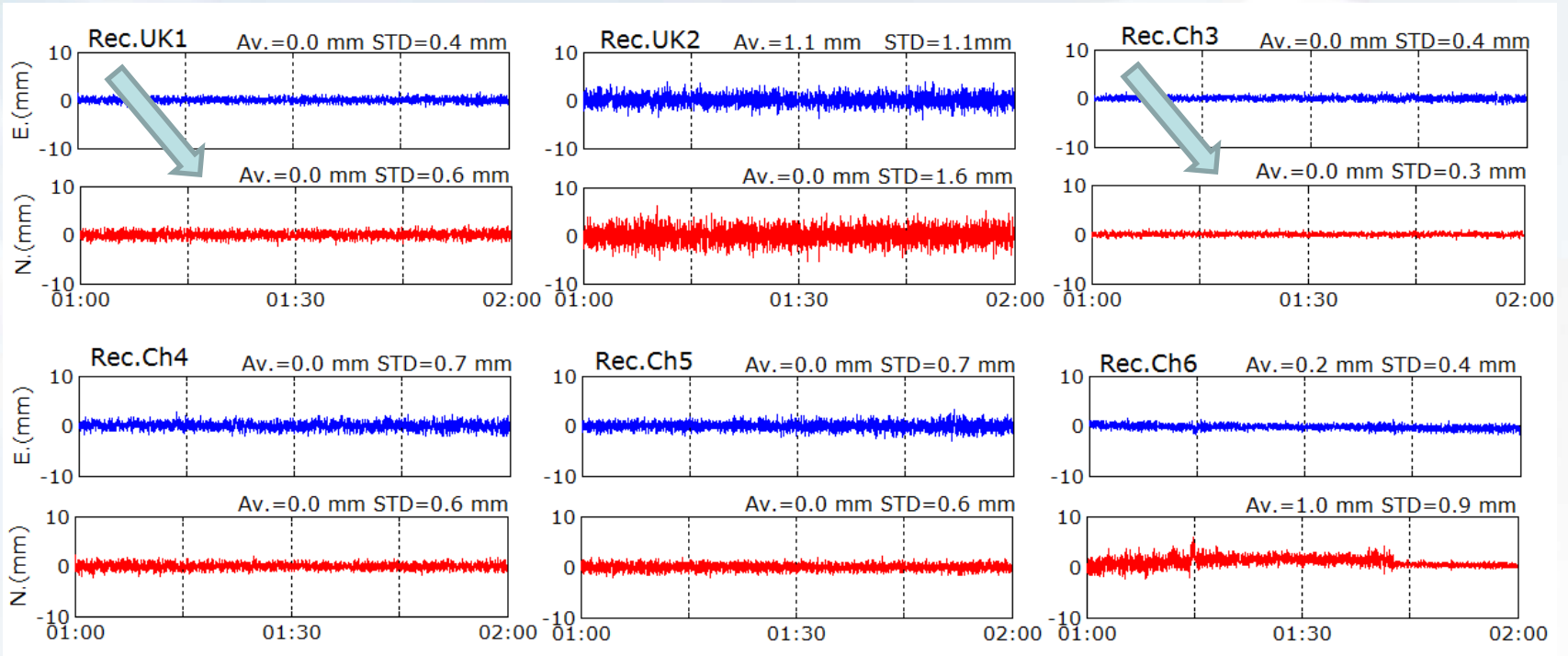
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- Preliminary analysis of 1h duration**

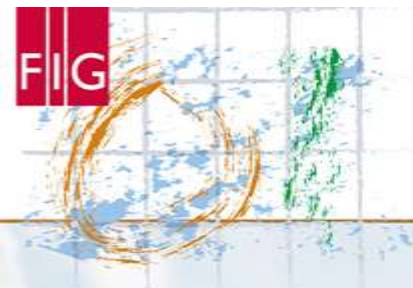


GPS time series of the zero-baseline records of the six types of receivers for the UK and China sites.



