

Supplementary Materials: Inter-annual variability in the Antarctic ice sheets using geodetic observations and a climate model

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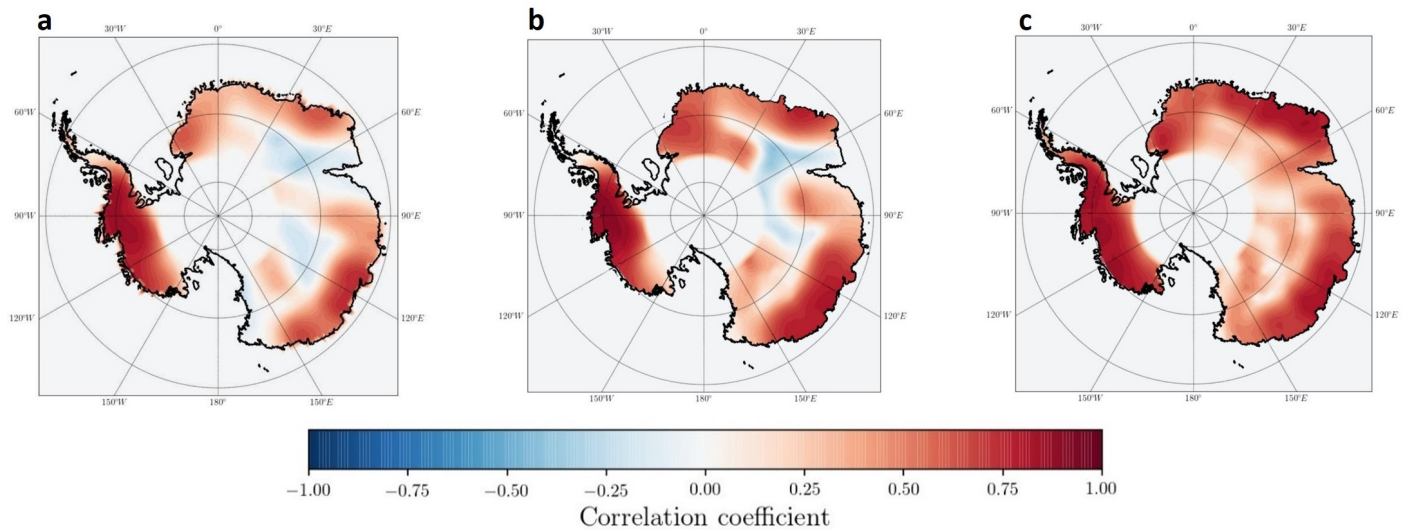


Figure S1. Coefficient of correlation between height changes estimated from (a) Envisat and GRACE, (b) Envisat and RACMO and (c) GRACE and RACMO, during the period 2002 - 2010. Positive and negative correlation coefficients are in red and blue respectively.

