Decorrelation of GRACE time variable gravity field solutions using full covariance information

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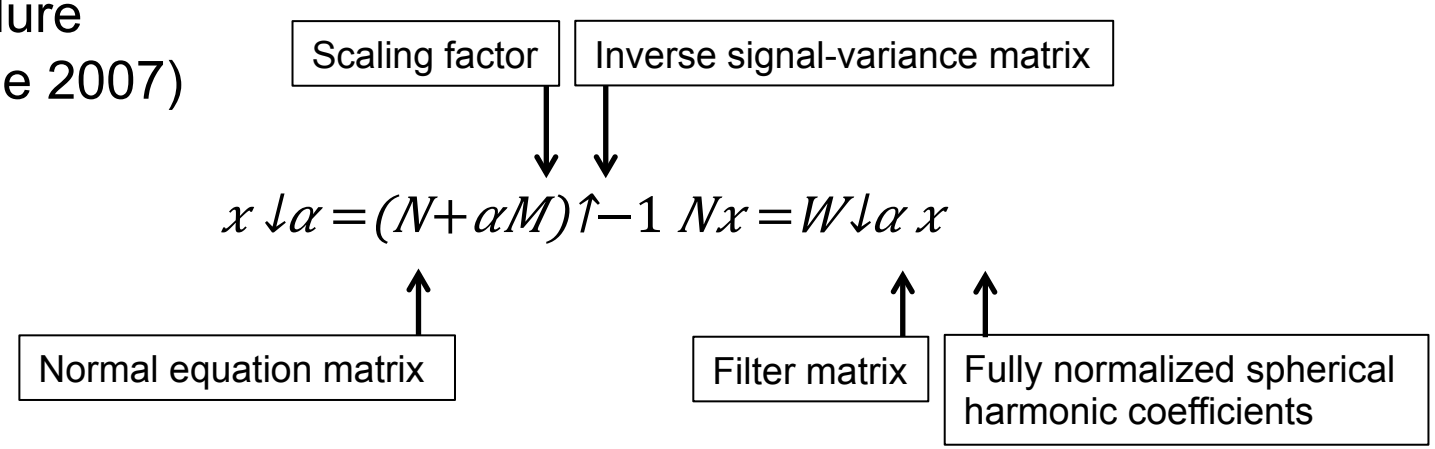
   - ITSG2014 (d/o 60 & 90)
   - GFZ RL05a (d/o 90)

c. Intercomparison to other post processing strategies

Decorrelation of GRACE like gravity fields

Procedure
(Kusche 2007)



Data used for closed-loop simulations:

M (AO)HIS model data (Gruber et al., 2011)

N Simulated GRACE-like full covariance information

GRACE-like means: GRACE orbits & GRACE-like observations and noise (acceleration differences) for one year

Results from closed loop simulations

Effect of different error covariances:

- Full
- Orderblock
- Diagonal

Effect of different signal variances:

- True reference signal
- Mean signal (mean signal variance)
- L-rule (degree dependent only)

