

Barotropic tides in the Southern Indian Ocean.

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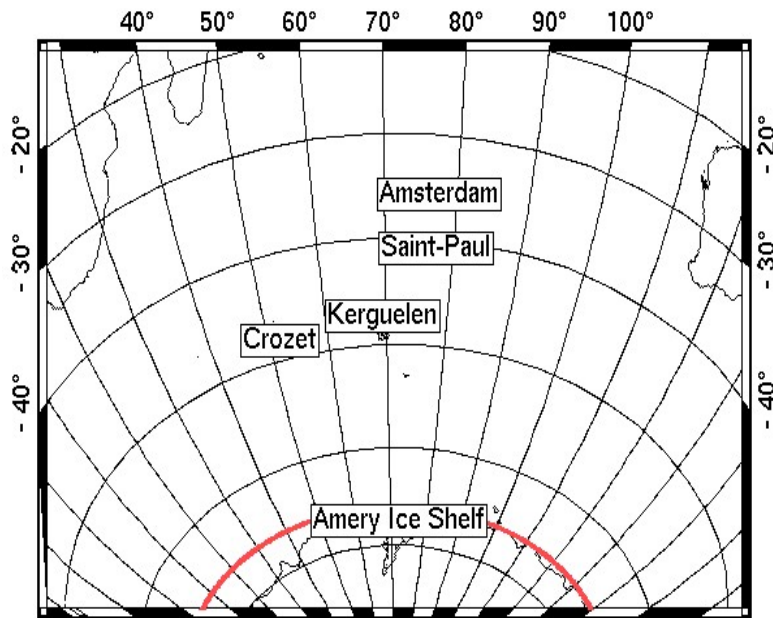


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Introduction

Sub-cm accuracy of tidal model in the deep non polar ocean



Challenges for new tidal models
coastal regions
high latitudes (66°S cut-off)
ice shelf areas

Southern Indian Ocean
lack of in-situ data
seasonal records
complex tides

Barotropic modelling

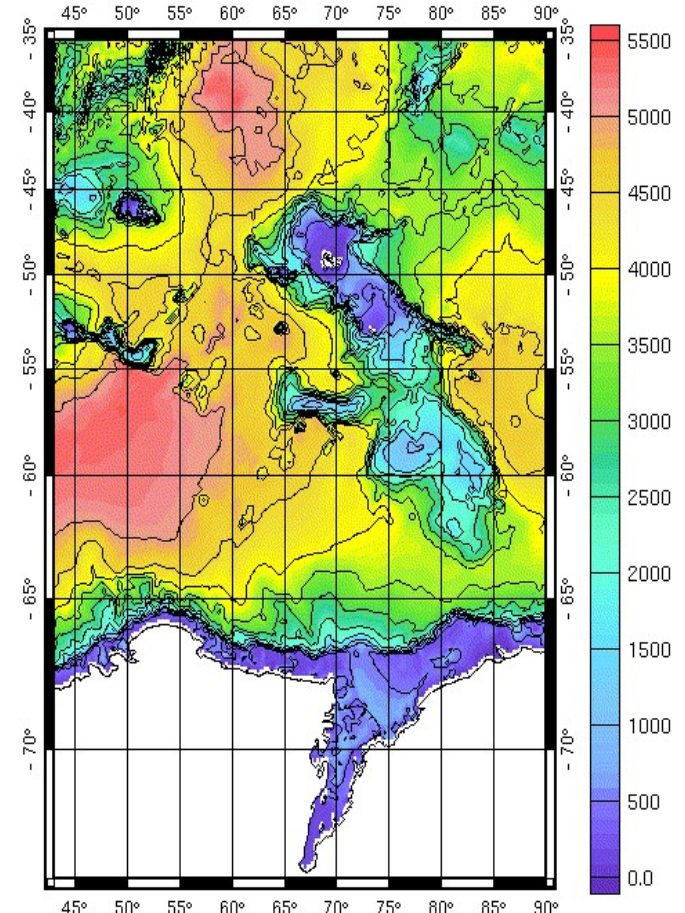
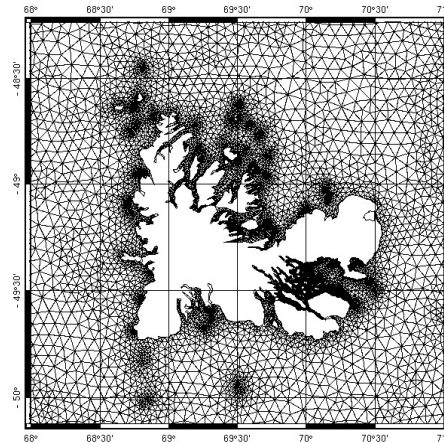
TUGO/MOG2D
(2D gravity waves model)

