SLR, GRACE and SWARM gravity field determination and combination

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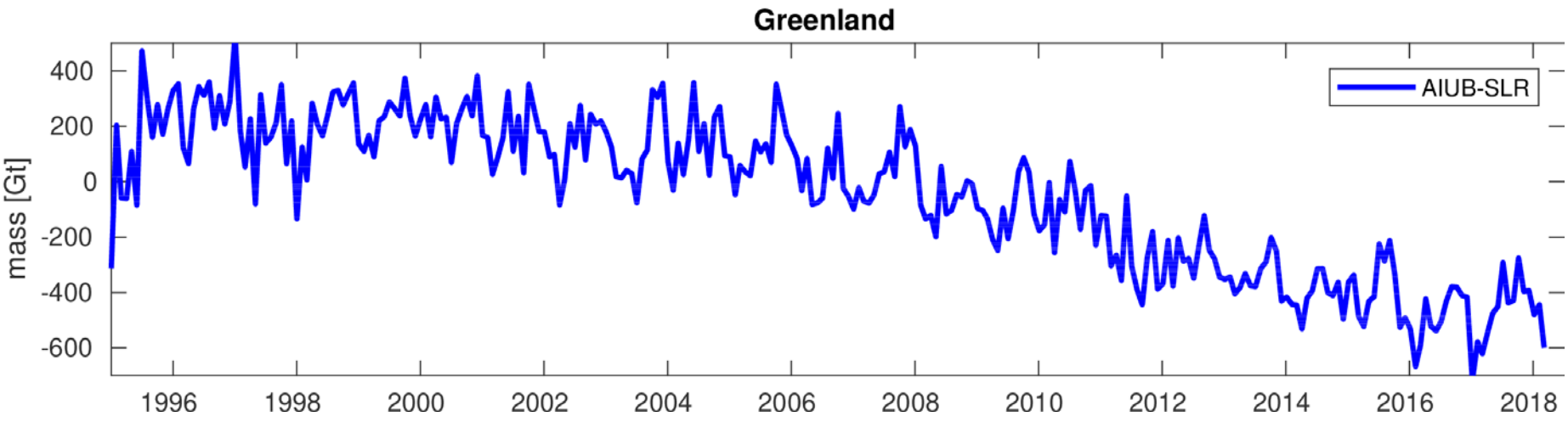
Contents

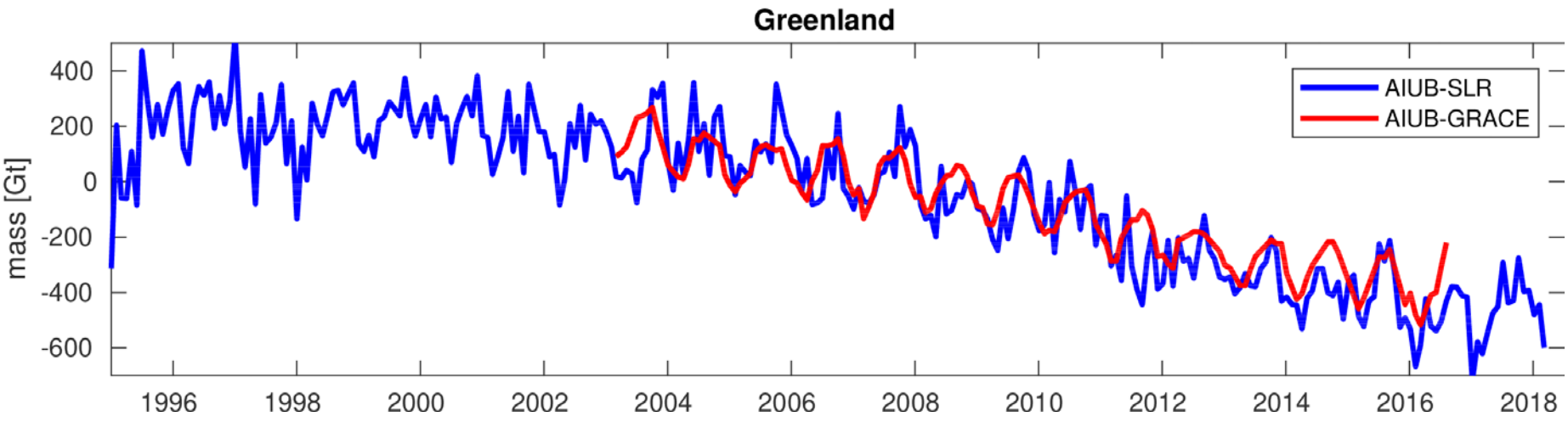
- Monthly gravity field solutions from:
  - SLR
  - GRACE
  - SWARM
- Localization of mass change signal
- Quantification and temporal variation
- Combination of normal equations:
  - SWARM + SLR
- Summary and Outlook

Monthly SLR gravity fields (d/o 6)



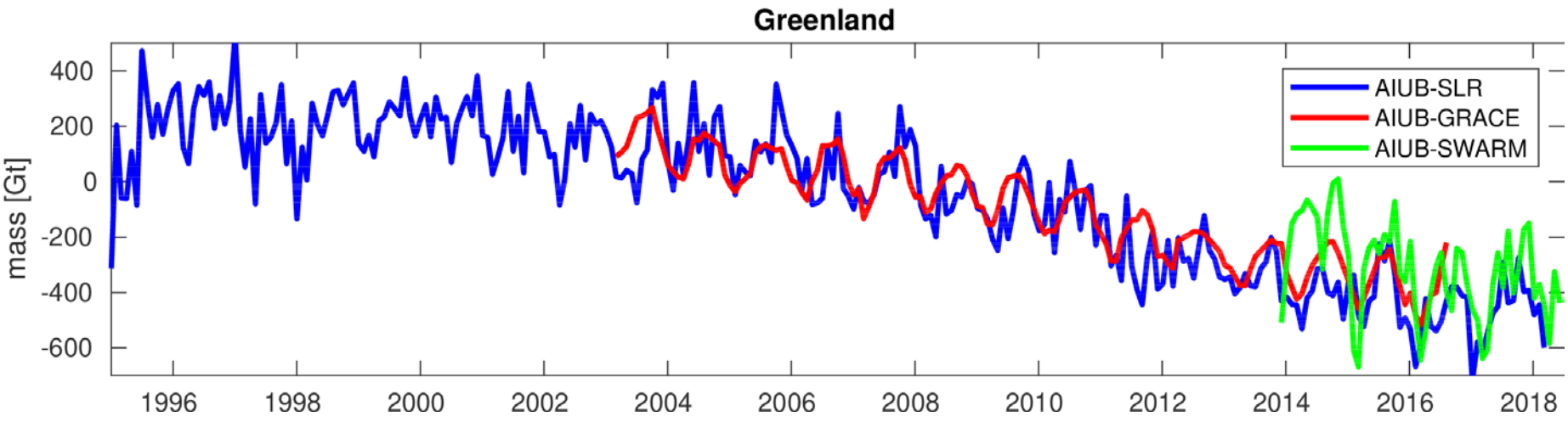
- LAGEOS 1+2: 30 d solutions based on 10 d arcs.
- SLR-LEOS (Beacon-C, Ajisai, Starlete, Stella, Larets, Lares): 30 d solutions based on 1 d arcs.
- Gravity field: 5 x 5 + C_{61} and S_{61}; C_{50} constrained.
- A priori gravity: static 7 y GRACE (AIUB-APR).
- A priori orbits: LAGEOS own predictions, LEOS CPF

Monthly GRACE gravity fields (d/o 90->6)