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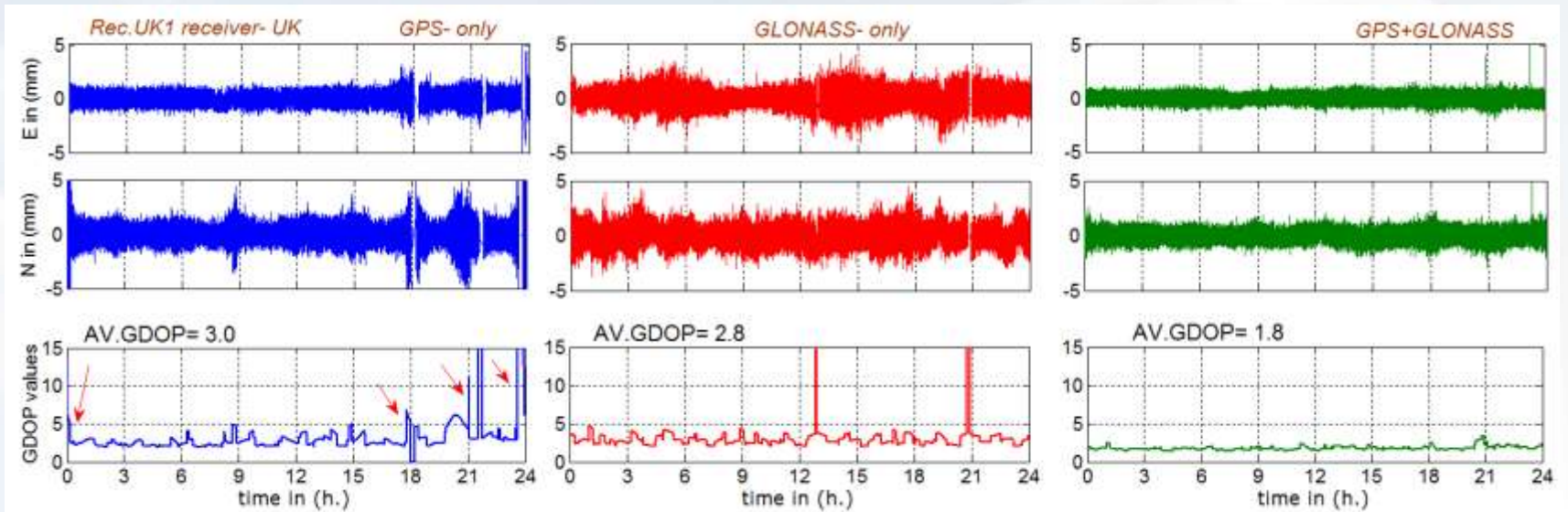
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- Availability of 24h in the UK

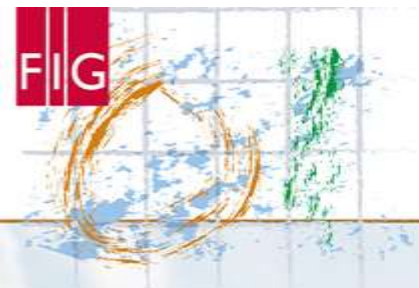


Daily time series showing GPS-only (left), GLO-only (centre) and combined GPS+GLO (right) with Rec. UK1 receiver (UK site) on 05/03/2015.