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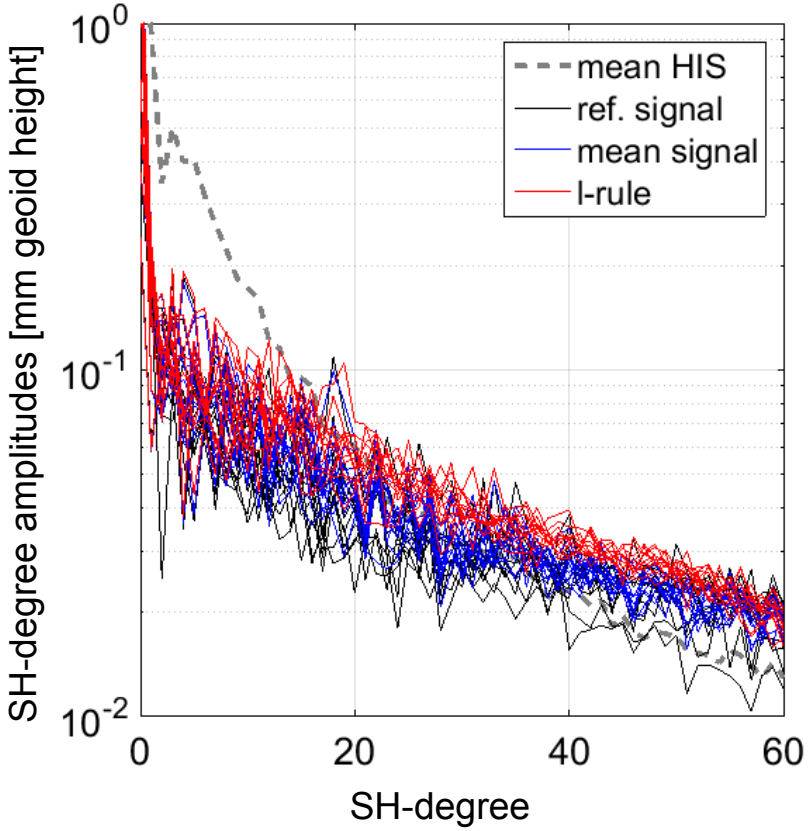
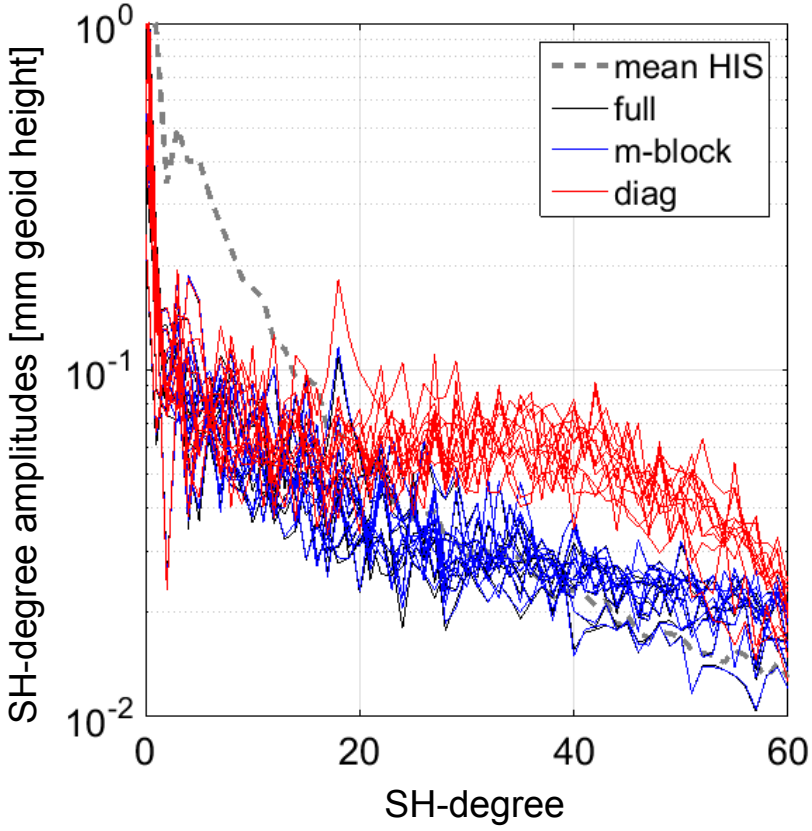
Residuals from closed loop simulations