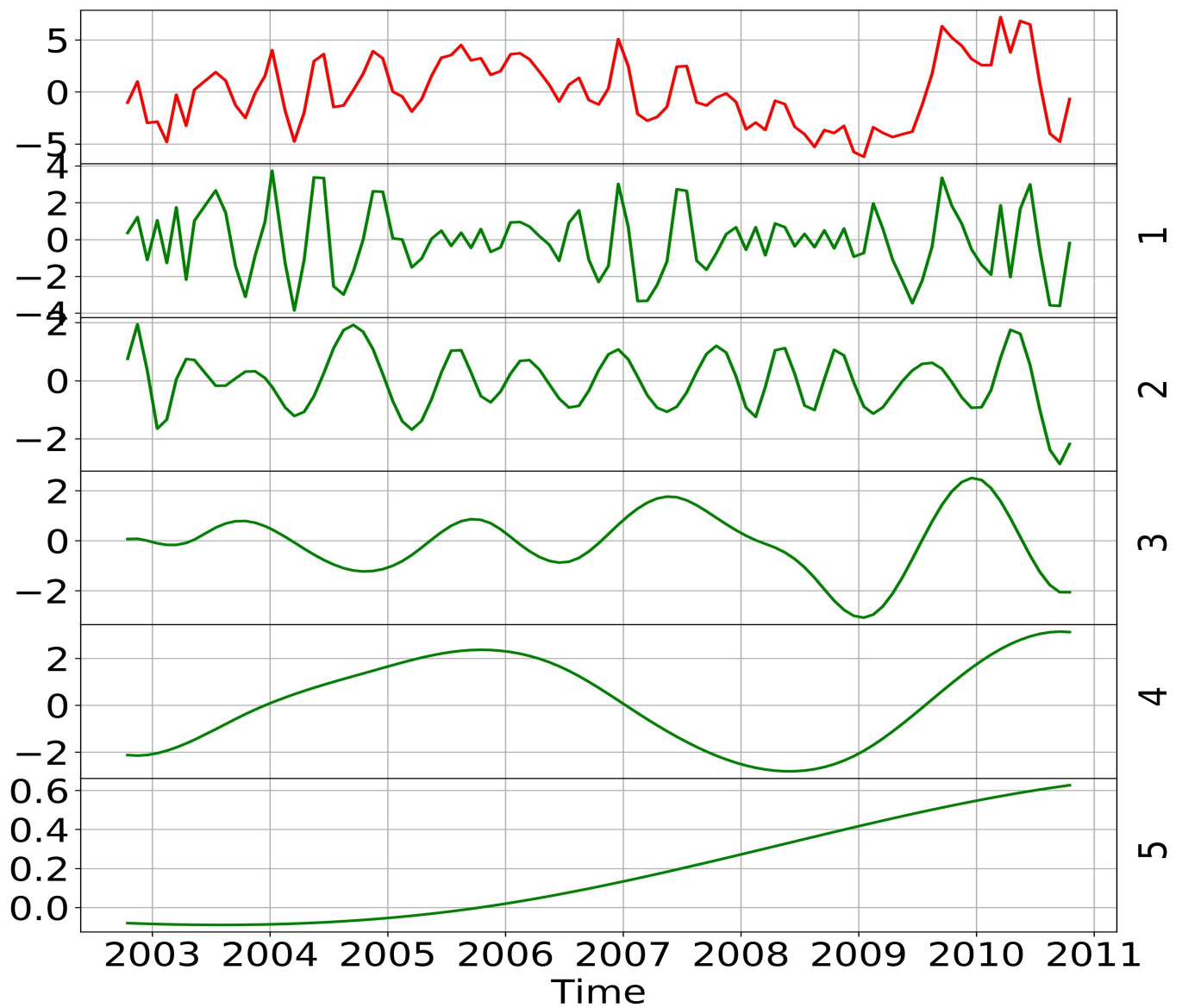


Figure S2. Overview of the empirical mode decomposition (EMD). Normalized snow equivalent height (SEH) at Dronning Maud Land (DML) in red and constituent modes in green. The abscissa is the time. The ordinate shows the amplitude of the signal and corresponding mode.

- 1 Inter annual signal is extracted using empirical mode decomposition (EMD) fol-
 2 lowed by a selective mode reconstruction. Here we estimate the information retained in
 3 the extracted signal. This is given as,

$$\%IA[i, j] = \left[\frac{RMS(S[i, j])}{RMS(O[i, j])} \right] \times 100 \quad (1)$$

- 4 where S and O represent the extracted inter-annual signal and monthly height
 5 changes respectively. i and j stand for the latitude and longitude of the region respec-
 6 tively.

