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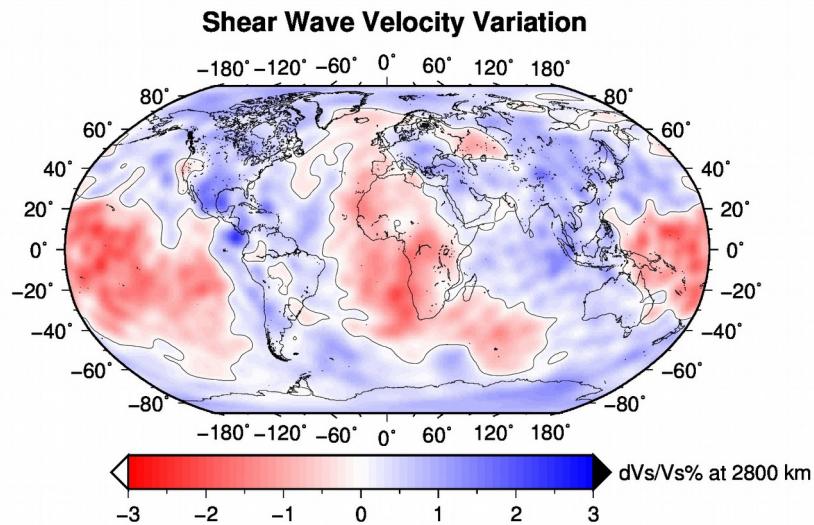


Figure 1a S40RTS tomography at CMB

Fig1

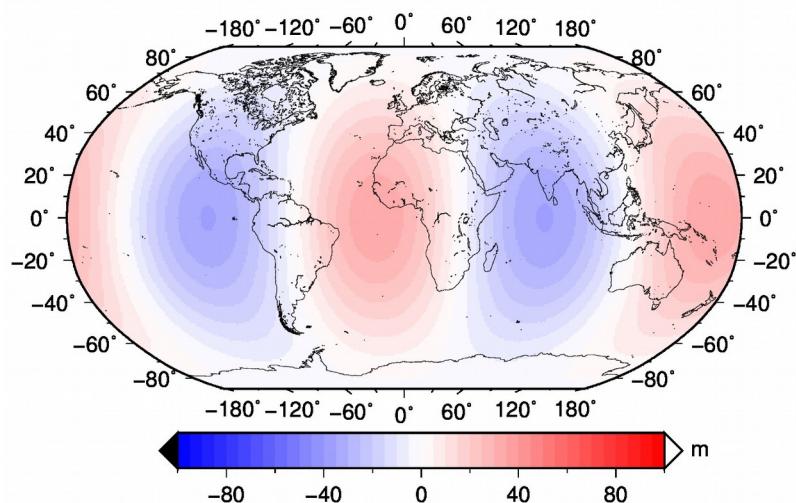


Figure 1b degree 2 observed geoid

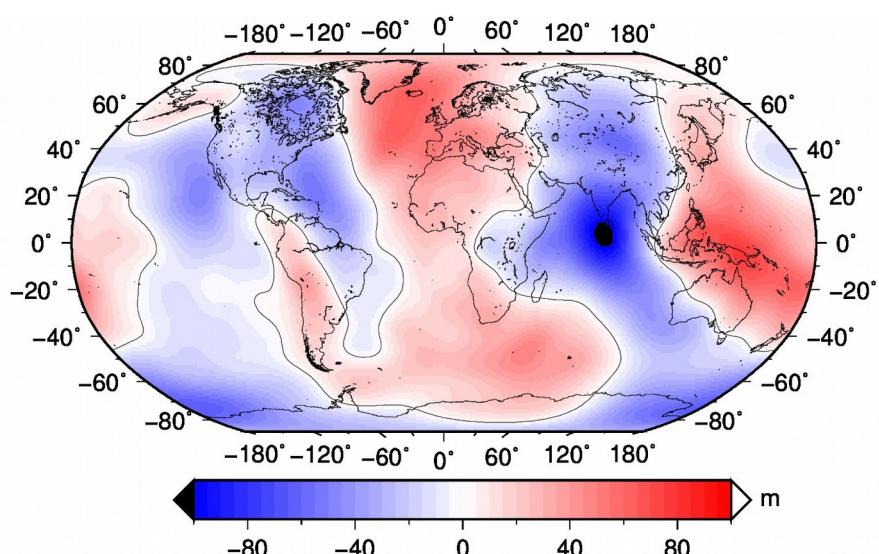


Figure 1c degree ~20 observed geoid
(the same degree range as CitcomS Output)