With different signal variances



With different error covariances

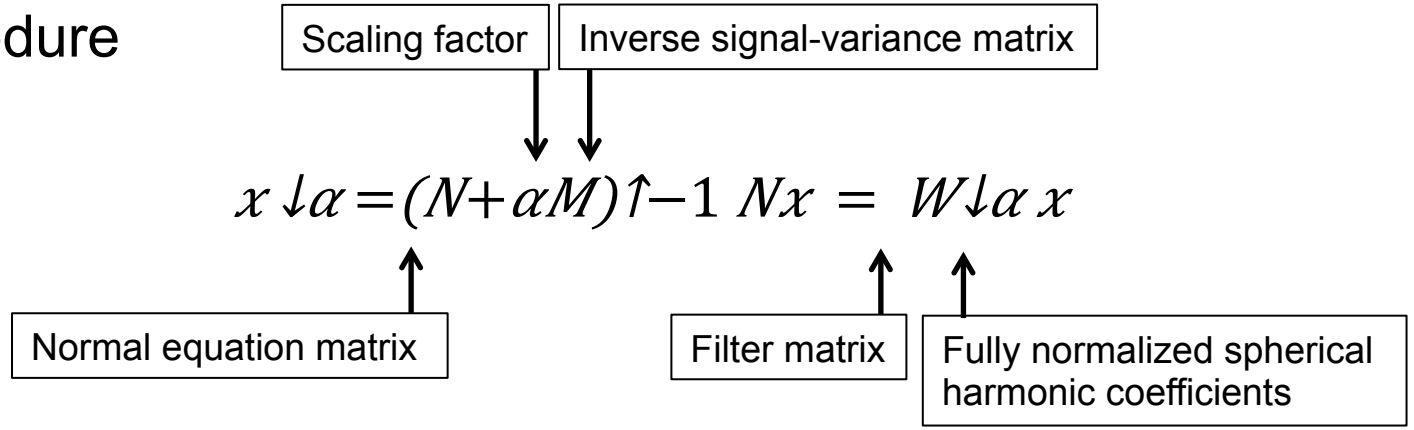


→**Mean signal variance gives 9% improvement w.r.t. l-rule**
→**Full error covariance gives 37% improvement w.r.t. diagonal**
→**Static error covariance costs 10%-30% deterioration**