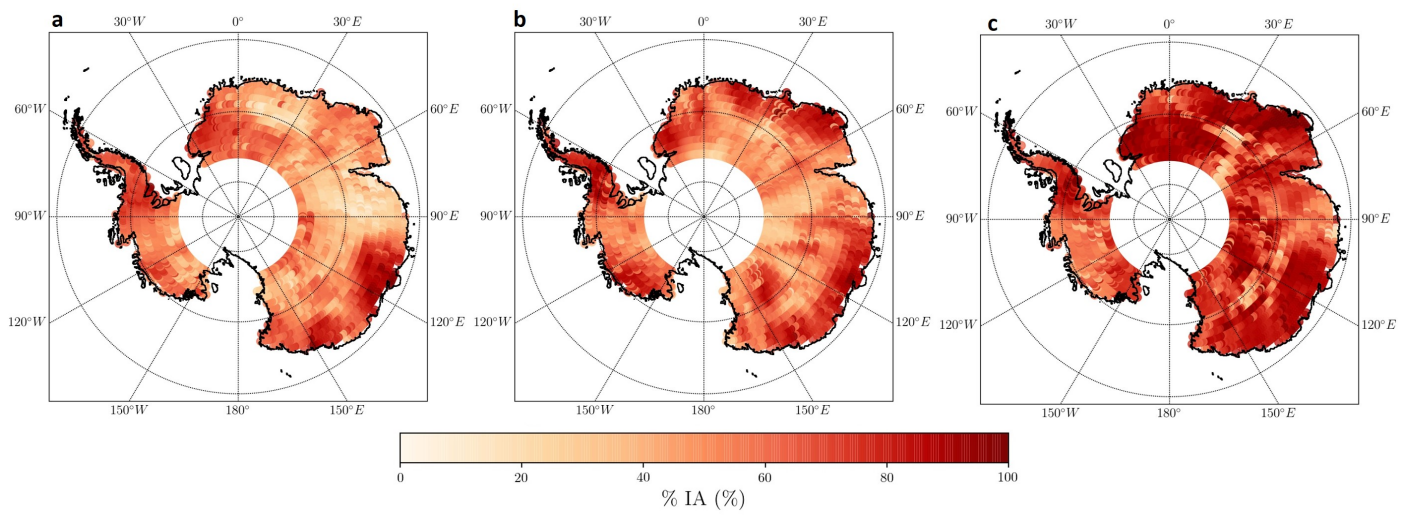


Figure S3. Energy ratio of the inter-annual signal extracted from (a) Envisat, (b) GRACE and (c) RACMO. Higher values indicate higher energy content in the inter-annual signal. It is calculated as the ratio between the inter-annual signal and the original signal.

Table 1: Explained variance in percentage after Principal Component Analysis (PCA).

Longitude[°]	First Principal Component (PC1)	Second PC (PC2)	Third PC (PC3)
15	73.20	20.83	5.96
30	80.99	14.16	4.85
45	81.93	12.72	5.35
60	71.86	21.38	6.76
75	68.97	17.85	13.18
90	46.29	33.26	20.45
105	84.97	9.54	5.48
120	82.76	11.42	5.81
135	84.11	9.40	6.49
150	72.91	22.24	4.85
165	57.86	32.08	10.06
-	-	-	-
-	-	-	-
210	57.97	34.84	7.18
225	77.05	17.79	5.16
240	79.63	13.78	6.59
255	76.20	20.30	3.50
270	91.21	5.95	2.84
285	75.64	16.89	7.47
-	-	-	-
-	-	-	-
330	77.09	20.91	2.00
345	91.39	6.39	2.22
360	90.97	6.27	2.75

Table 2: Coefficient of each data-set in PC1.

Longitude[°]	ENVISAT	GRACE	RACMO
15	0.49	0.60	0.63
30	0.54	0.59	0.60
45	0.55	0.59	0.60
60	-0.54	0.64	0.55
75	-0.57	0.56	0.60
90	0.51	0.49	0.71
105	0.58	0.59	0.56
120	0.58	0.56	0.59
135	0.58	0.57	0.59
150	0.57	0.65	0.51
165	-0.23	0.69	0.68
-	-	-	-
-	-	-	-
210	-0.14	0.71	0.68
225	0.60	0.61	0.51
240	0.60	0.55	0.58
255	0.64	0.50	0.59
270	0.59	0.57	0.57
285	0.59	0.61	0.53
-	-	-	-
-	-	-	-
330	0.60	0.64	0.48
345	0.58	0.57	0.59
360	0.59	0.57	0.57