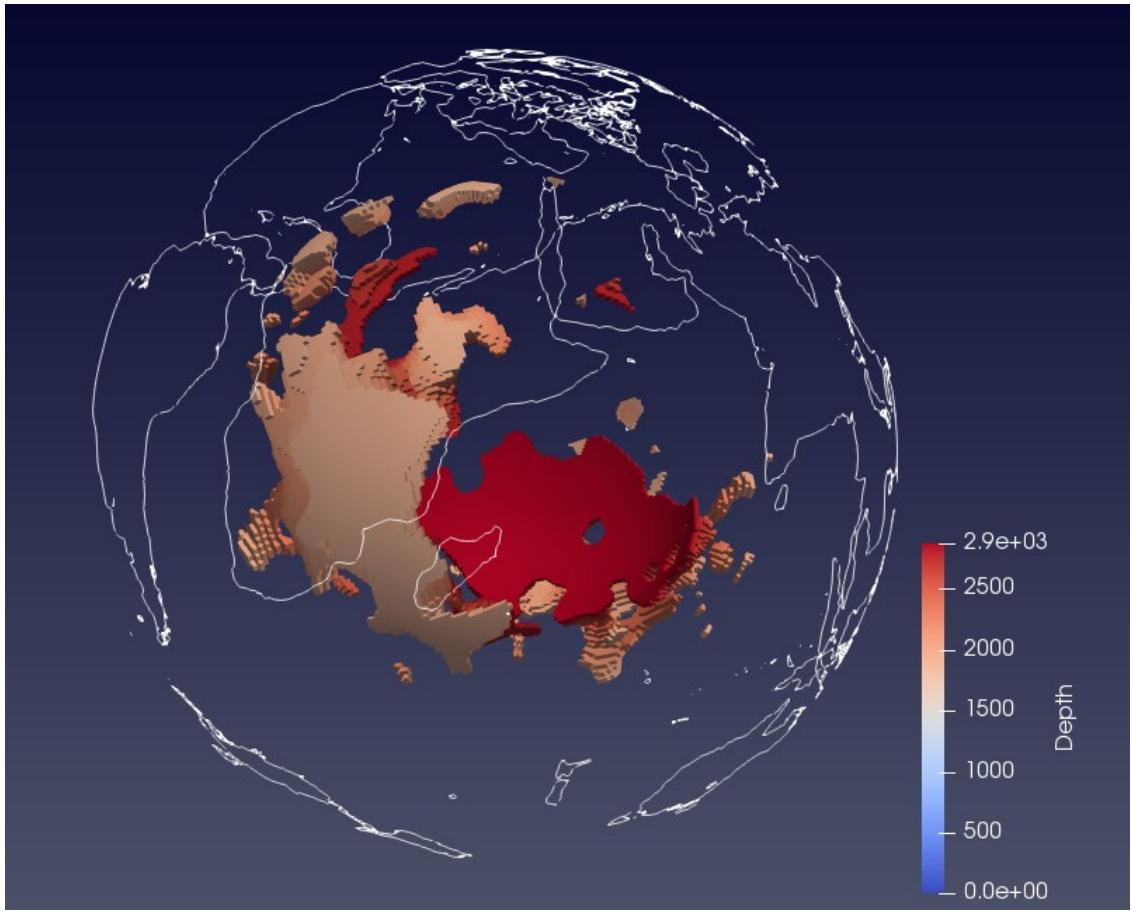


Figure 1d Threshold of T and Dpeth for LLSVPs in Paraview

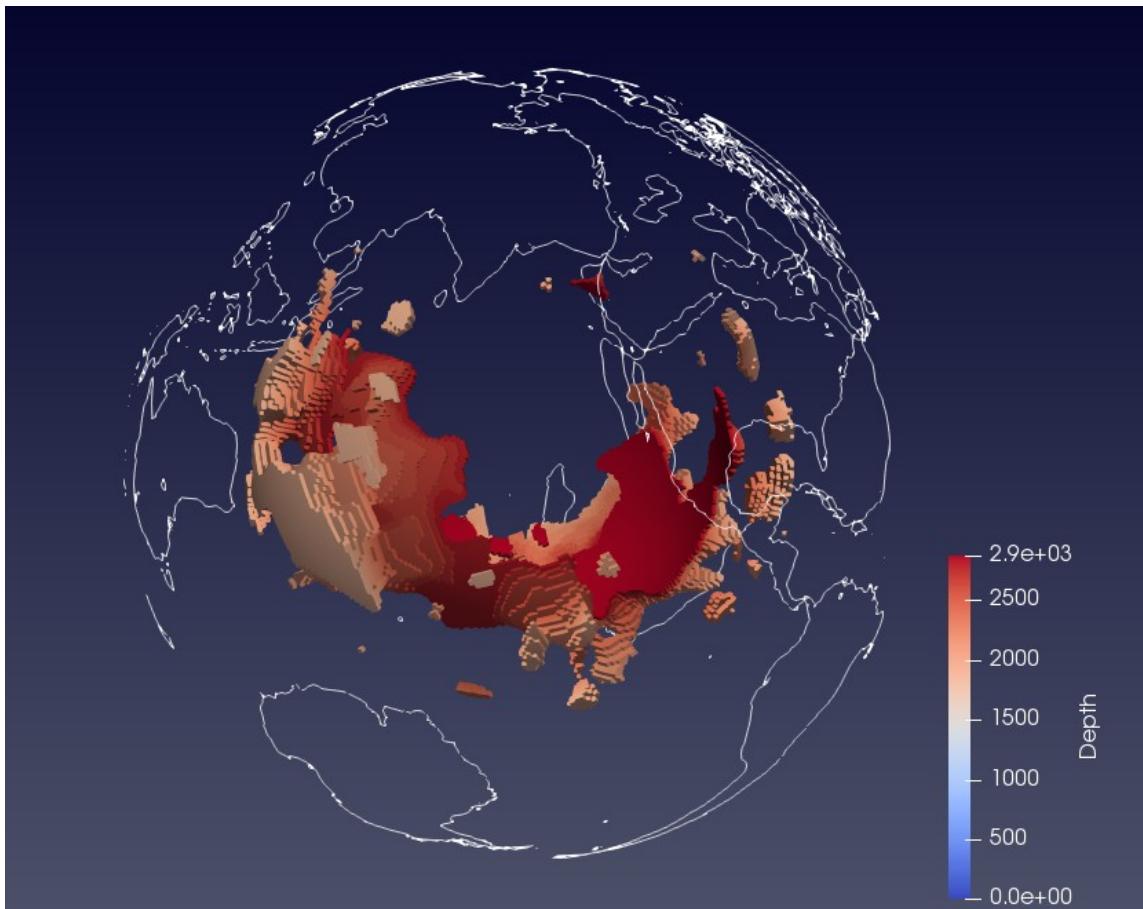


Figure 1e Threshold of T and Dpeth for LLSVPs in Paraview

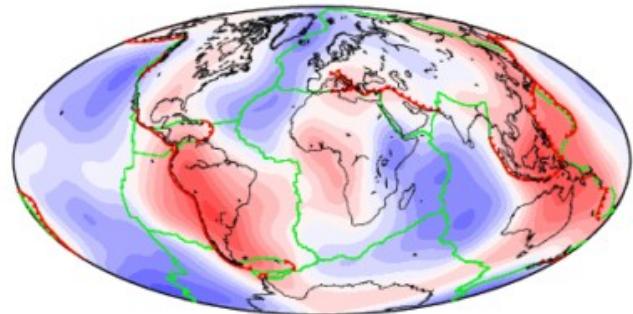
2a

2b

Fig2

Figure 2 Viscosity structure of Benchmark 1
a:Input as the paper;b:Output in CitcomS

3a



3b

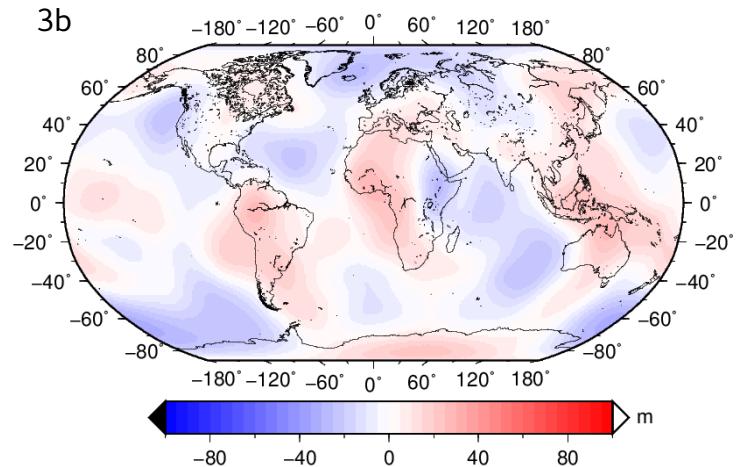
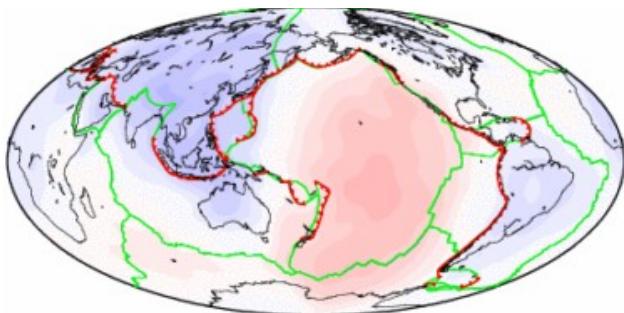