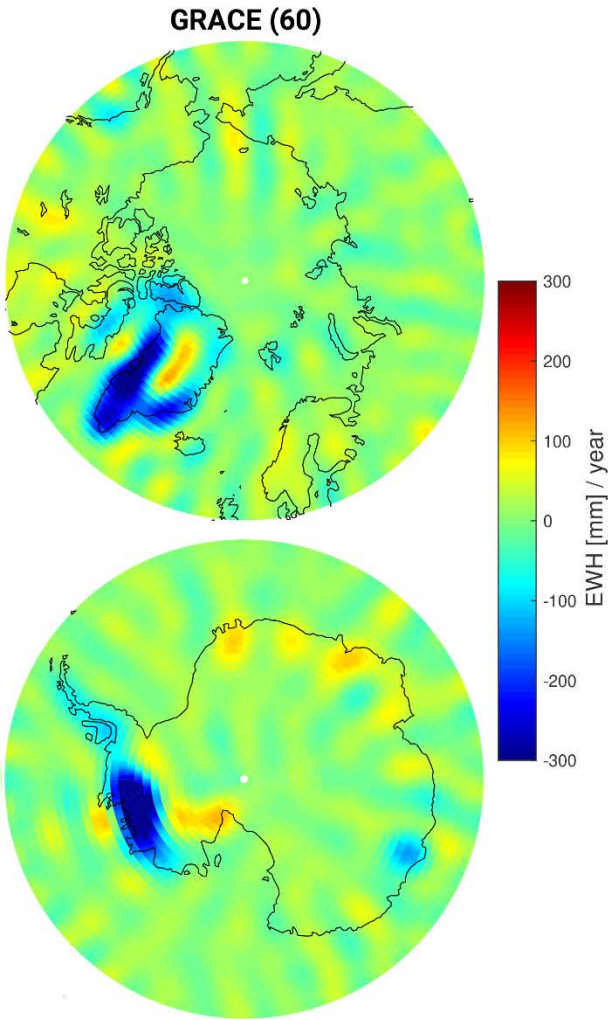
- GRACE GPS+K-band: monthly 90 x 90 gravity field solutions, truncated at degree / order 6.
- Degree 2 excluded.
- Degree 1 fixed to 0.
- No filter applied.

Monthly SWARM gravity fields (d/o 70->6)

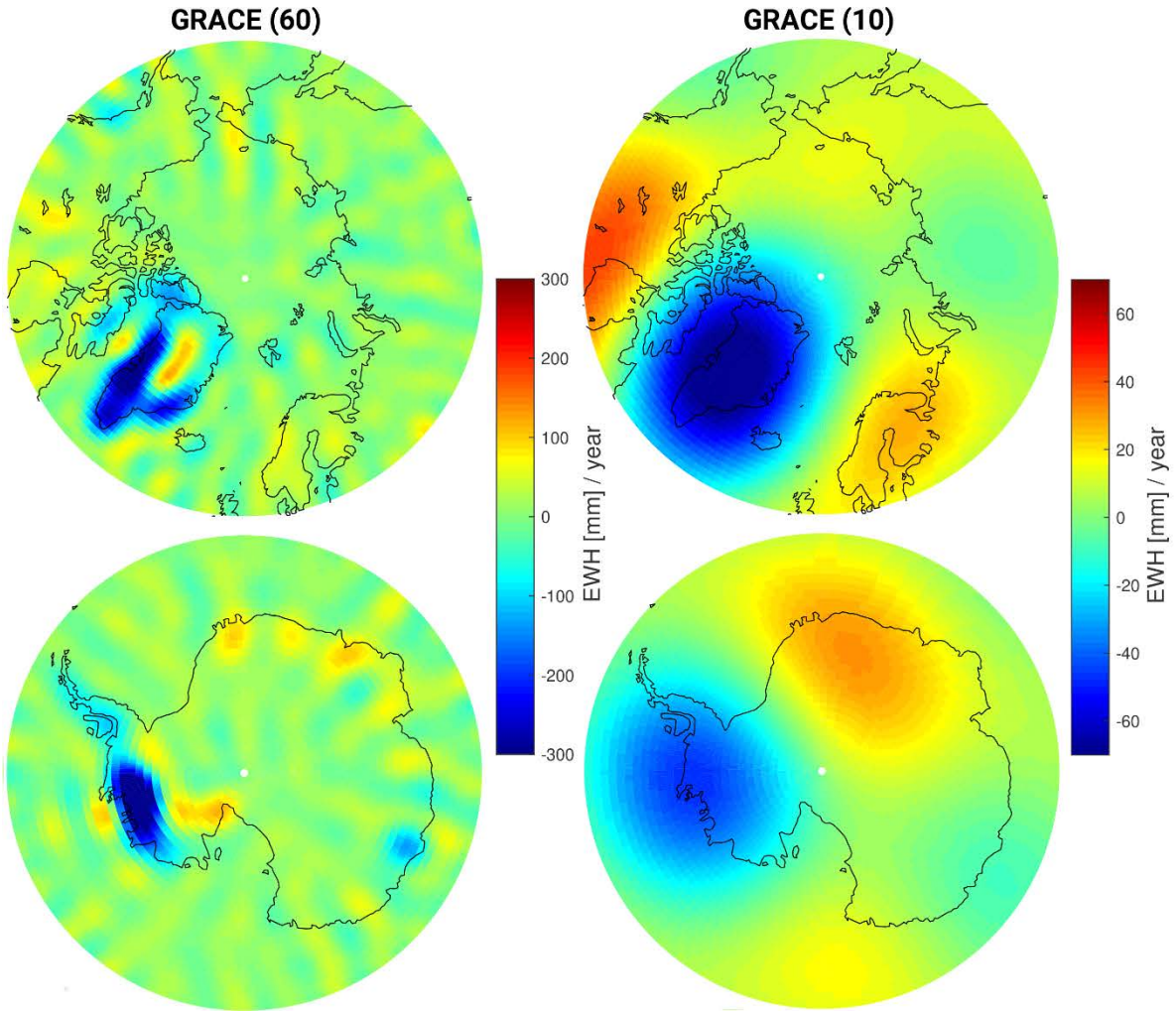


- SWARM GPS: monthly 70 x 70 gravity field solutions, truncated at degree / order 6.
- Degree 2 excluded.
- Degree 1 fixed to 0.
- No filter applied.