barotropic
non linear
finite element method
shallow water equations

Configuration

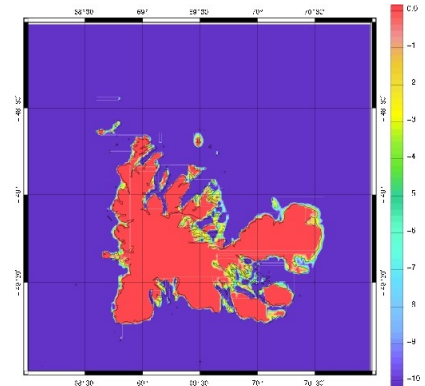
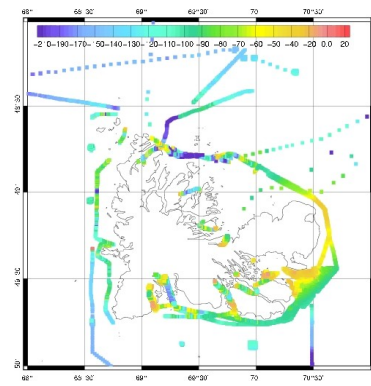
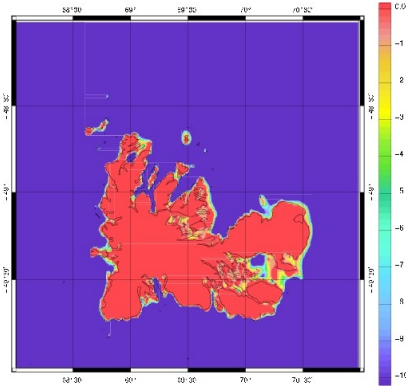
tidal forcing
OBC : FES2004
AIS particularities

13 tidal constituents

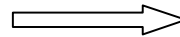


Bathymetry

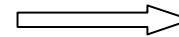
Kerguelen



GEBCO

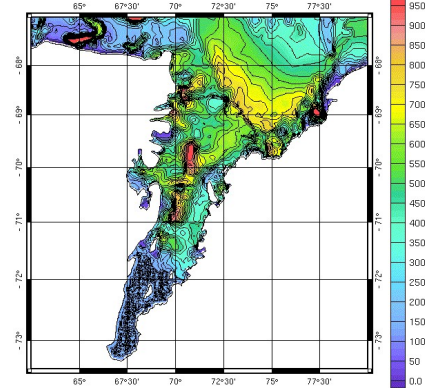
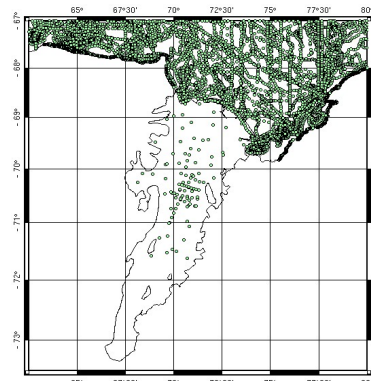
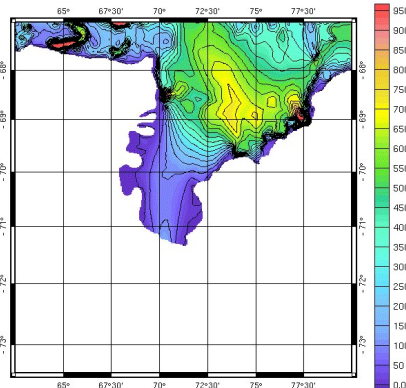