Figure 3 Geoid of Benchmark 1
a:from paper;b:from CitcomS

4a



4b

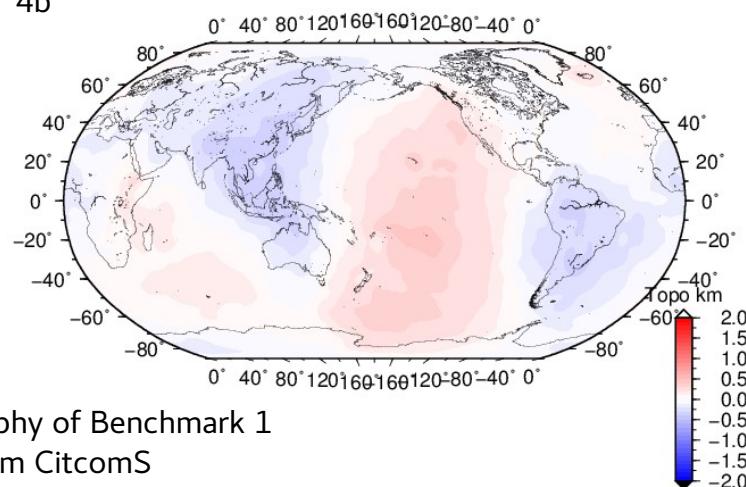
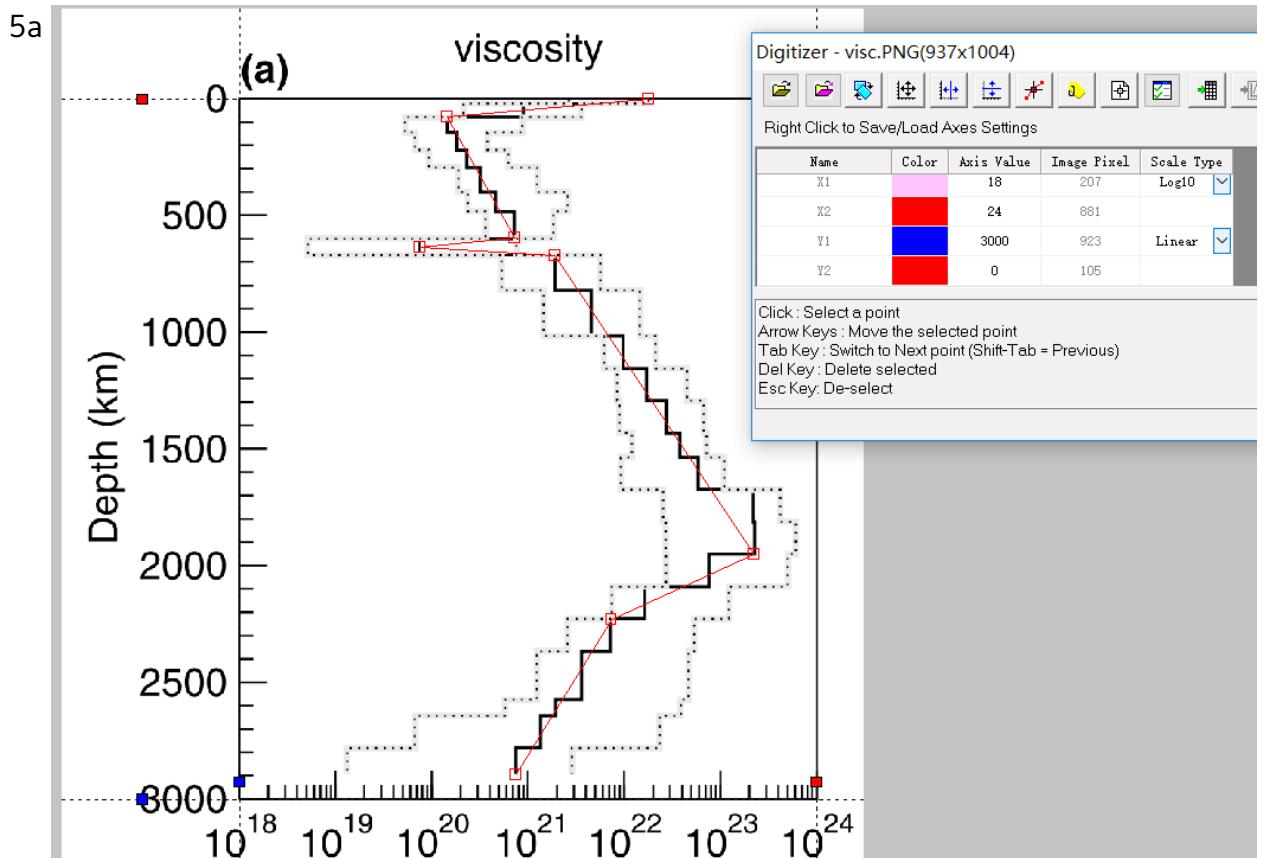


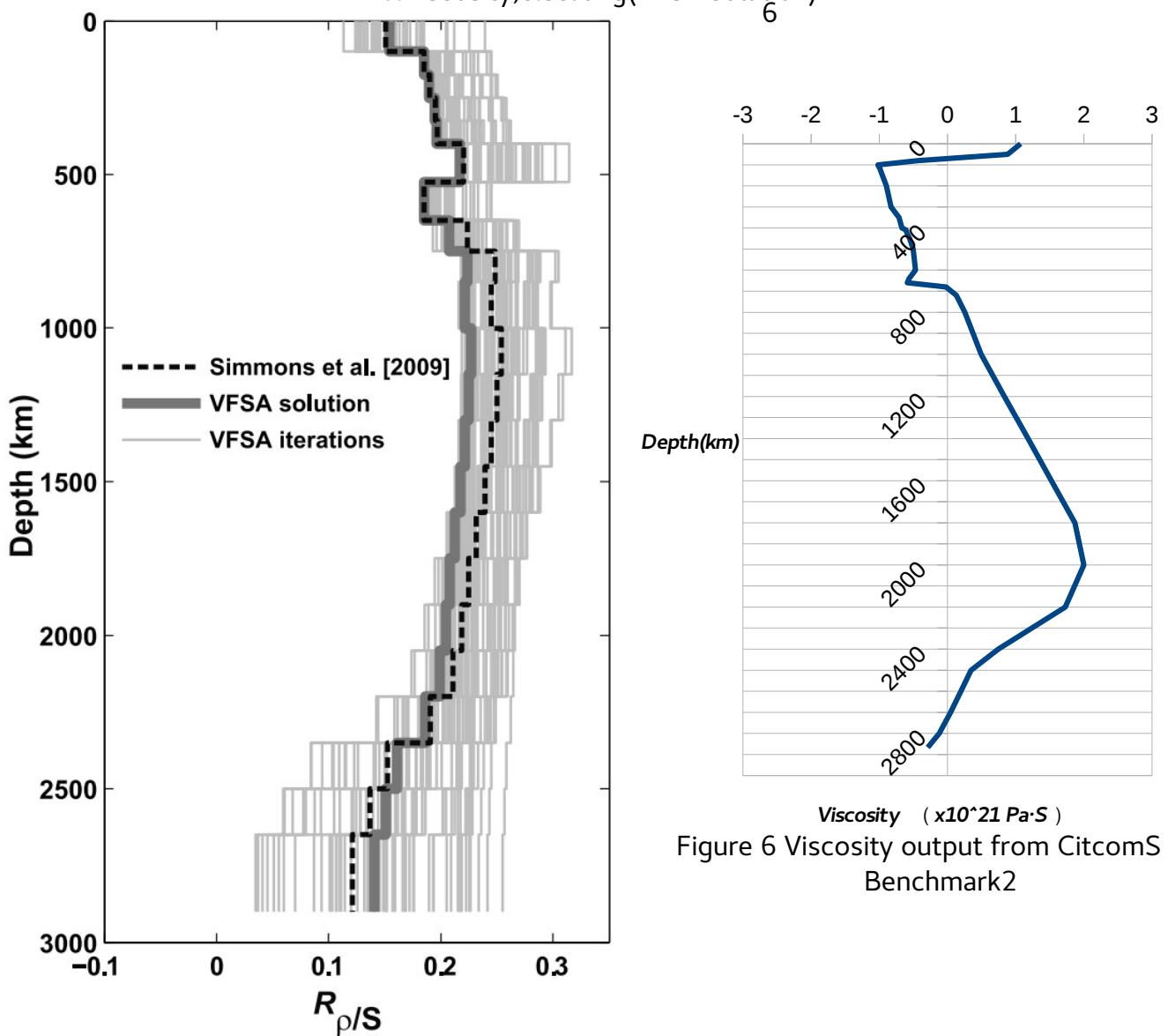
Figure 4 Dynamic Topography of Benchmark 1
a:from paper;b:from CitcomS