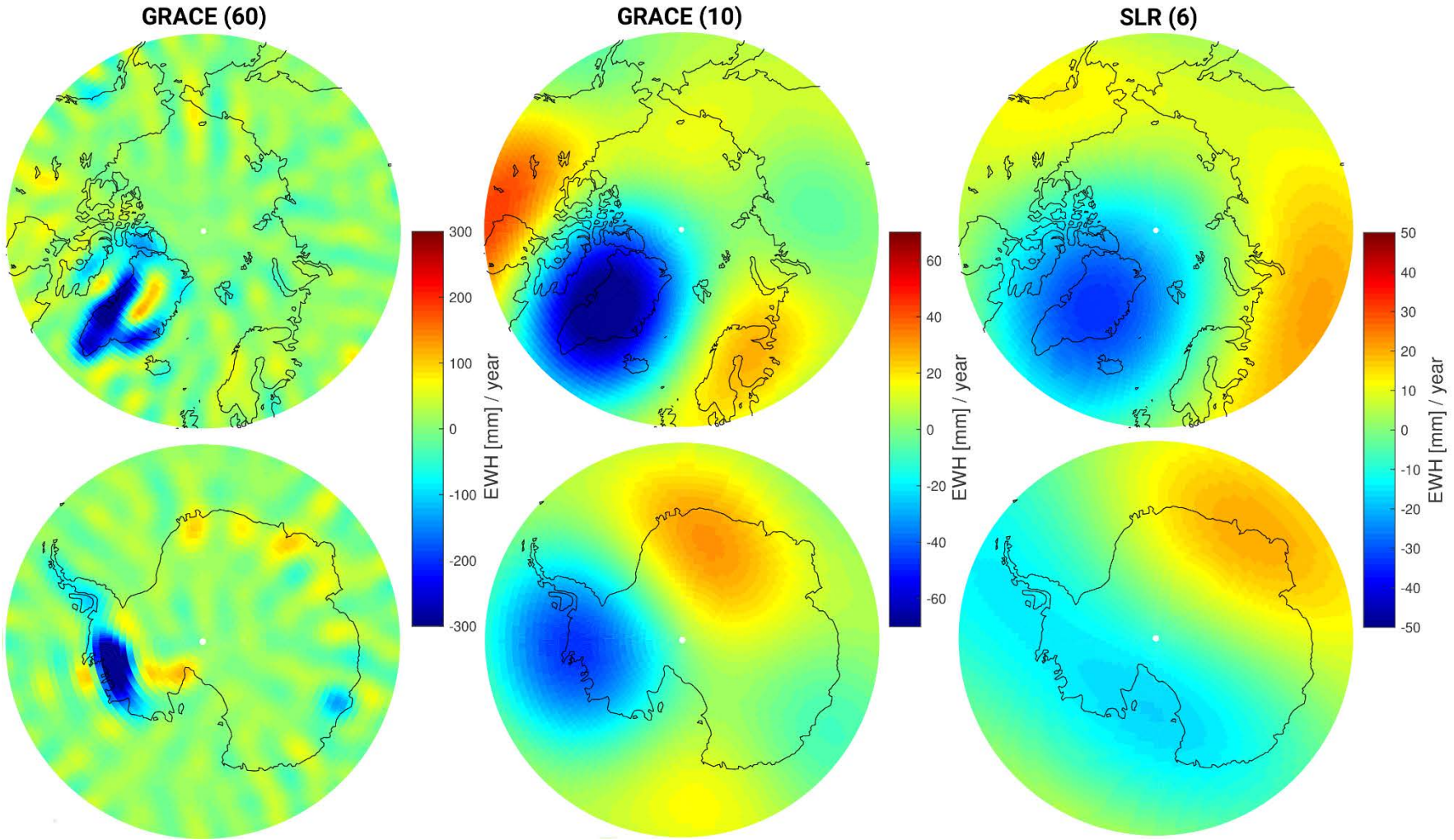
Localization of mass change



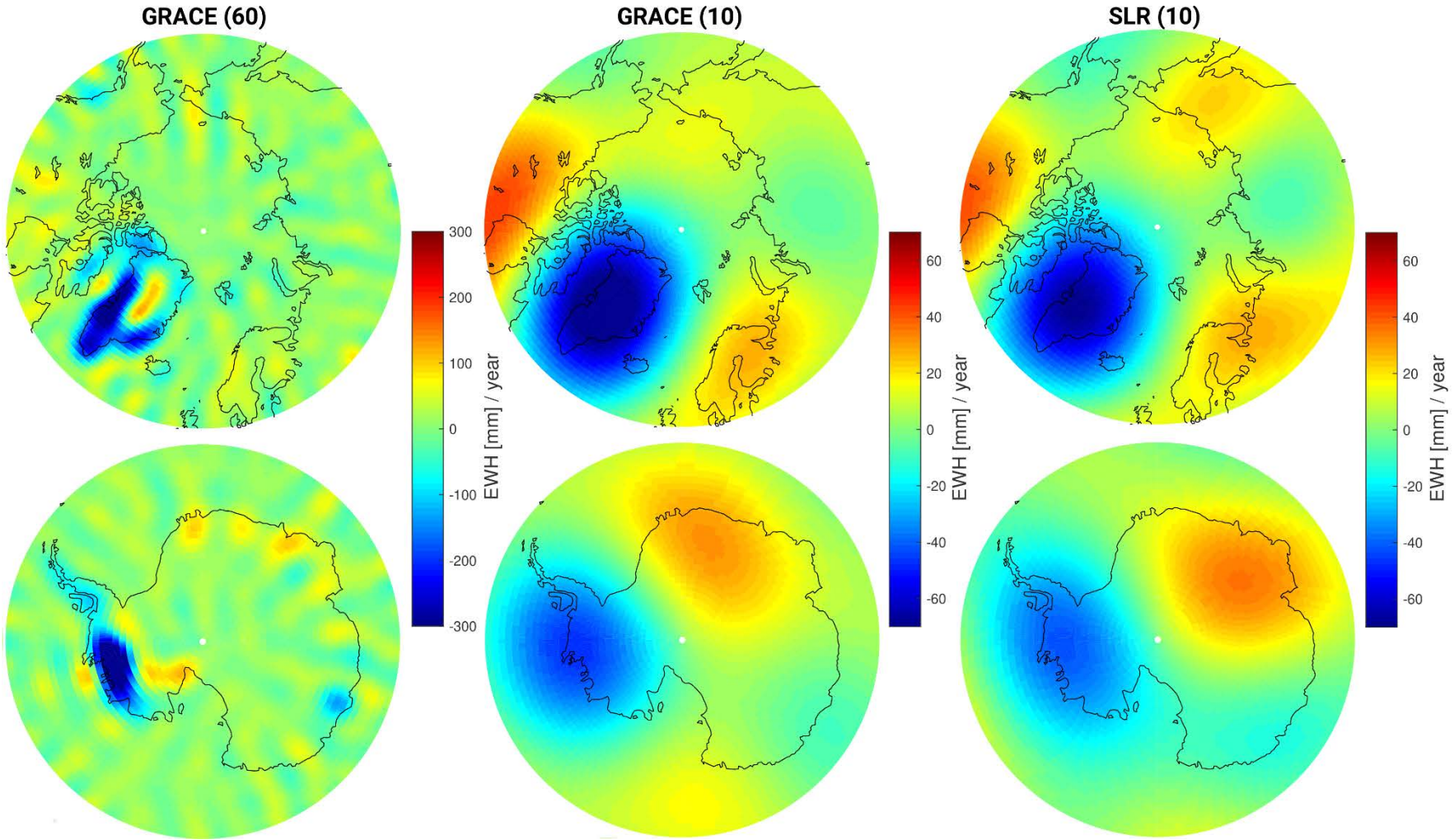
Localization of mass change



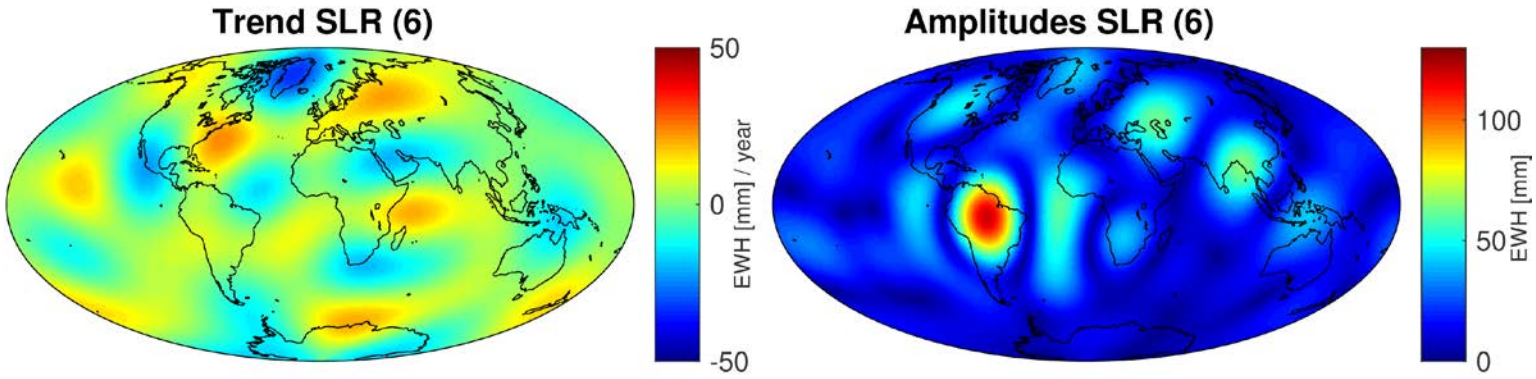
Localization of mass change



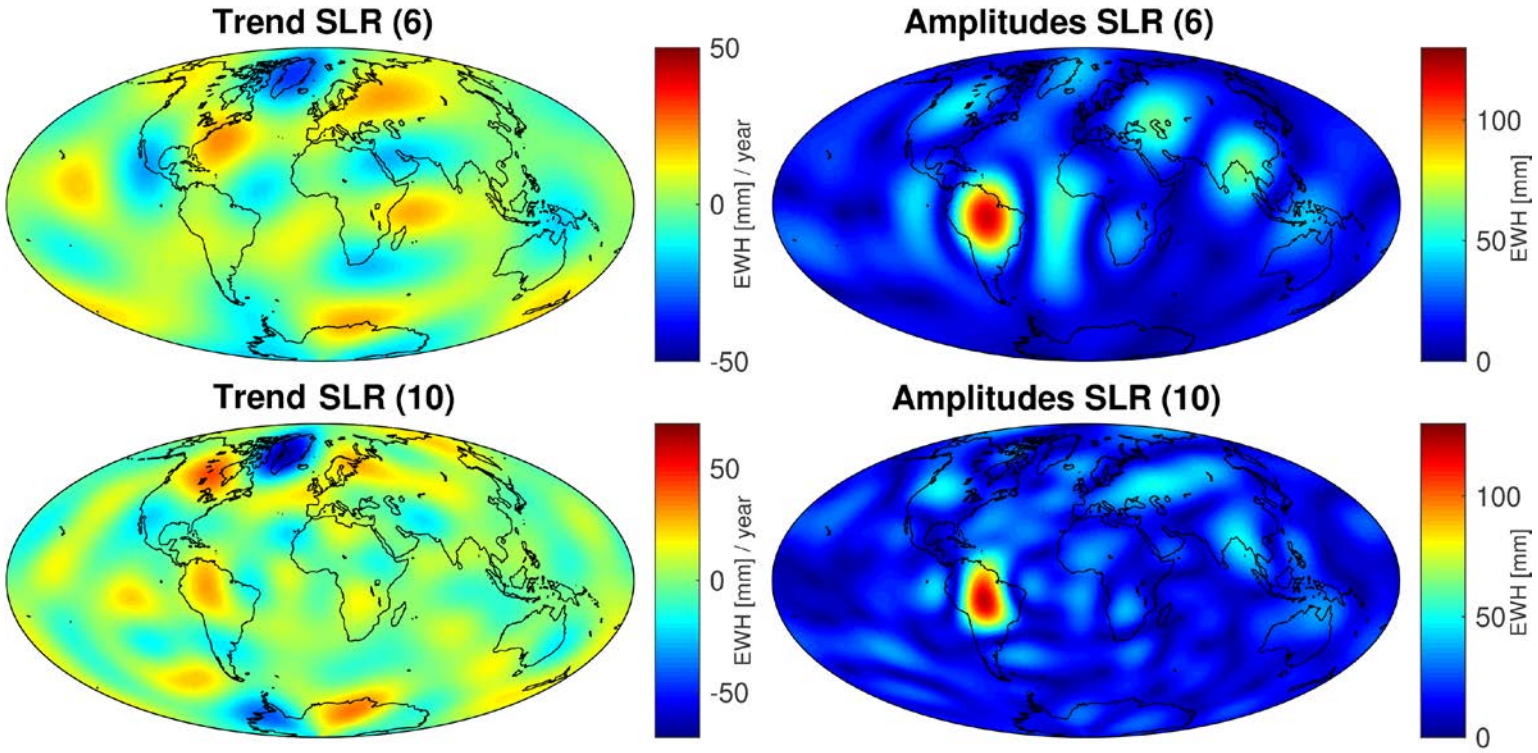