Data



New bathymetry

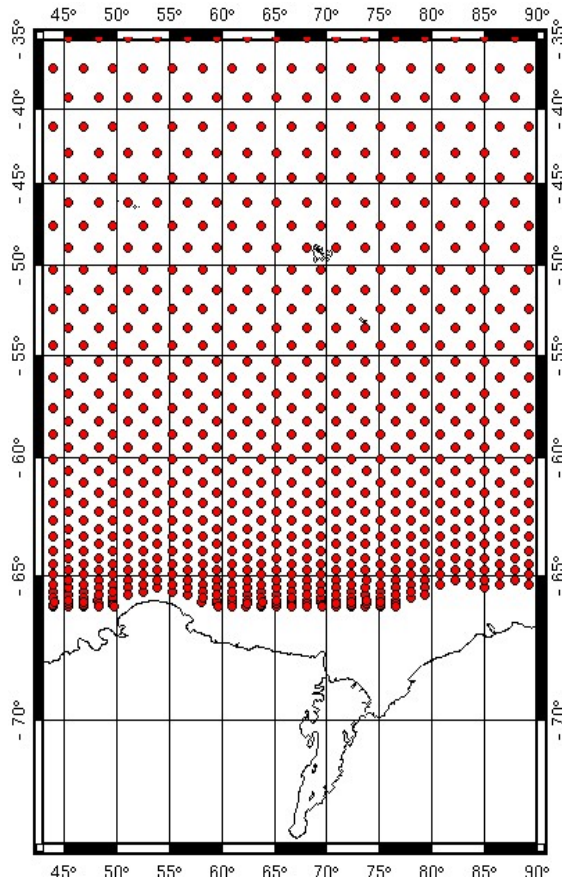
AIS



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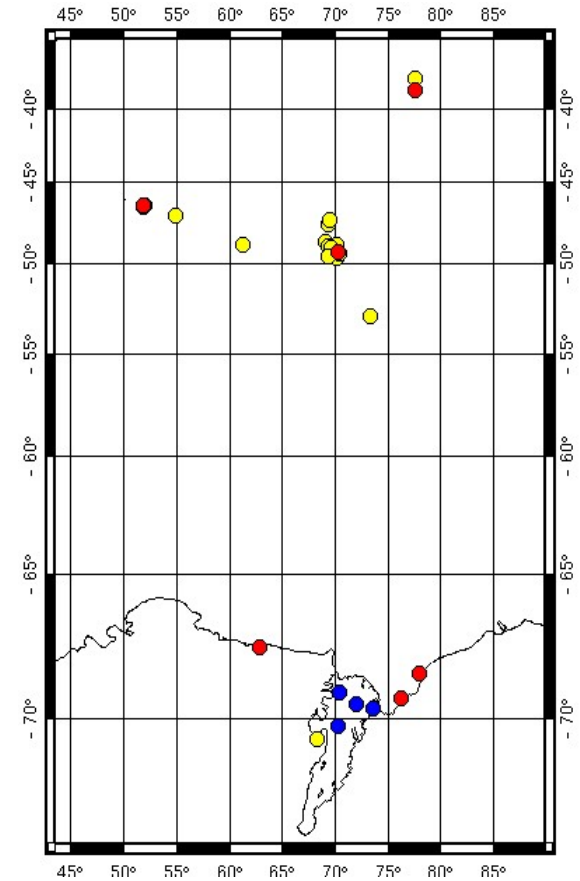
Data for the validation



TP cross over points
x-track (NOVELTIS, CTOH)
North to 60°S
Up to 200 points

In-situ data

- Coastal TG (ROSAME, Australia, China)
- Moorings (ROSAME, SHOM, IFREMER)
- GPS (Australia)



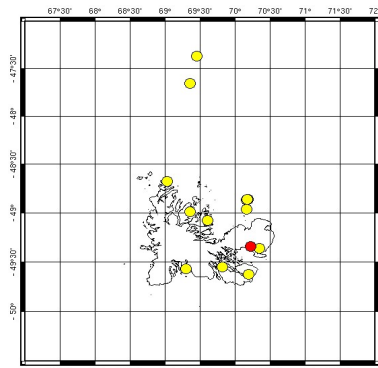
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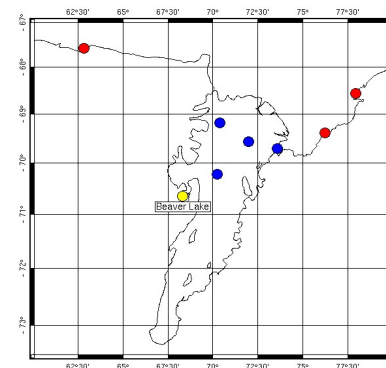
Effects of the new bathymetry