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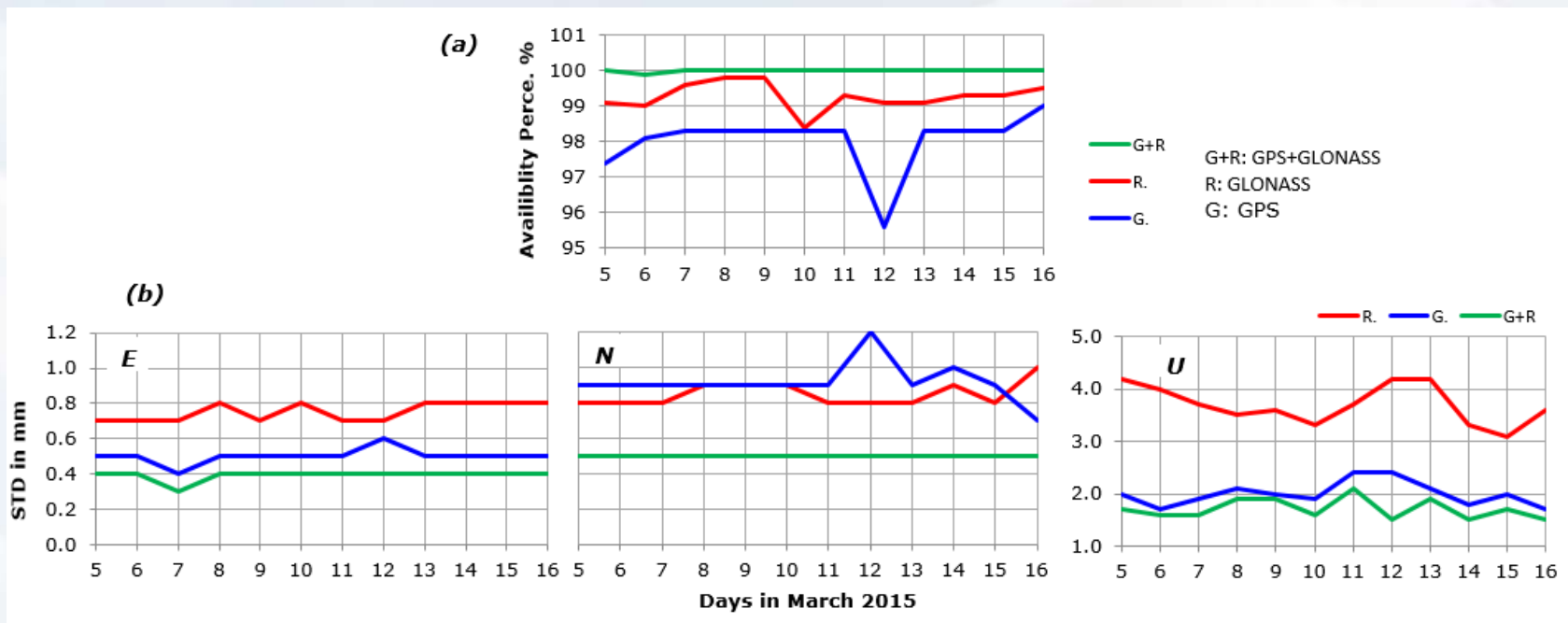
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- Comparison of Availability and Precision for 12 days in the UK



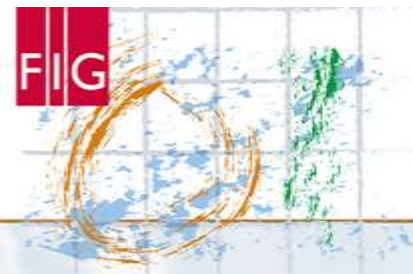
(a) Availability and (b) precision expressed as STD at the UK site with Rec.UK1 over the 12 days period of the measurements.