Looking at cumulative geoid errors

Decorrelation of real data

Procedure

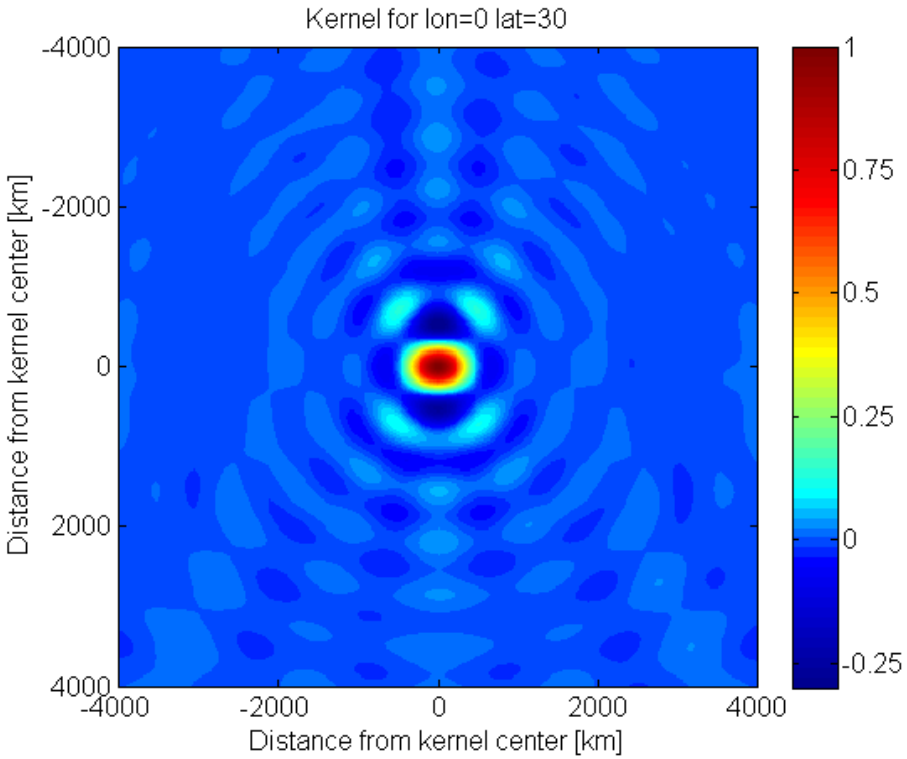


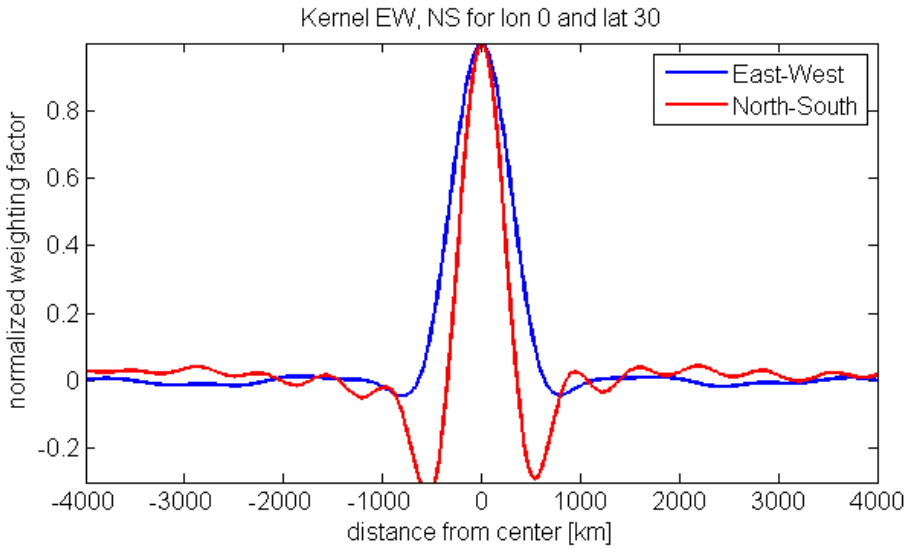
Data used for decorrelation of real data:

M (AO)HIS model data (mean Jan to Dec per Coefficient)
(Gruber et al., 2011 & Dobslaw et al., 2015)

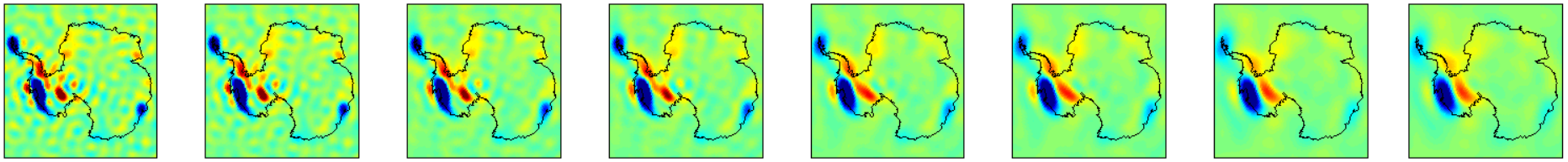
N Full real GRACE covariance information from ITSG 2014
(Mayer-Gürr et al., 2014) & GFZ RL05a (Dahle et al., 2013)

Filter kernels 1D and 2D





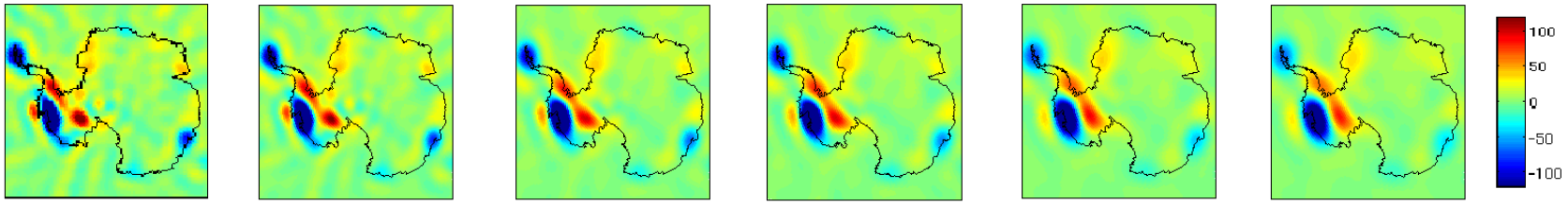
Decorrelation of real data – ITSG2014 GRACE (do 90)



