

Antarctic ice mass change from ICESat and GRACE data

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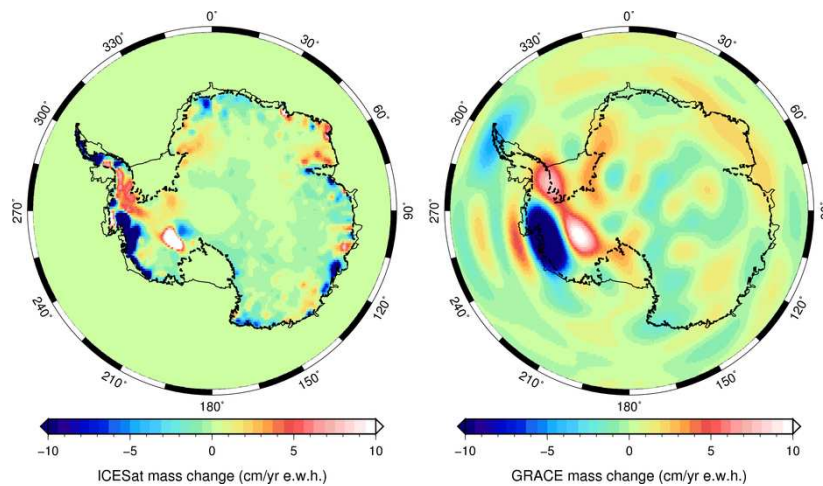
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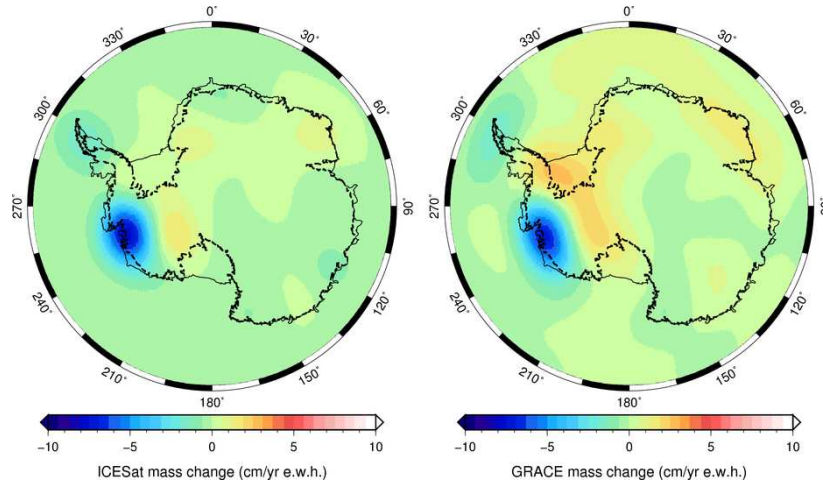
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ICESat vs. GRACE (CSR RL04)