5b

Figure 5 Background of Benchmark2
a:Viscosity;b:scaling(VFSA solution)

Fig 5,6



7a

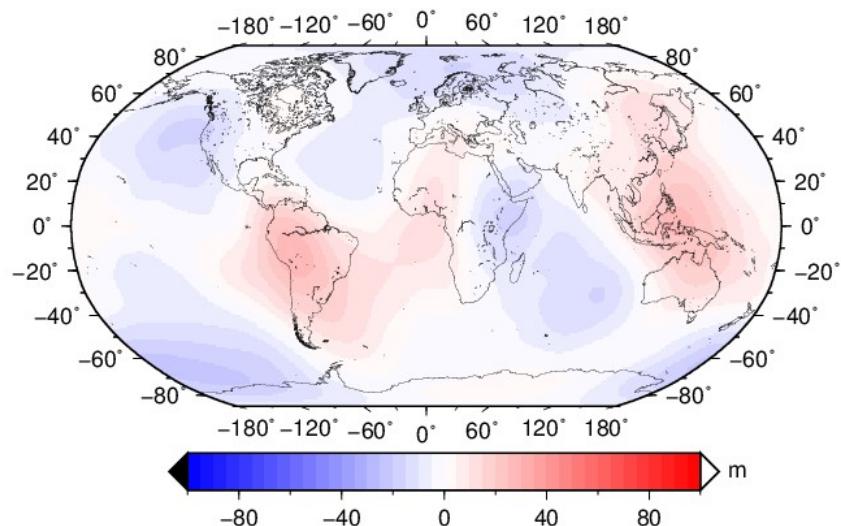


Figure 7a Geoid output of Benchmark2

Fig 7,8

7b

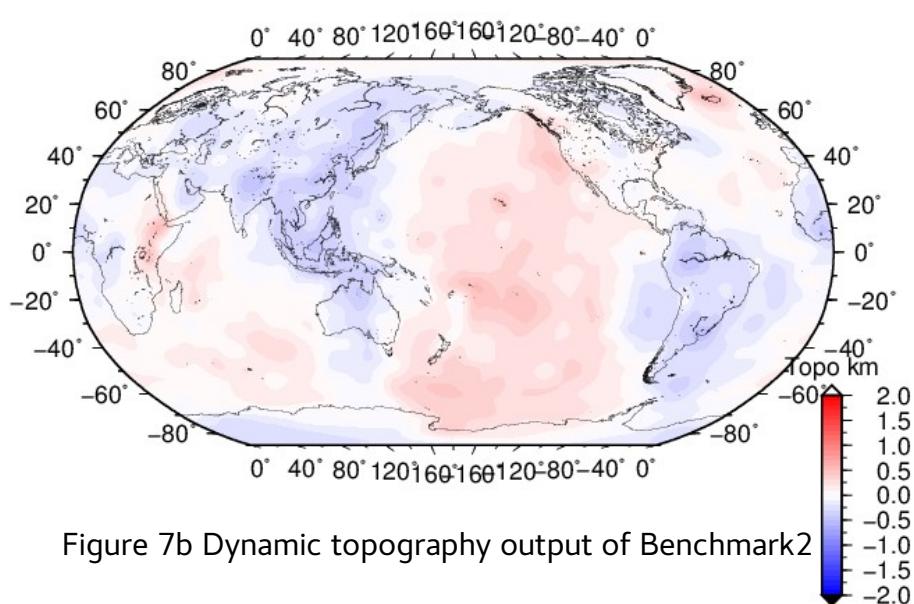


Figure 7b Dynamic topography output of Benchmark2

8

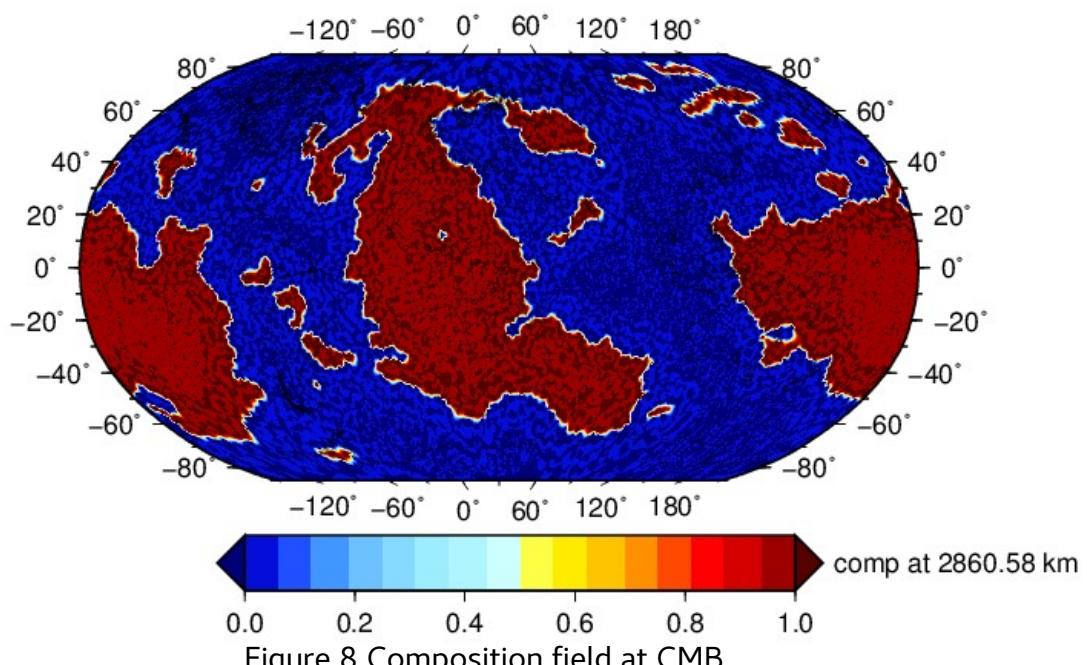


Figure 8 Composition field at CMB

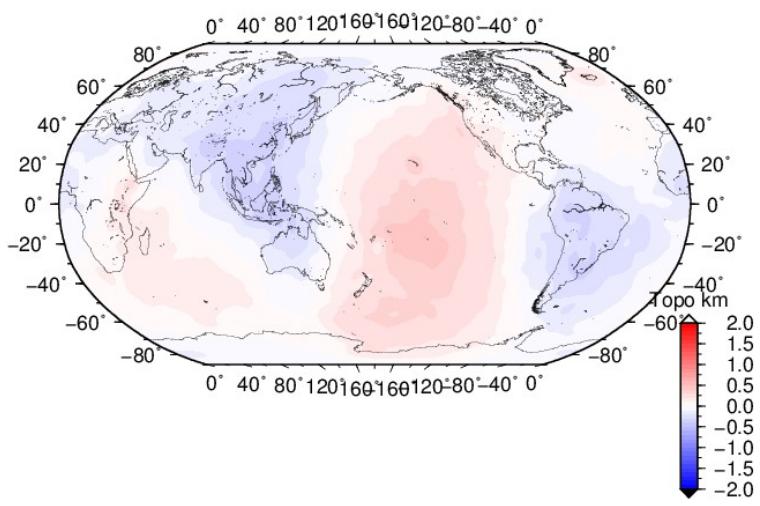
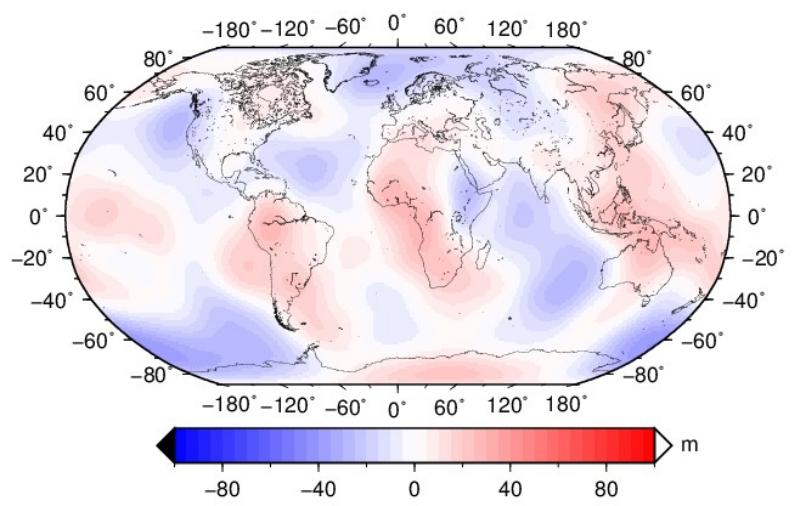