Localization of mass change



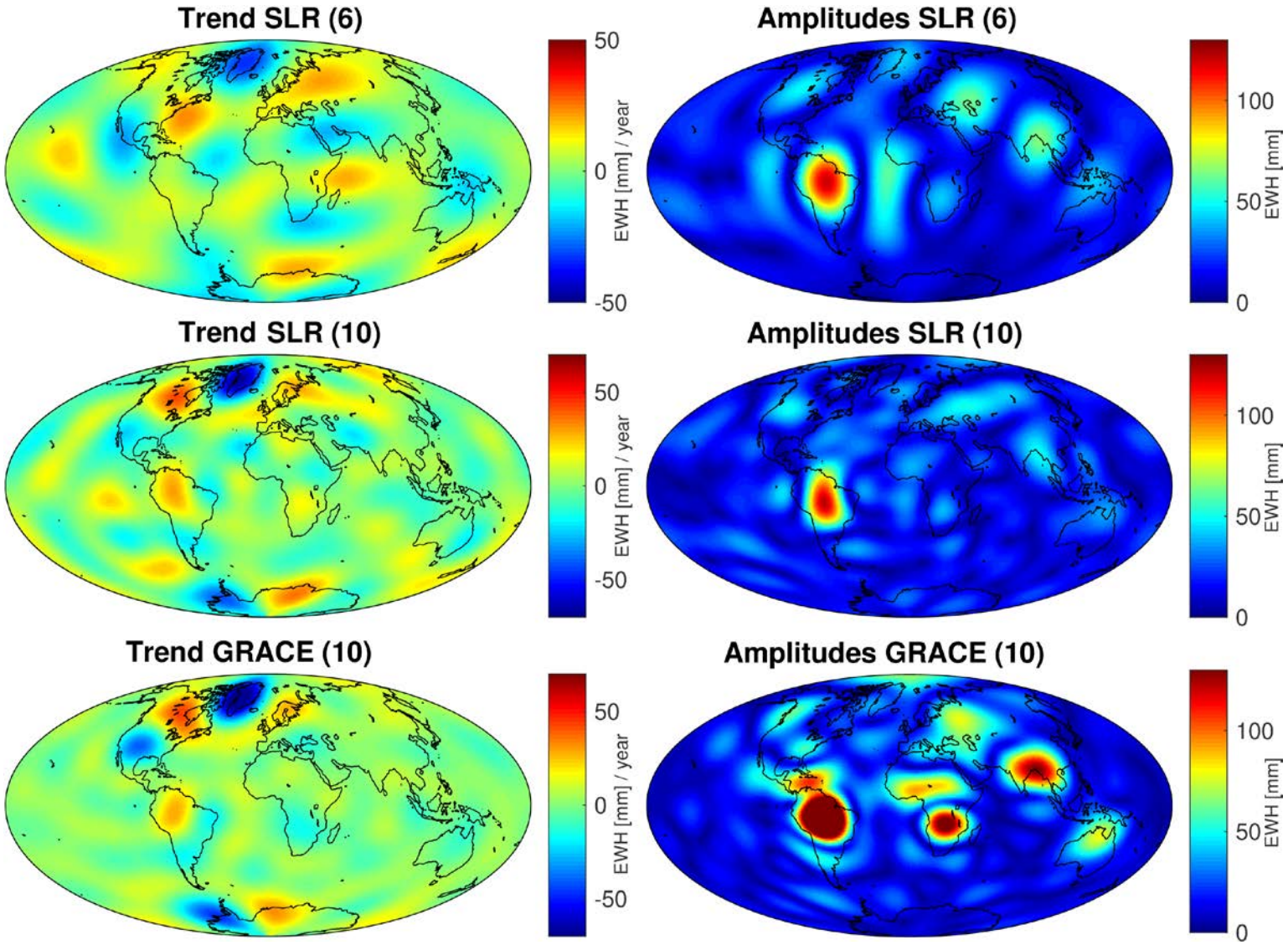
Localization of mass change



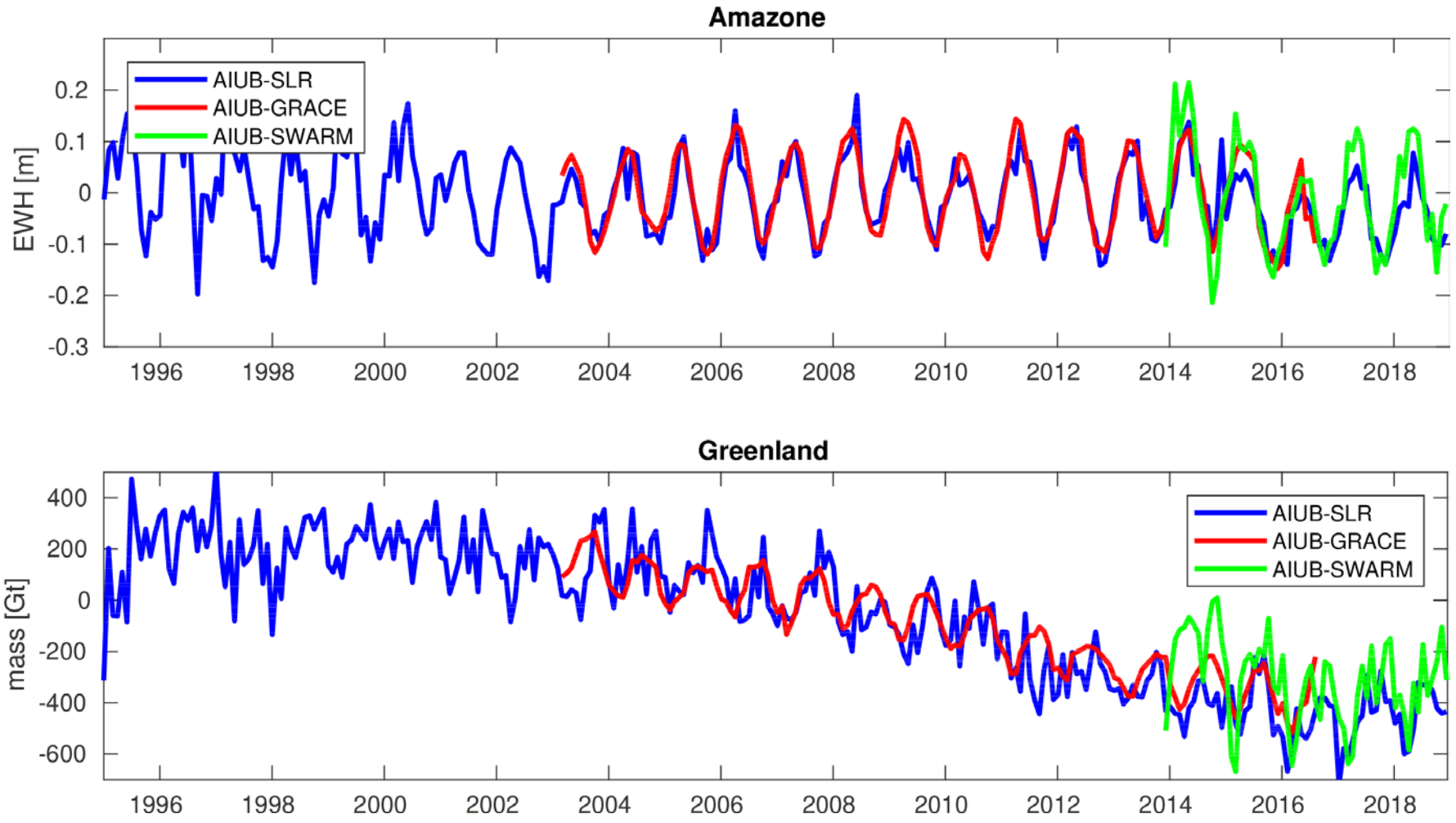
Localization of mass change



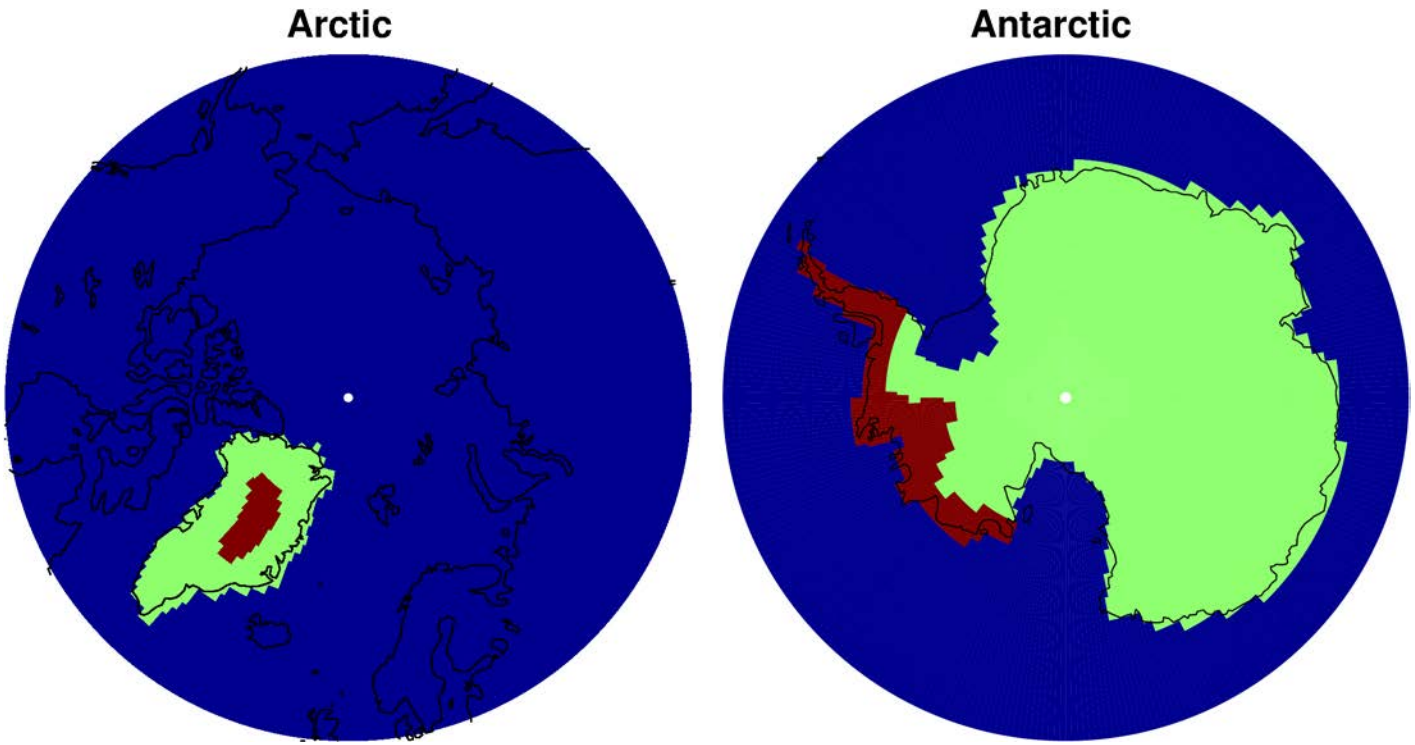
Localization of mass change