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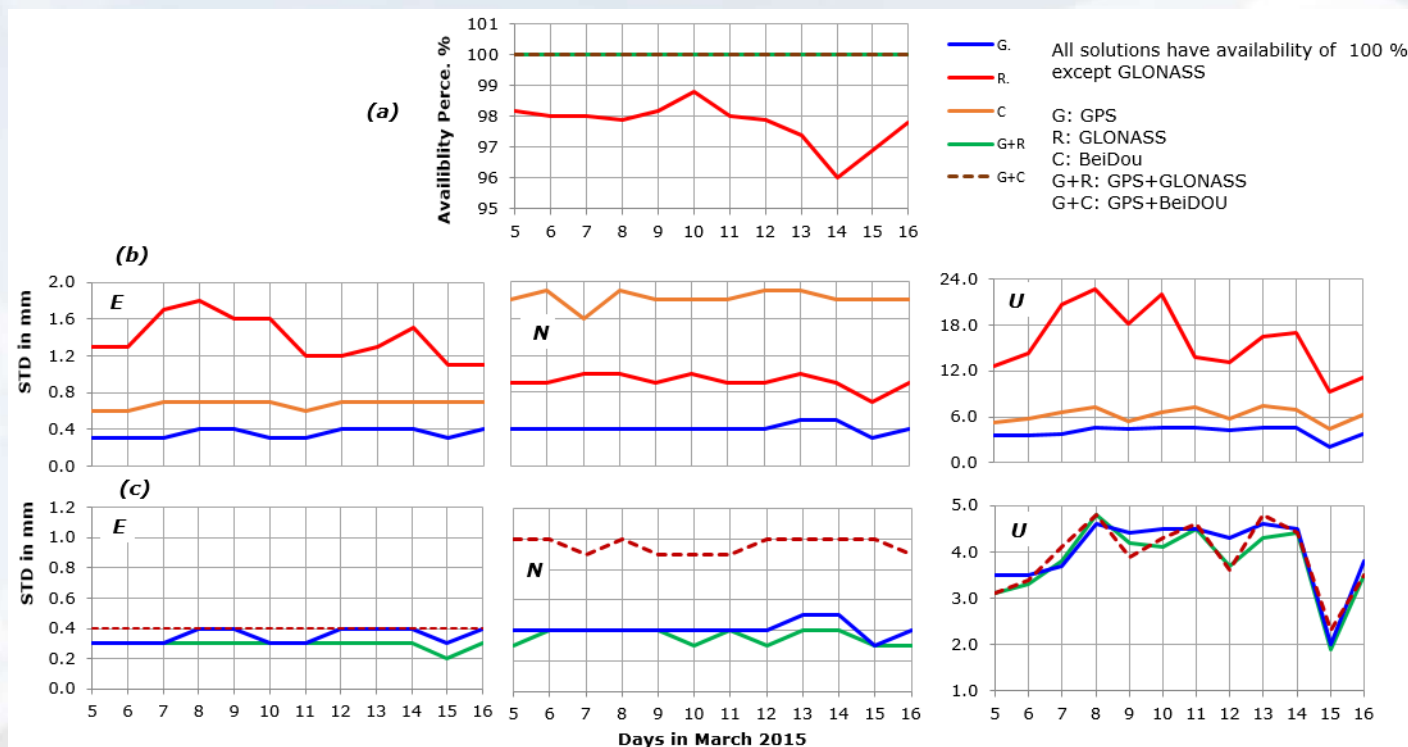
# FIG WORKING WEEK 2017

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From digitalisation to augmented reality

- Comparison of Availability and Precision for 12 days in China



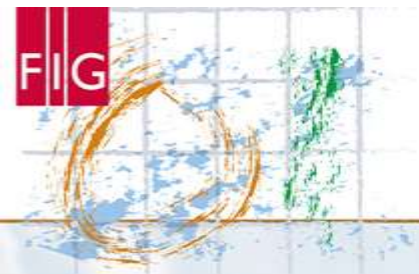
a) Availability of fixed solution and (b) comparison between precision expressed as STD of individual GPS, GLO and BDS solutions and c) GPS-only, combined GPS/GLO and combined GPS/BDS at the China site with Rec.Ch3, during the 12 days period of the measurements.