Fig9

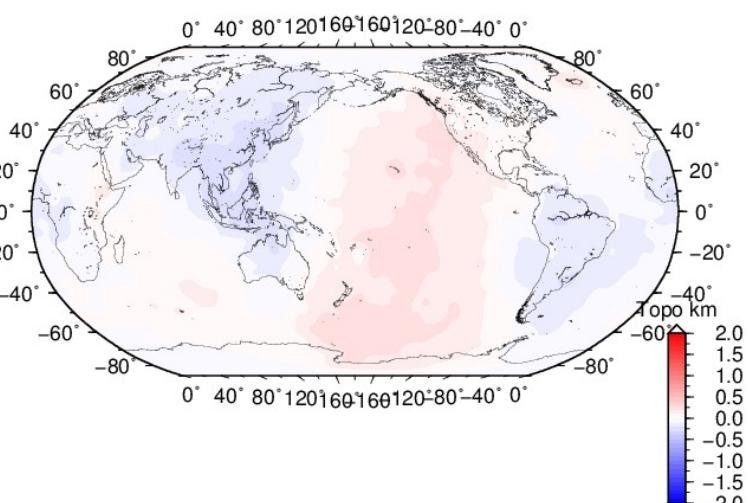
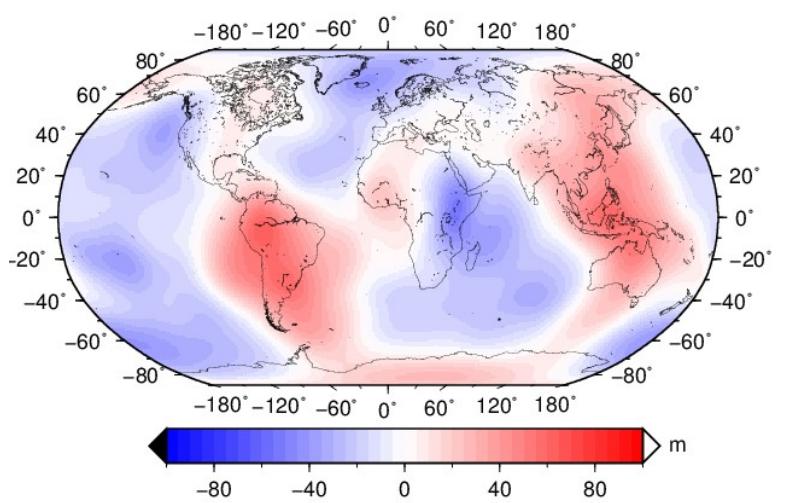
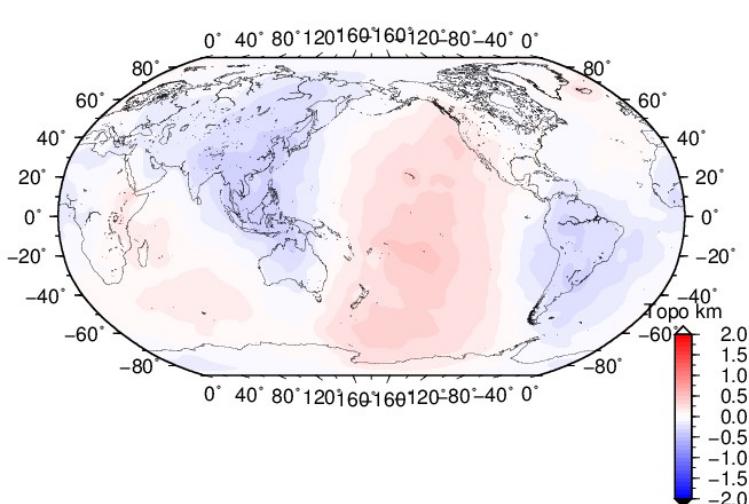
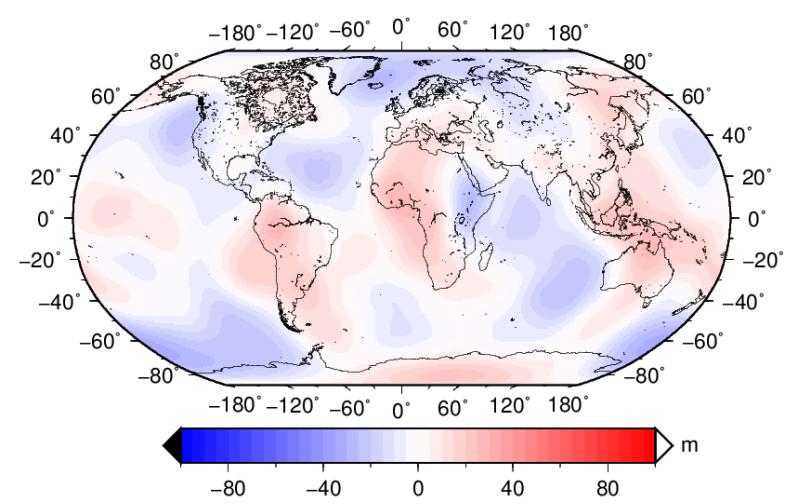


Figure 9 Geoid and Dynamic Topography output
r->refined coordinate

s_b->simple scaling and viscosity, from benchmark 1

0.1,10->Composition dependent Viscosity ratio,

compared to ambient($C=0$)