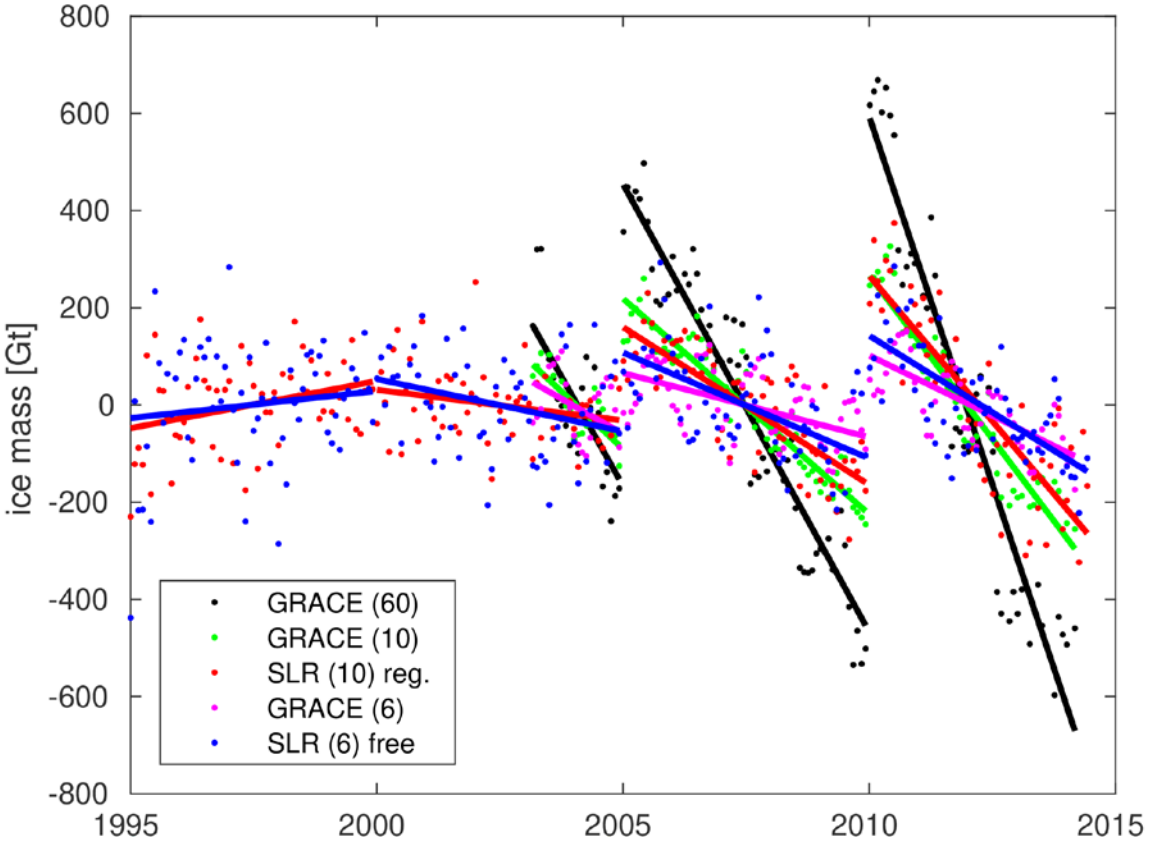
Quantification of mass change



Quantification of mass change

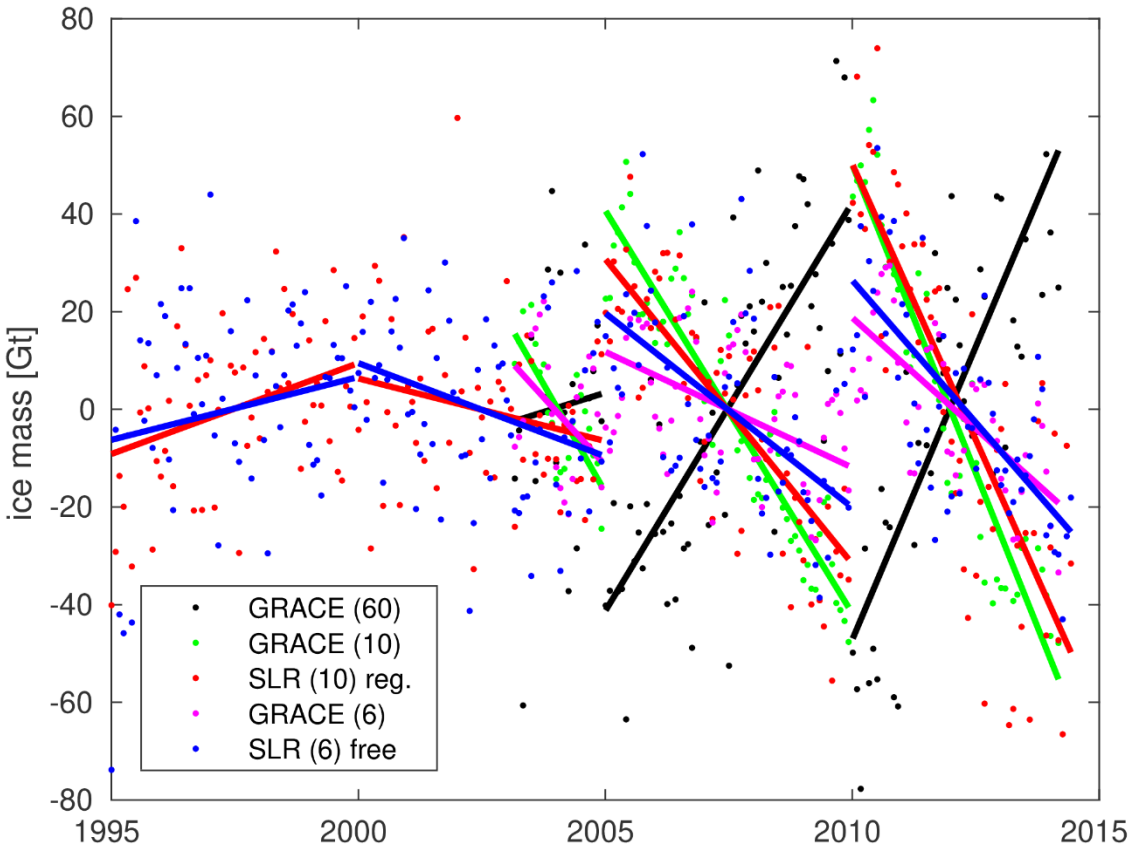


Ice mass change: Greenland Coast



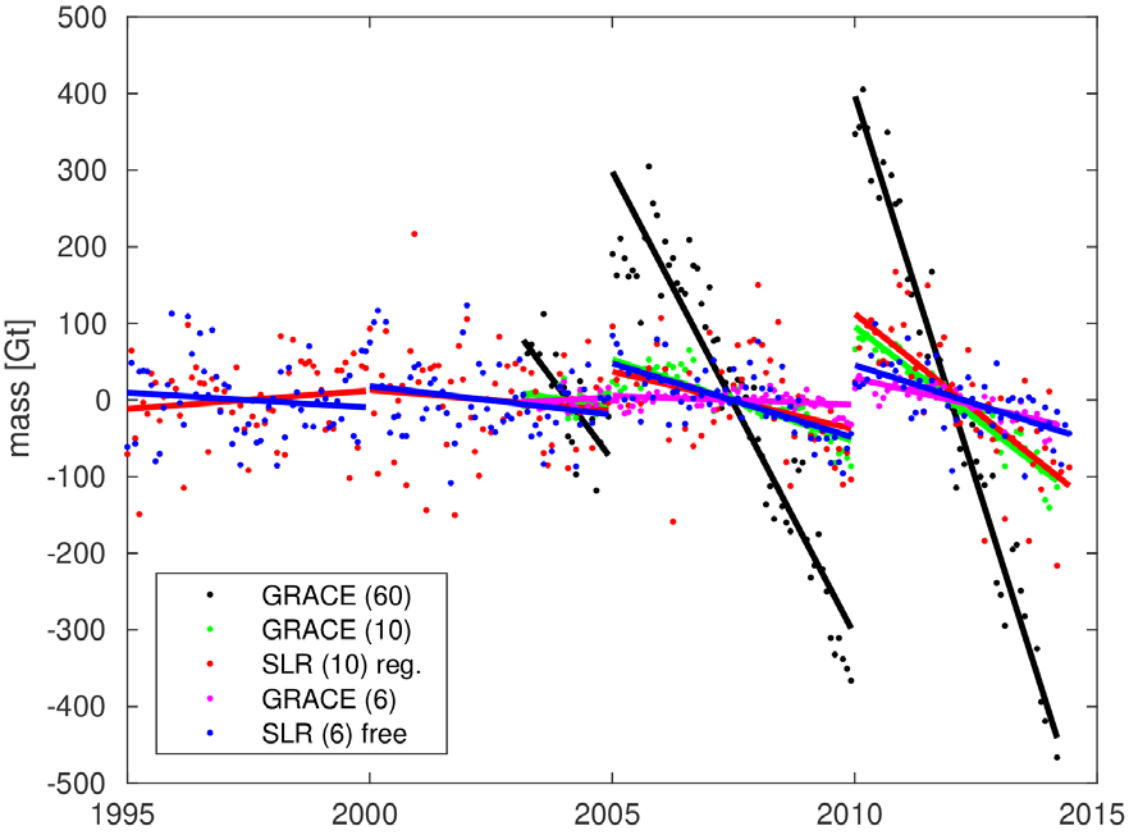