~175km

steps of about 40km

~450km



DDK 8
(180km)

DDK 3
(330km)

Units: mm ewh / year linear trend
All estimates from ITSG2014

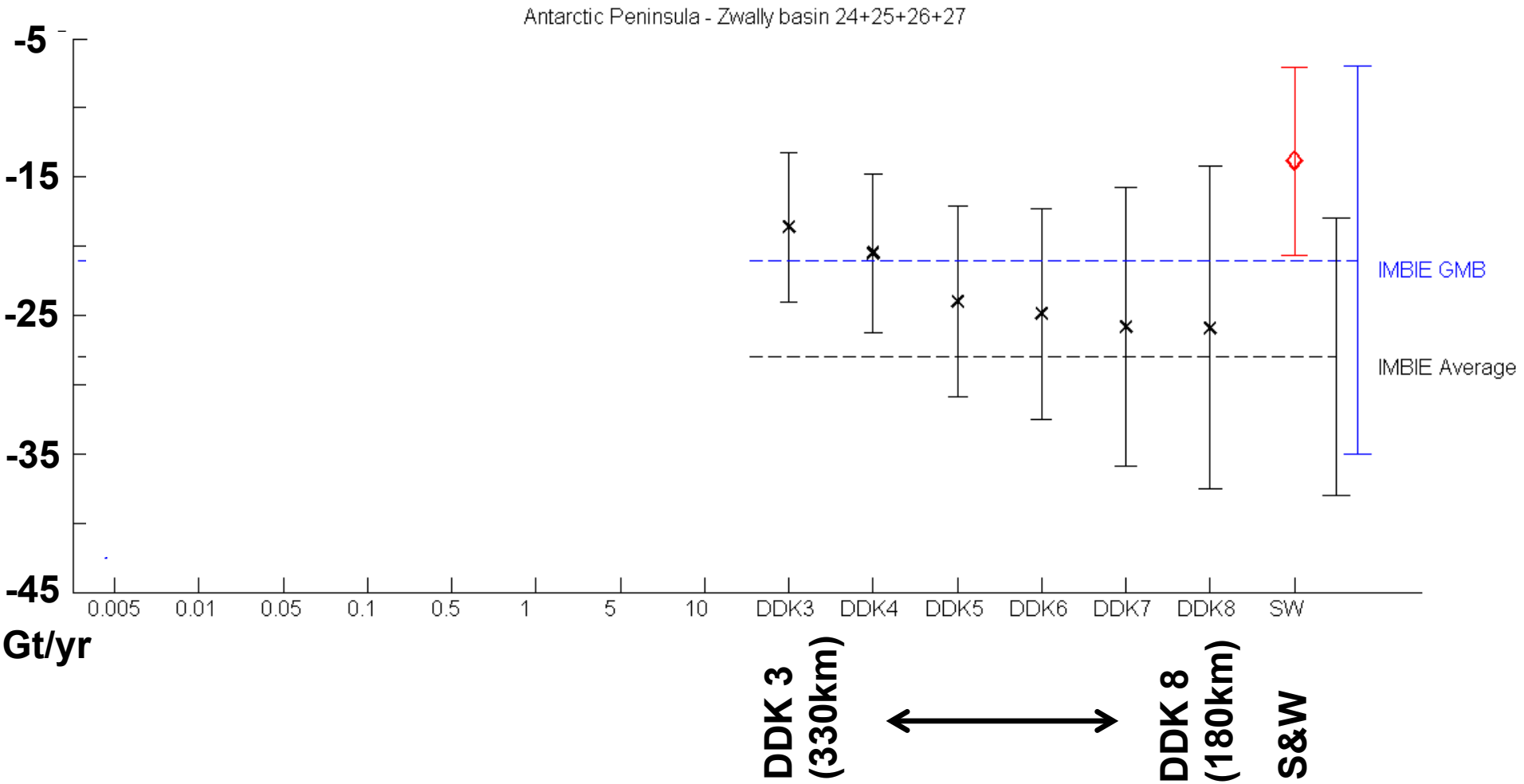
Intercomparison to other post processing strategies