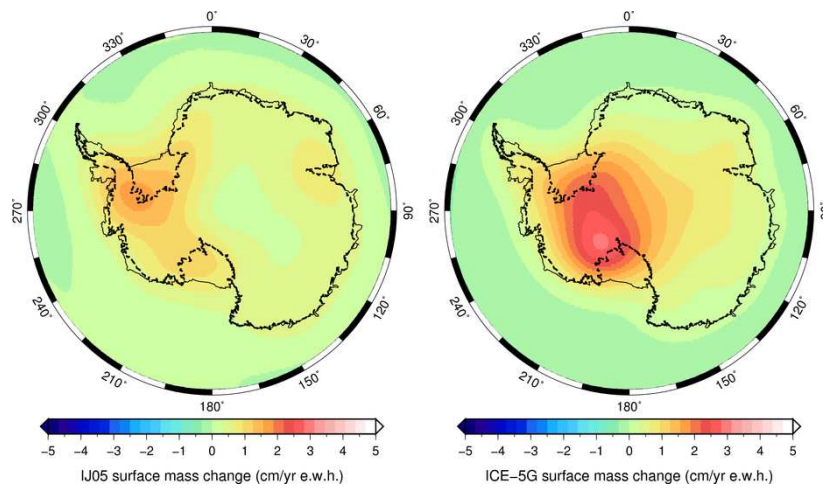


ICESat vs. GRACE, 400-km Gaussian



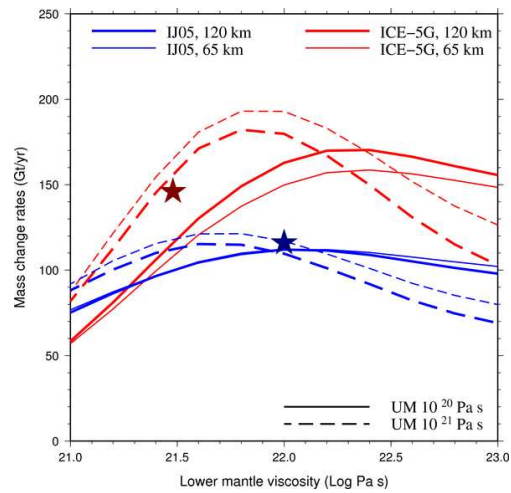
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GIA model results: IJ05 and ICE-5G(VM2)



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GIA mass estimates and Earth parameters



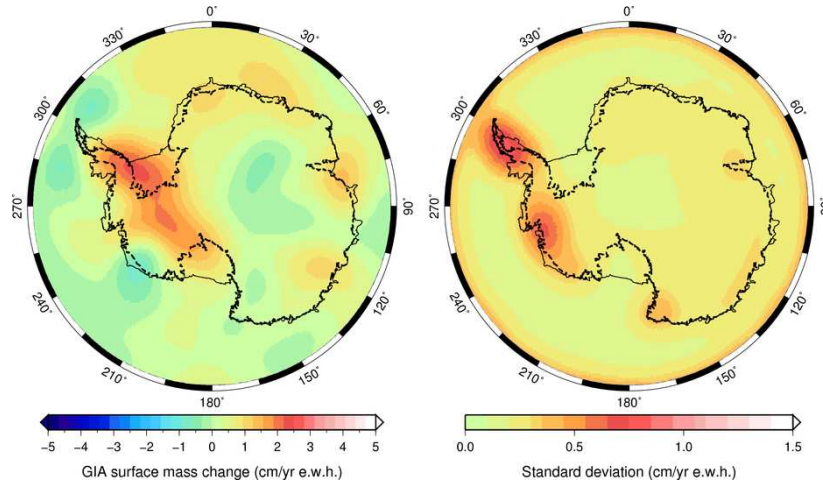
ICESat – GRACE combination

Different geodetic signature of GIA and surface mass changes:

- Solid Earth deformation: mainly gravity changes
- Snow/ice variations: mainly elevation changes

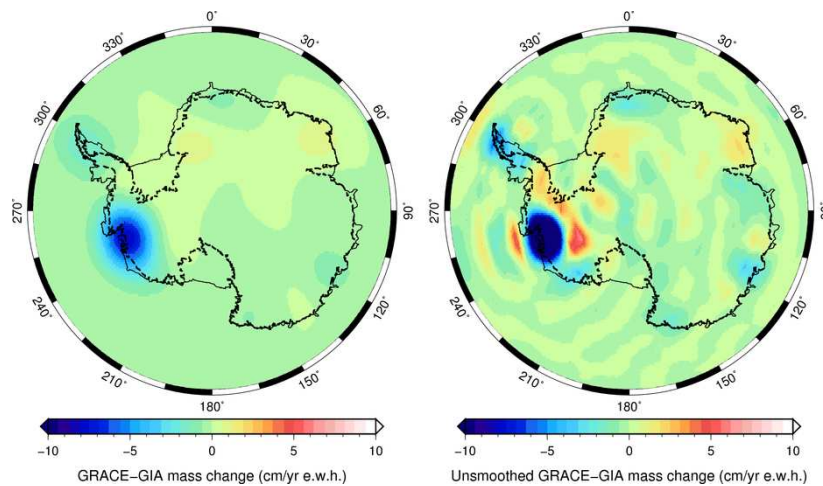
There is only one combination of change in bedrock elevation and thickness of the surface layer that satisfies both GRACE and ICESat trends.