- SLR and GRACE provide consistent mass trends when truncated at the same degree/order.

Ice mass change: Greenland Inland



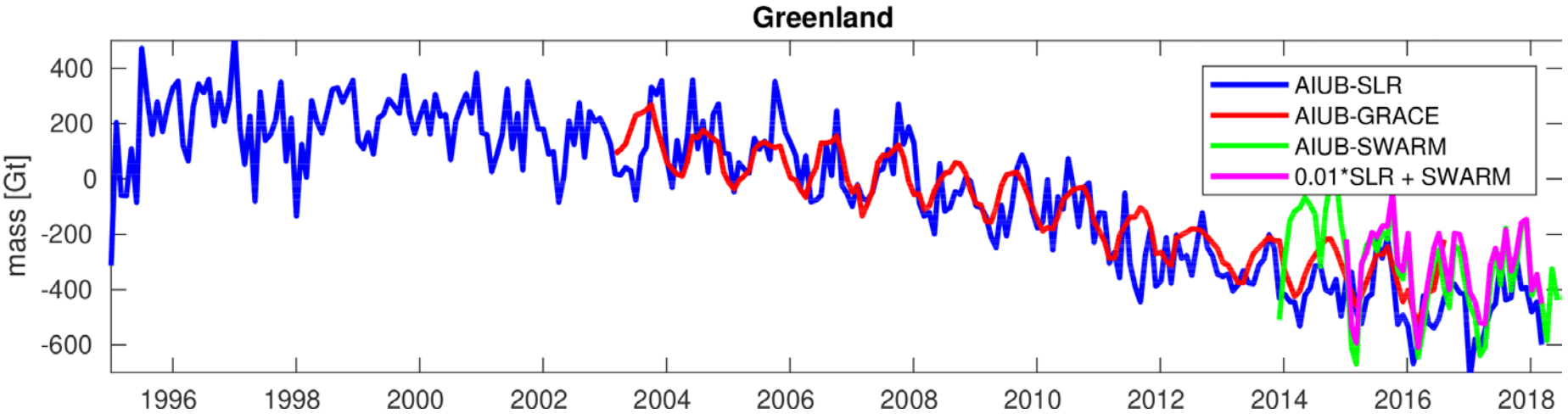
- Details at small spatial scales are lost. A separation between Greenland coast and inland is not possible with SLR.