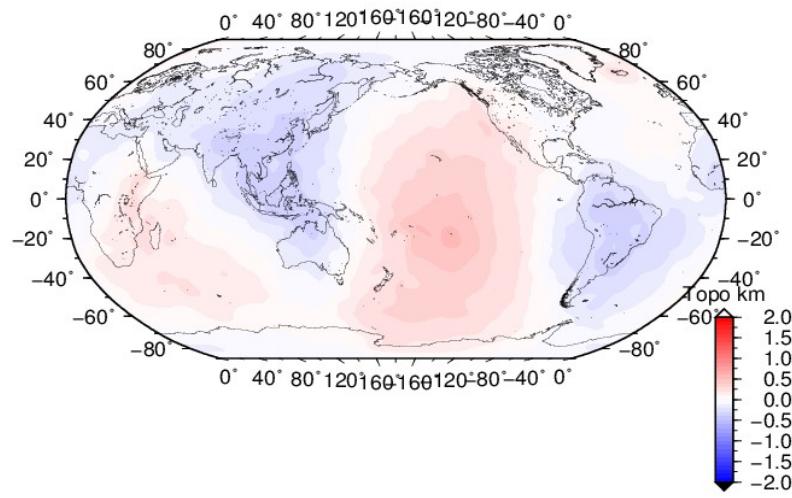
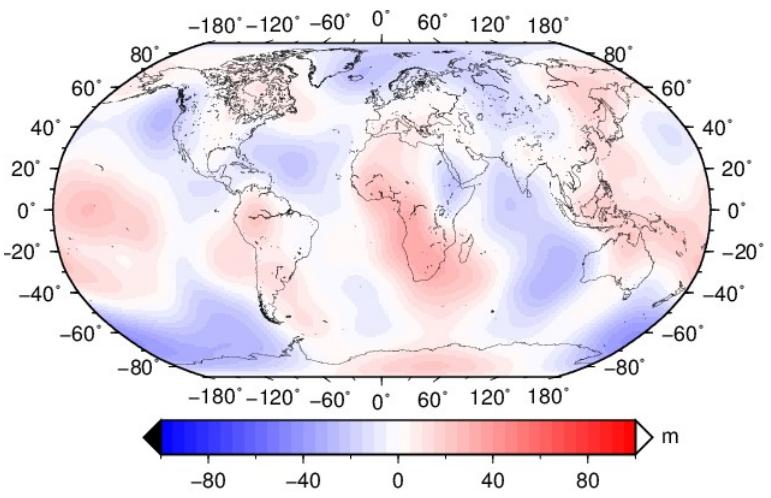


Fig10

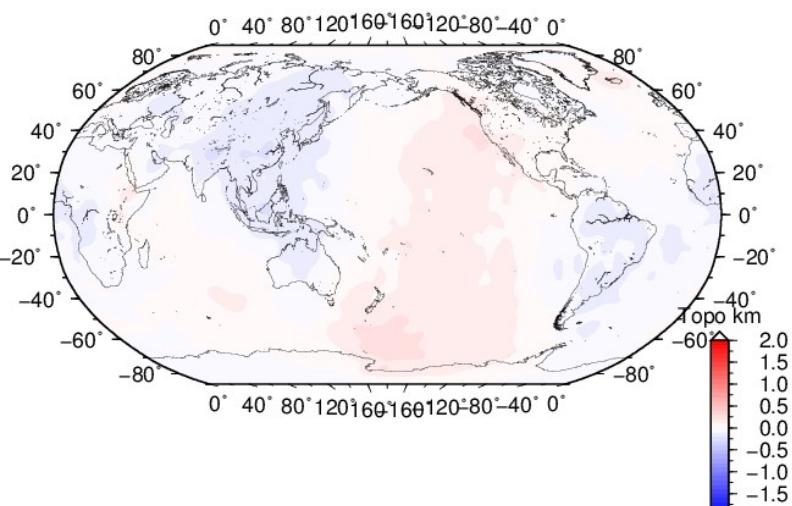
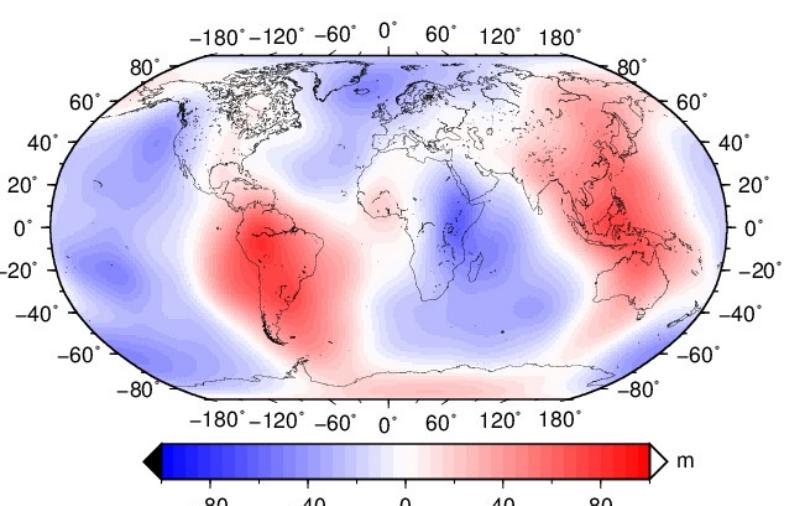
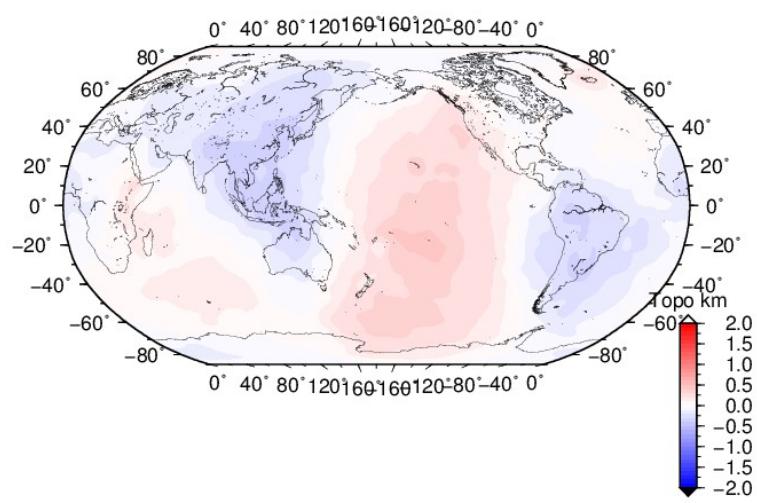
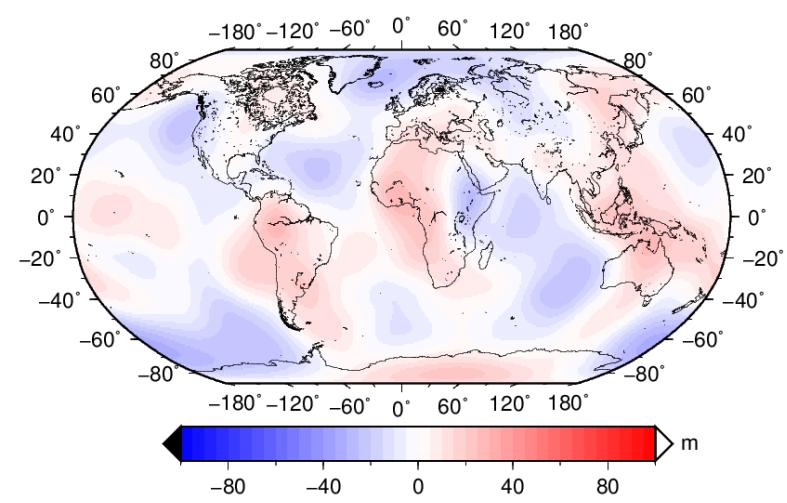


Figure 10 Geoid and Dynamic Topography output

r->refined coordinate

s_b->simple scaling and viscosity, from benchmark 1

0.01,100->Composition dependent Viscosity ratio,
compared to ambient($C=0$)