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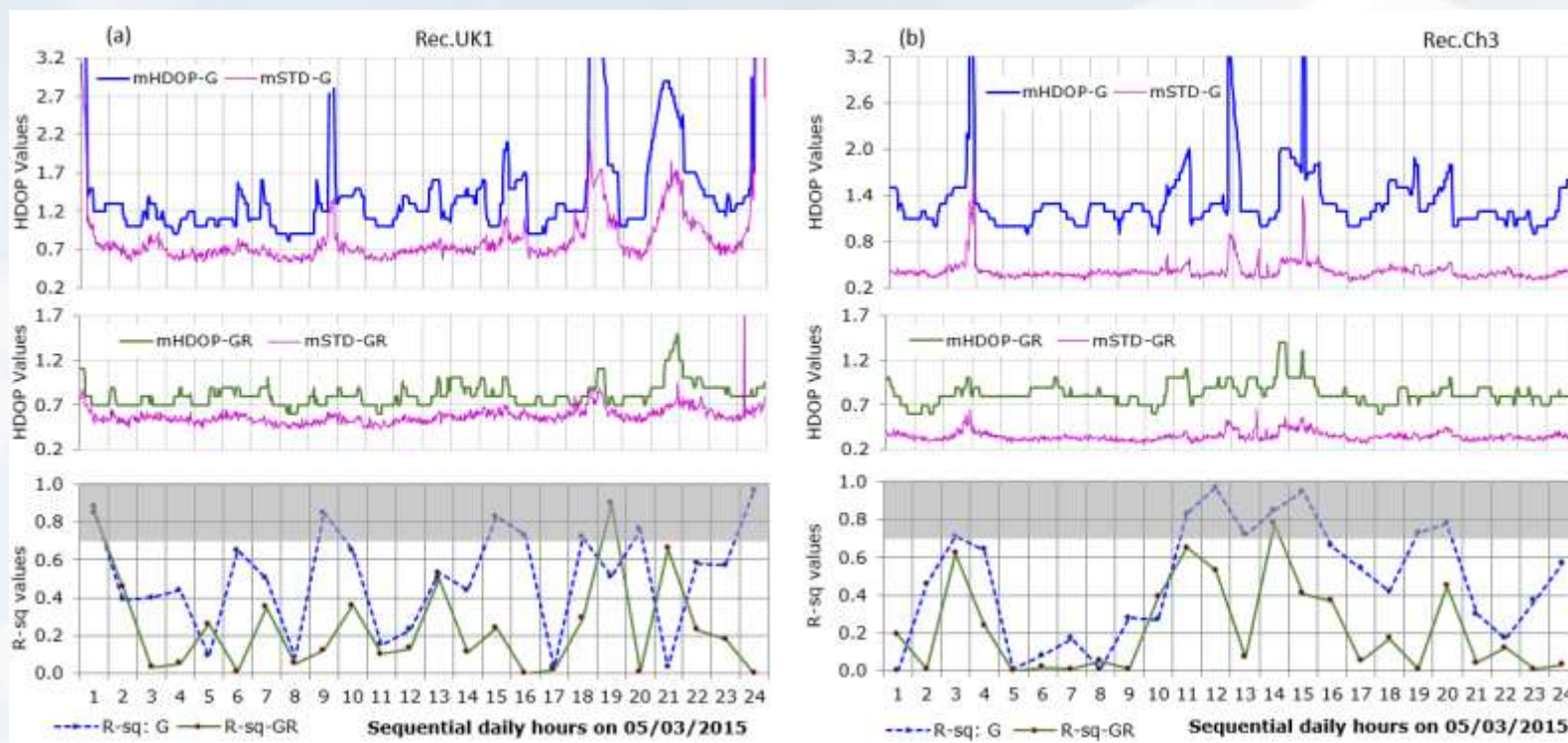
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- Noise and Geometry Correlation

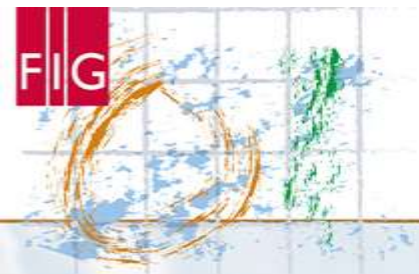


Linear correlation between moving average of the HDOP values and the moving STD of the corresponding horizontal component for GPS-only and combined GPS/GLO solutions for (a) the UK site (b) China site.



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- **Conclusions**

- The combination of GPS with other GNSS constellations can overcome problematic periods
- Ability of combined solution to reduce the noise level and improved the positioning precision
- There is a correlation between GNSS geometry expressed by DOP values and the precision of noise characterised by STD
- The high correlated intervals can identified when the DOP values and STD are larger than the limit of daily mean of the corresponding DOP and STD, while lower correlation occurred in periods lower than this limit.
- The impact of this correlation can be applied when analyse the noise of GNSS constellations

*Thanks For Your Listening*



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