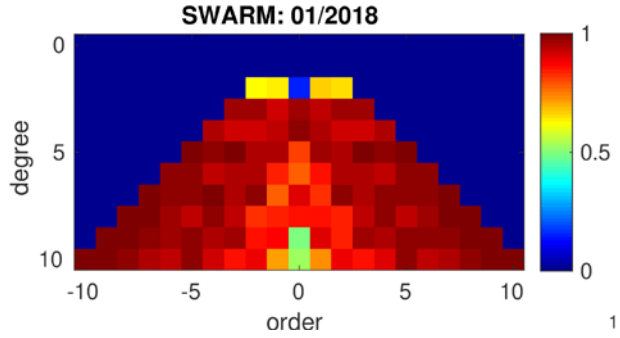
Ice mass change: Antarctica

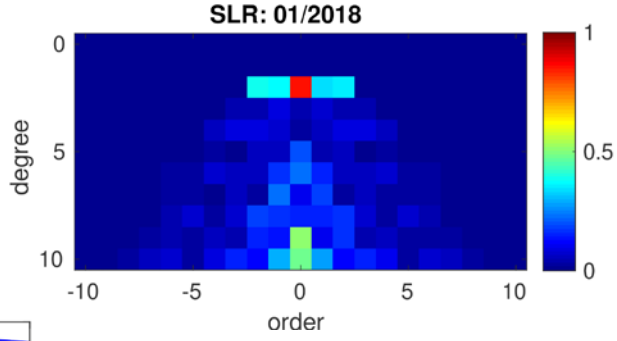


- Mass loss at the coast of West Antarctica is well represented by the SLR solutions.

Combination of NEQs: SWARM + 0.01 * SLR

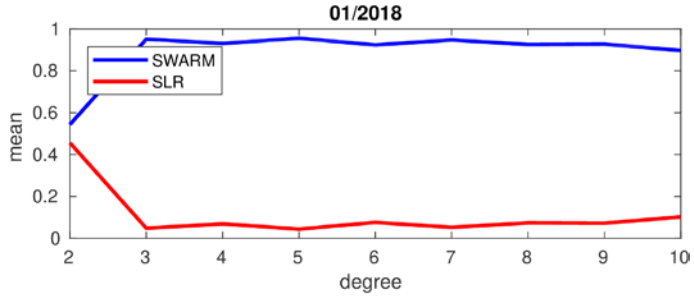




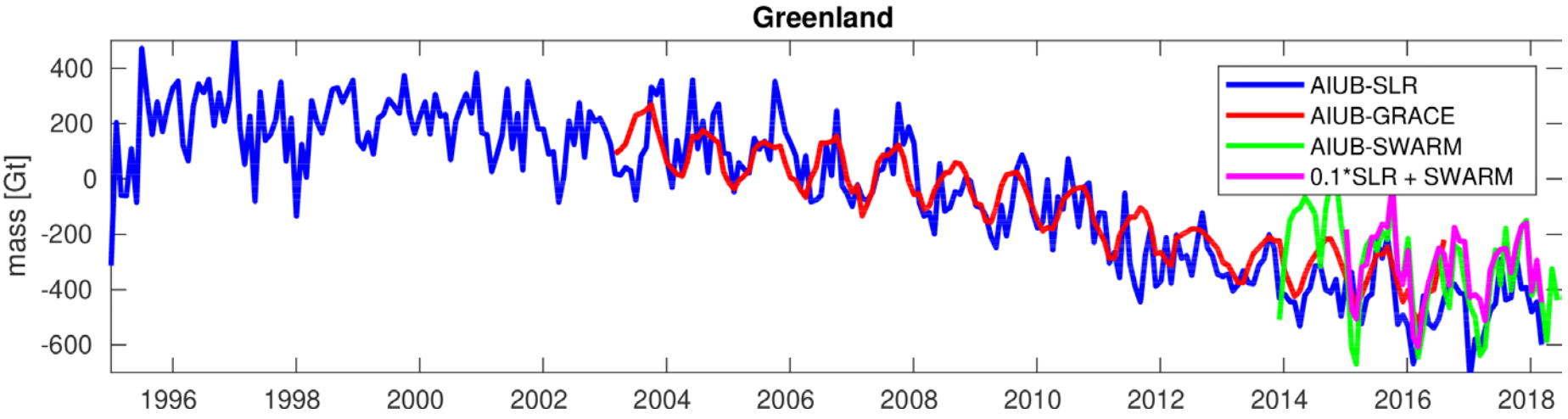


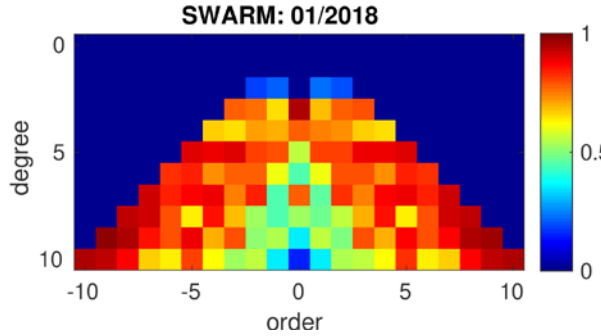
Contribution analysis per SH coefficient.

Mean contribution per degree.