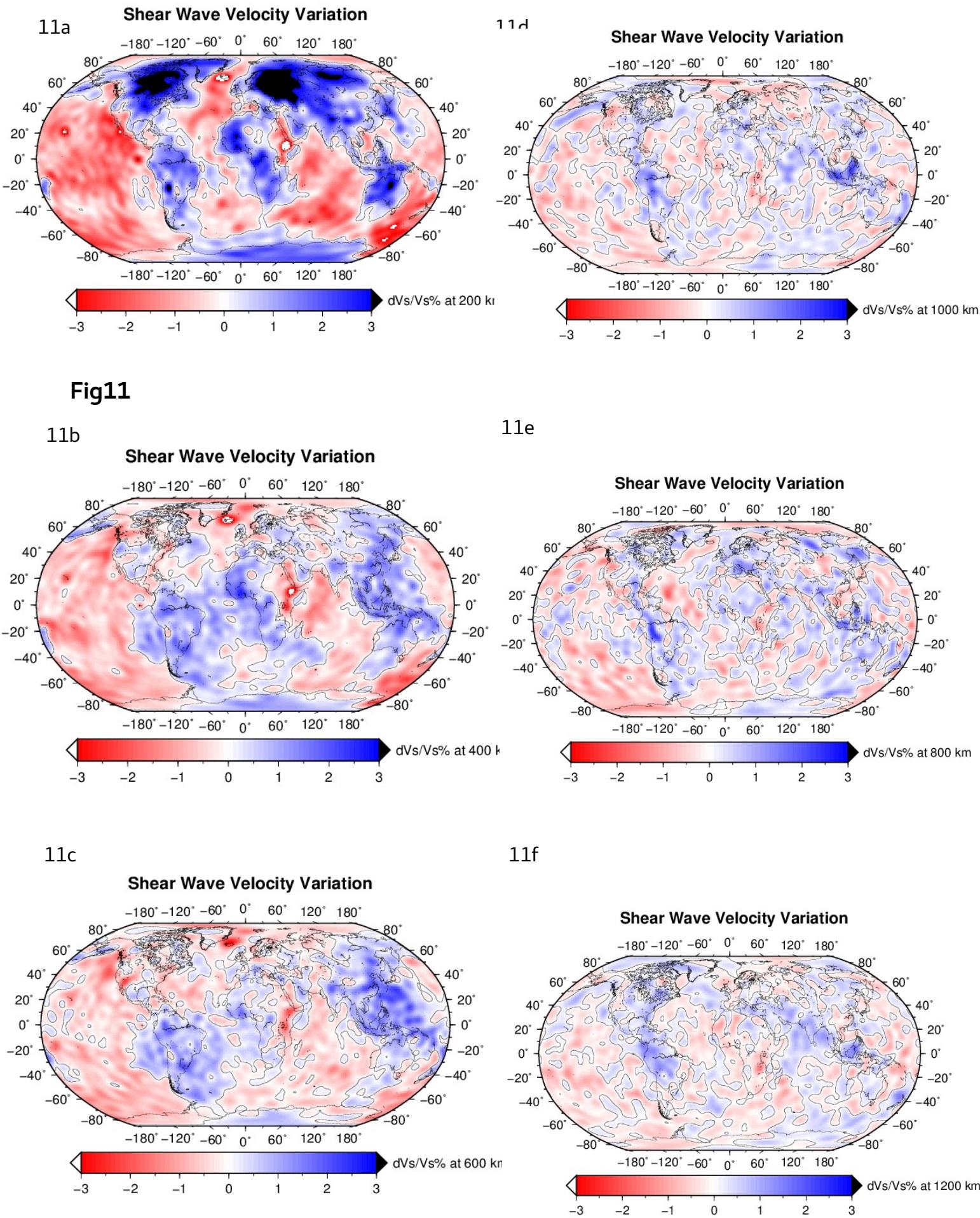


Figure 11 S40RTS Tomography from 200km to 1200km

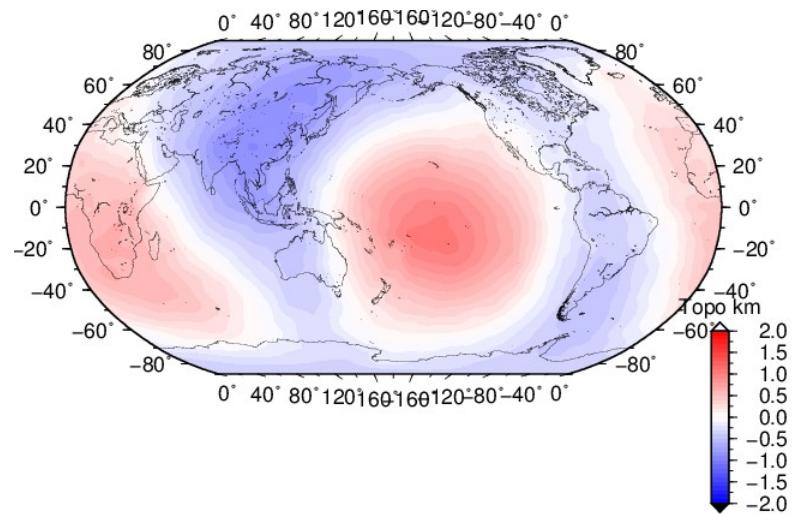
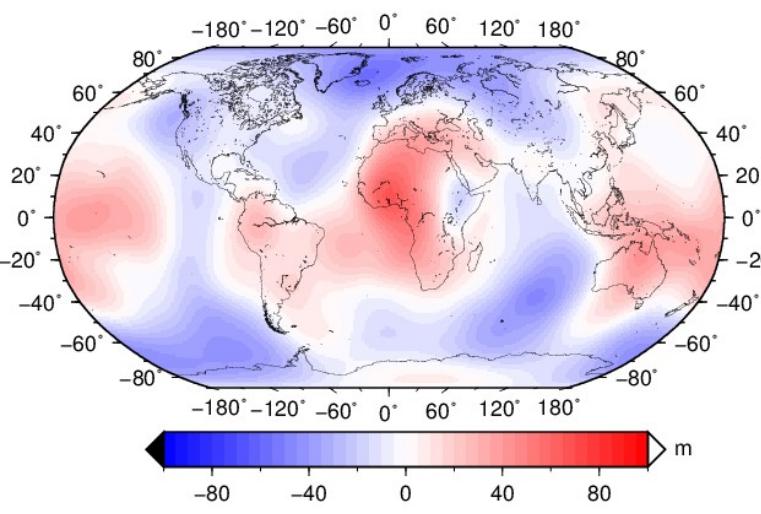