GIA combination results



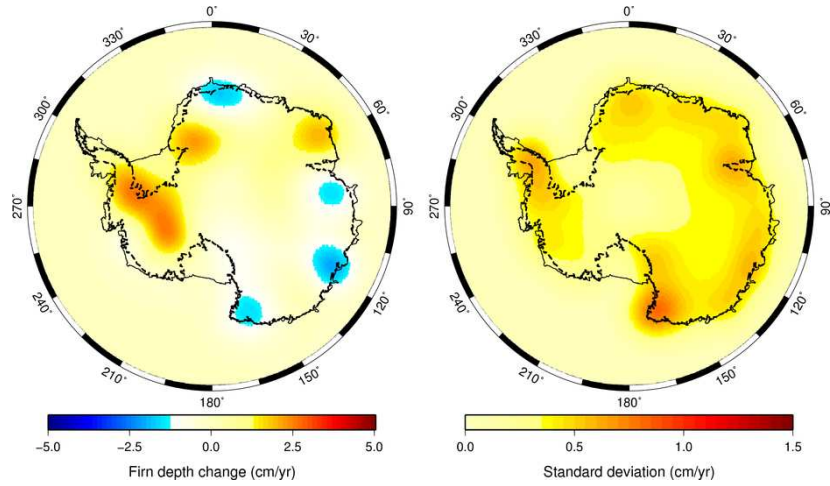
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GRACE – combination GIA



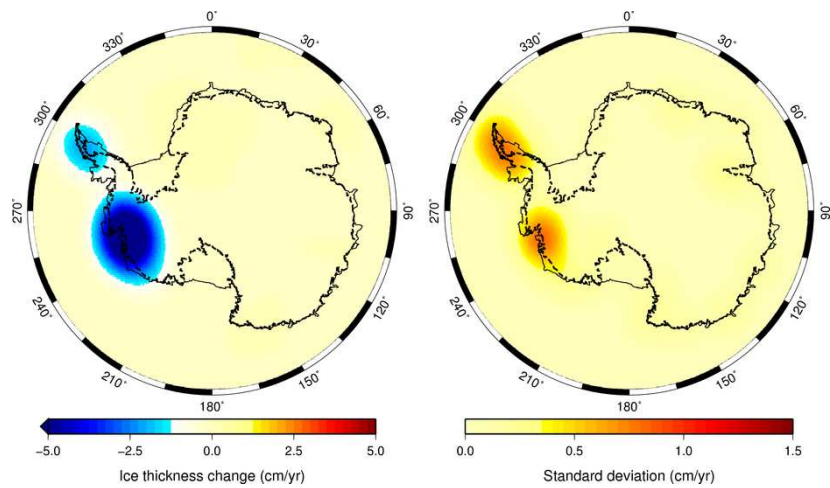
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Firn depth change from combination



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Ice thickness change from combination



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Surface mass balance (Gt/yr)

	Antarctica	WAIS	ASE	Graham
GIA:	114 ± 56	60 ± 24	16 ± 9	1 ± 6
GRACE-GIA:	-82 ± 56	-71 ± 24	-64 ± 9	-12 ± 6
ICE:	-85 ± 24	-84 ± 16	-66 ± 7	-12 ± 5
Horwath & Dietrich (2009)				
Aug02-Jan08:	-109 ± 48	-82 ± 42	-88 ± 10	
Rignot et al. (2008)				
2000:	-138 ± 92	-106 ± 60	-136 ± 55	-15 ± 8
2006:	-196 ± 92	-132 ± 60	-162 ± 55	-47 ± 9

Conclusions

- Present-day GIA over Antarctica appears to be concentrated over the Antarctic Peninsula and the Weddell Sea Embayment.
- The GIA impact on GRACE-derived estimates of mass balance amounts to 114 ± 56 Gt/yr.
- The GIA estimate is mainly constrained by the GRACE trend, from which it inherits the largest uncertainties.