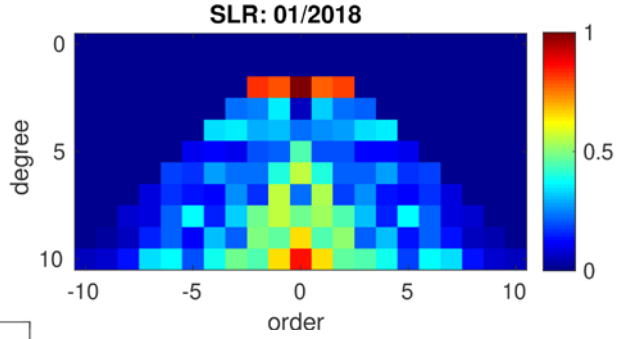


Combination of NEQs: SWARM + 0.1 * SLR

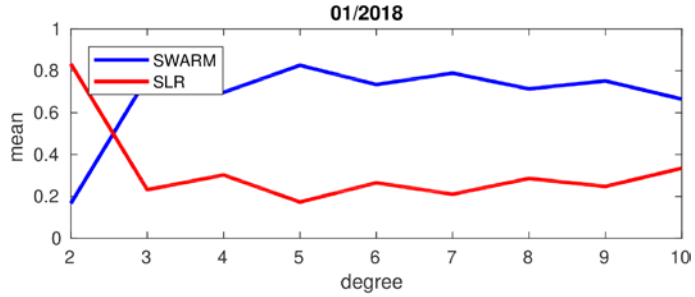




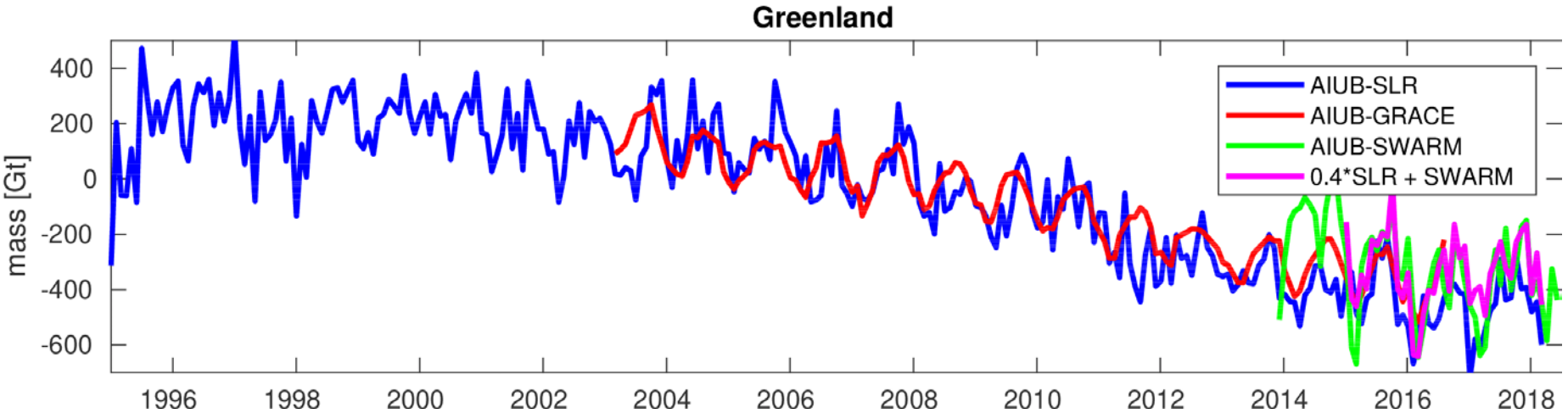
Contribution analysis per SH coefficient.

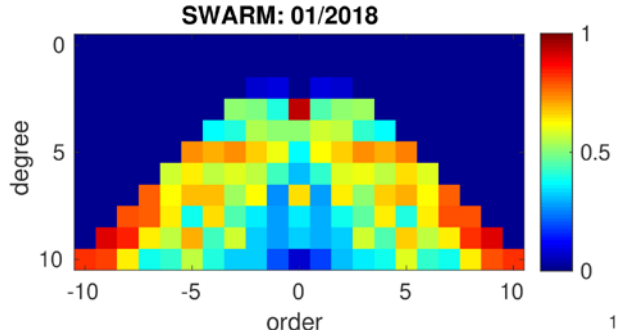


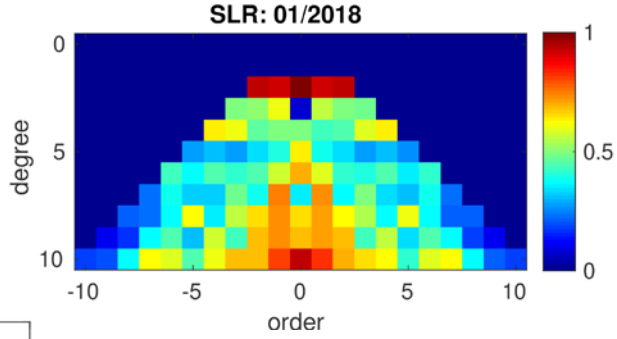
Mean contribution per degree.



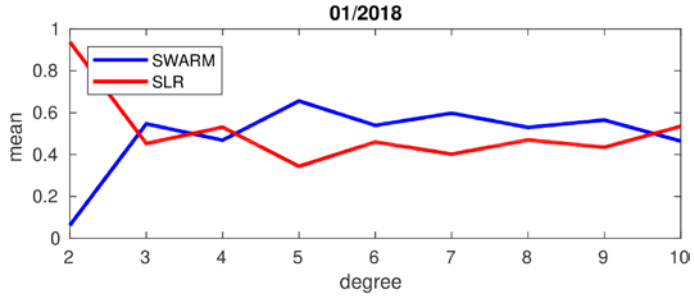
Combination of NEQs: SWARM + 0.4 * SLR





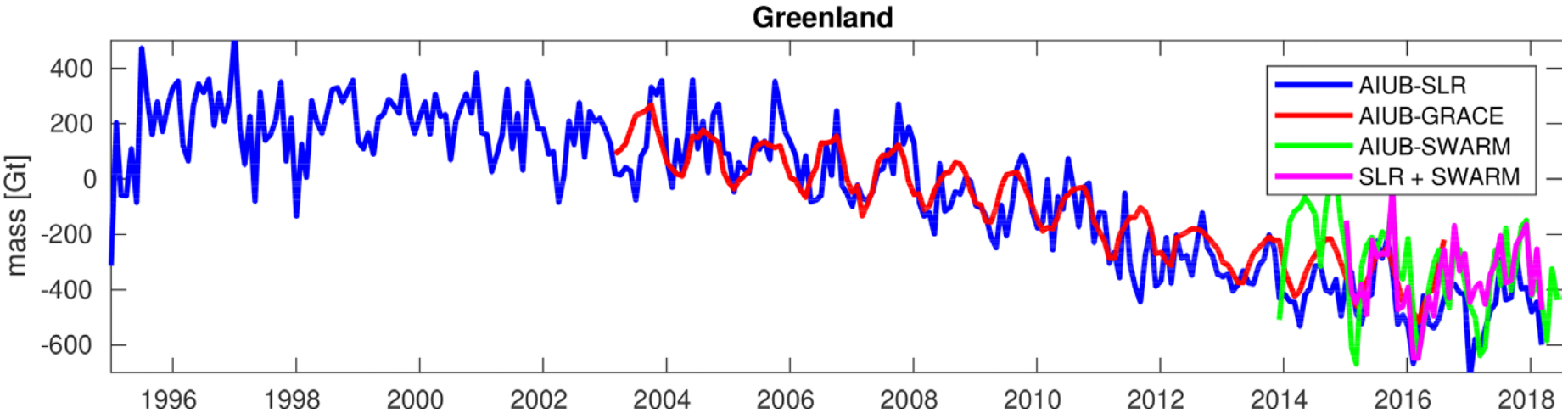


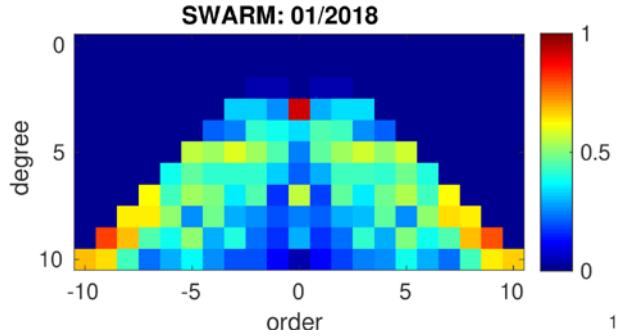
Contribution analysis per SH coefficient.

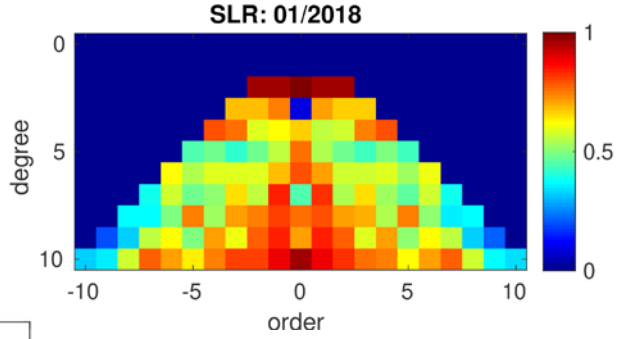


Mean contribution per degree.

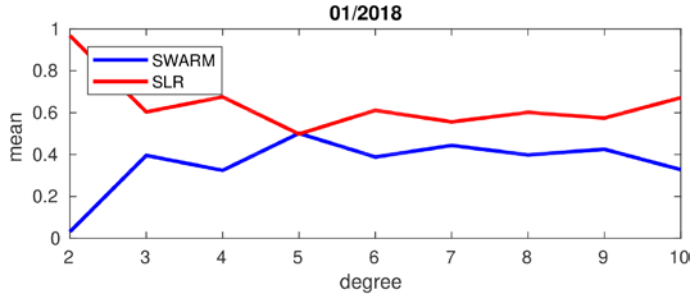
Combination of NEQs: SWARM + SLR







Contribution analysis per SH coefficient.



Mean contribution per degree.

Summary and Outlook

- Truncated to the same spherical harmonic resolution the three space geodetic techniques SLR, high-low-SST (GPS) and low-low-SST (K-band) provide comparable estimates of large-scale mass change.
- Temporal evolution of Greenland and West Antarctic ice mass change is well observed by SLR at d/o 10.
- Best SLR + SWARM combination results are achieved with equal weighting.