Results will be tested against:

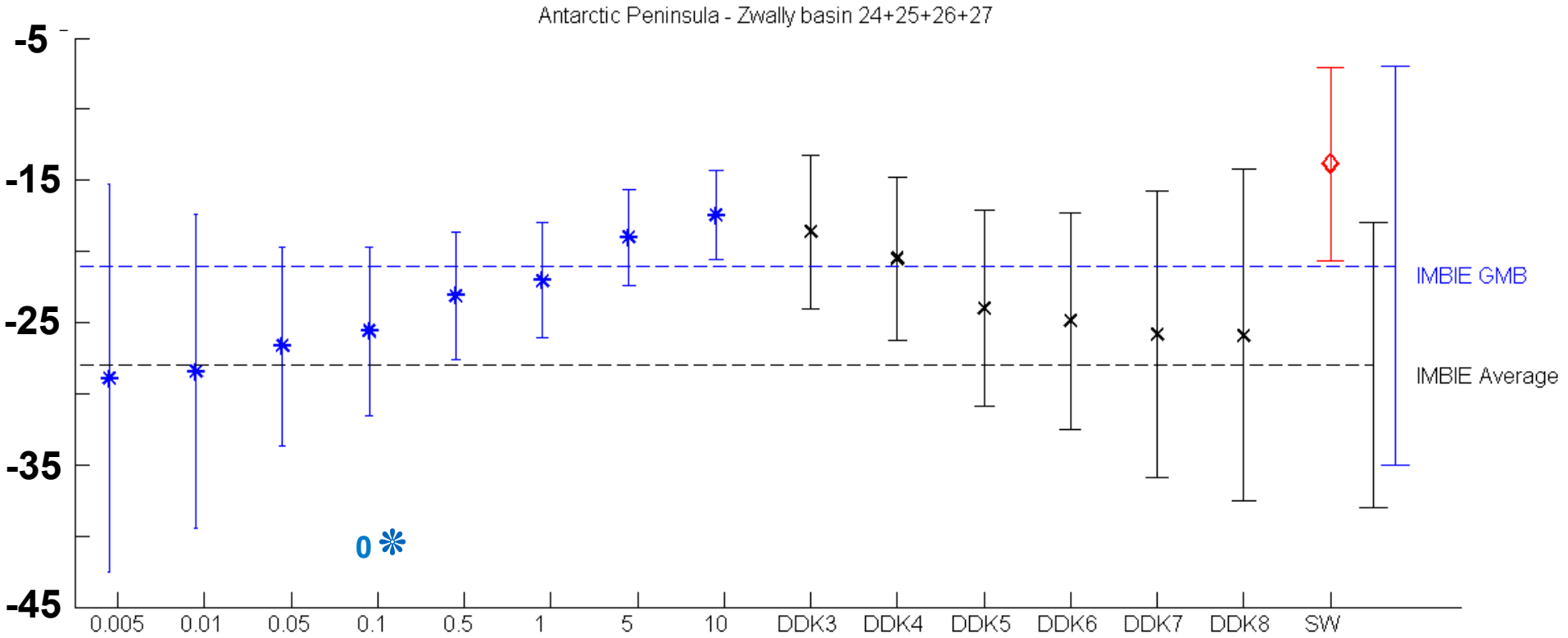
- Anisotropic Swenson & Wahr Type filter (optimized for Antarctic region)
- DDK decorrelation filter (Kusche, 2009)