Statistics :

$$r_{comb} = \sqrt{\frac{1}{2N_{obs}} \sum_{i=1}^{N_{constituents}} \sum_{j=1}^{N_{obs}} (Z_{j,mod} - Z_{j,obs})^2}$$



	Kerguelen TG	All Kerguelen data
GEBCO	4.8	2.2
GEBCO + improvements	1.6	1.3



	Prydz Bay	AIS with BVL	AIS without BVL
GEBCO	1.6	2.9	2.1
GEBCO + improvements	1.5	2.2	1.7



Comparisons with other models

GLOBAL

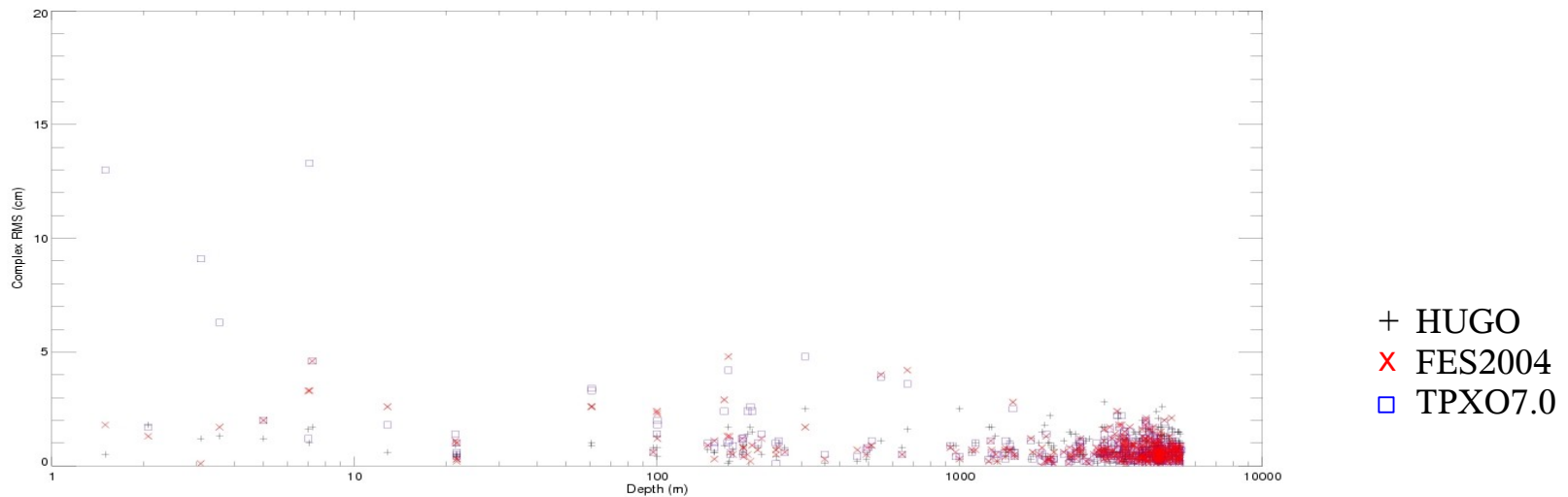
FES 2004

TPXO7.0

ANTARCTICA

CADA00.10

	In-situ data			Altimetric data	
	All	North to 56°S	South to 56°S	All	South to 56°S
HUGO	1.3	1.1	2.0 (1.7)	1.2	1.1
FES2004	1.6	1.2	2.9 (2.0)	1.2	1.1
TPXO7.0	1.8	1.6	2.5 (2.5)	1.2	1.1
CADA00.10			2.1 (2.0)		1.1



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Conclusion

Tides equivalent in the deep ocean with models assimilating data
and better in coastal regions

Improvement beneath the AIS

Results without assimilation

→ we can expect results to be good for regions well away from data