In terms of: - estimated trend results
- integrated mass change on basin scale

Integrated mass change



Integrated mass change



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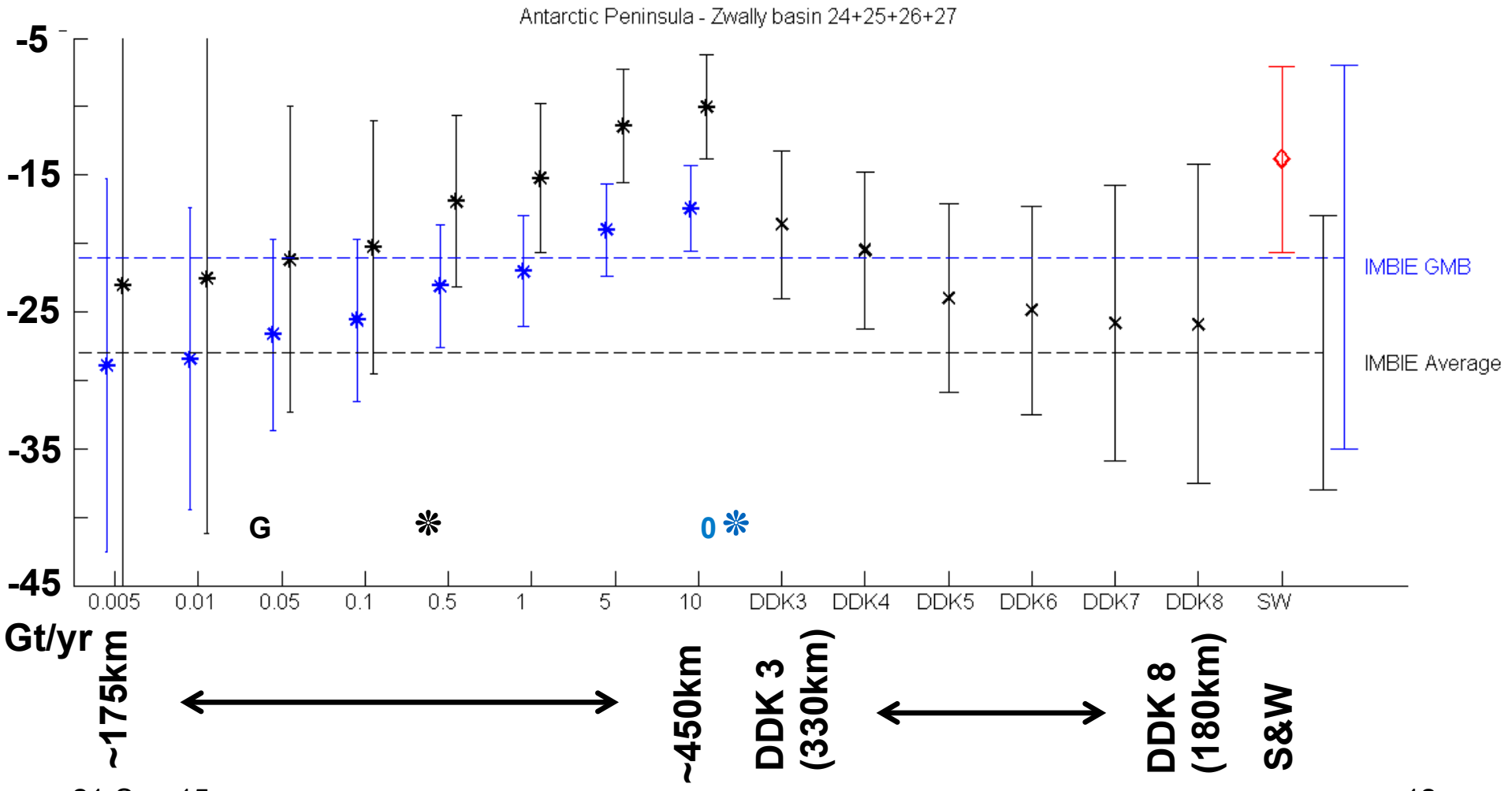
Integrated mass change



Conclusion & Outlook

- Best suitable post processing strategy depends on target area and characteristics of target signal
- Largest deterioration with L-rule signal and diagonal error covariance → Utilization of “mean” signal variance and time variable error covariance information is advisable
- Method delivers competitively small formal errors for integrated mass change
- Determination of signal variance in an iterative procedure minimizing utilization of apriori information.

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