Fig12

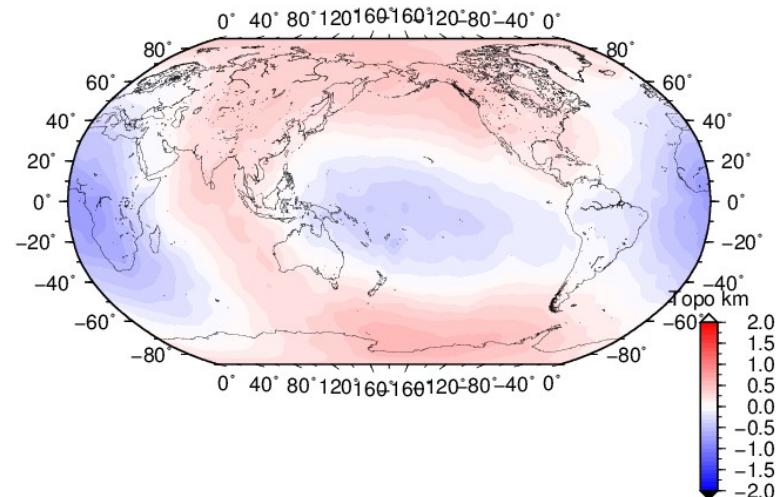
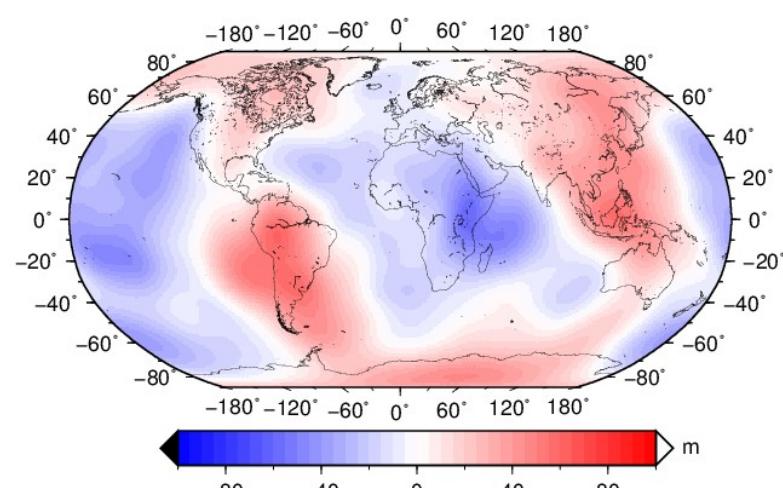
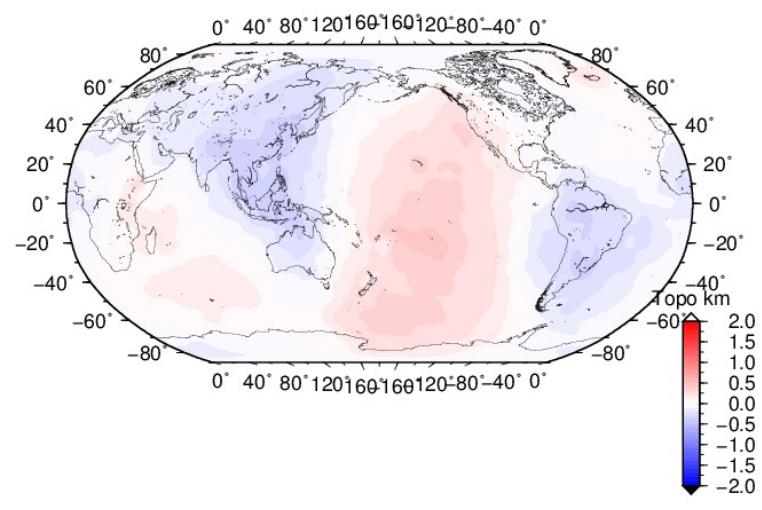
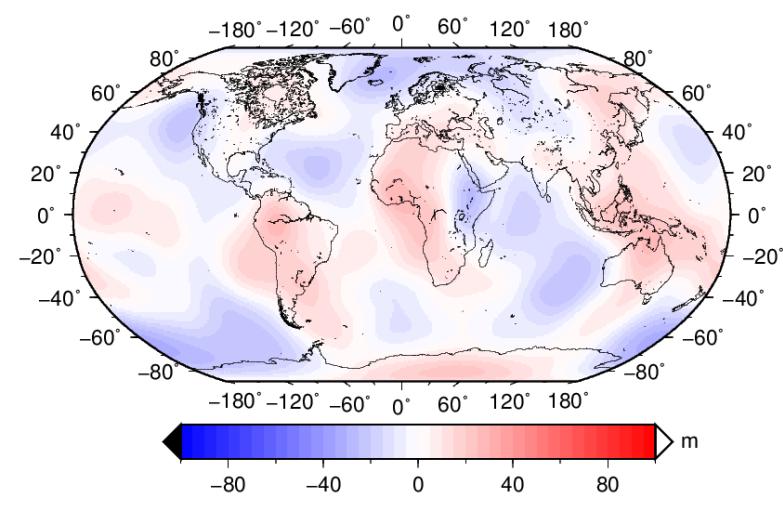
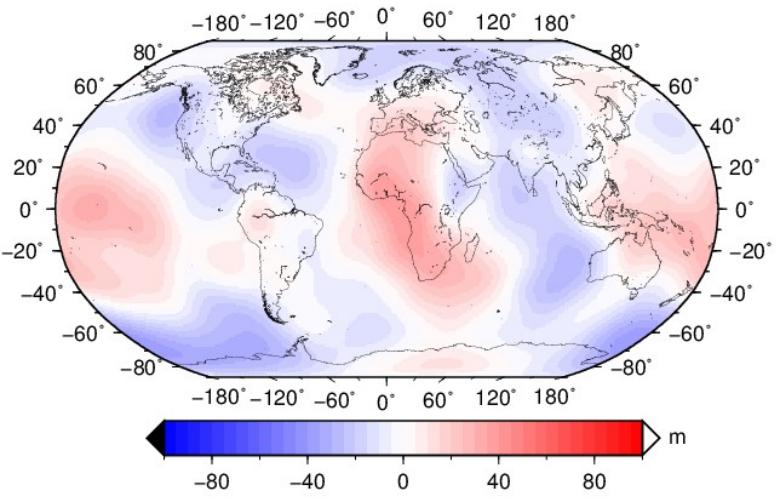


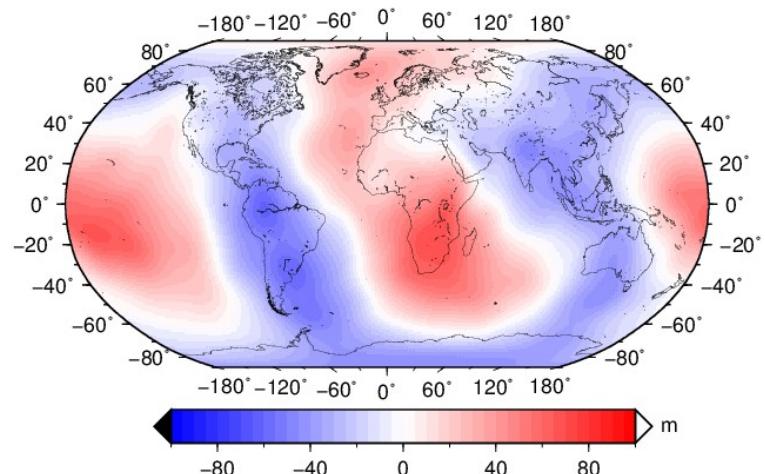
Figure 12 Geoid and Dynamic Topography output
 r ->refined coordinate

s_b ->simple scaling and viscosity, from benchmark 1

0.5,-0.5->Chemical buoyancy ratio, additional chemical density compared to pure thermal density(from scaling),negative for more buoyant

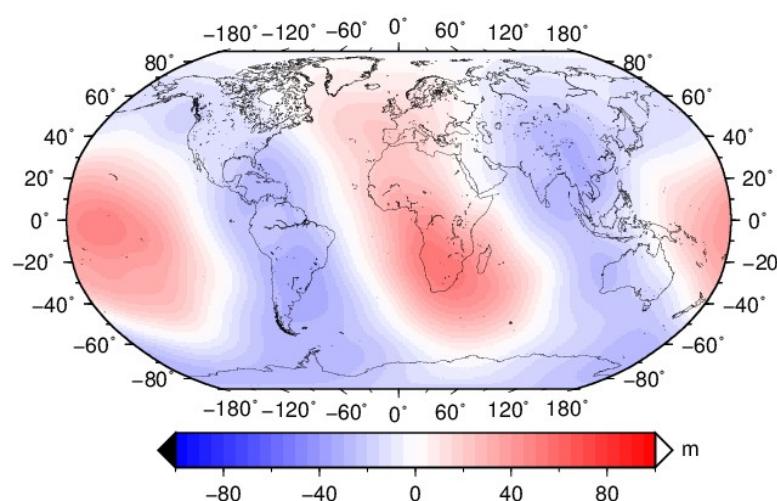


r2_s_1c

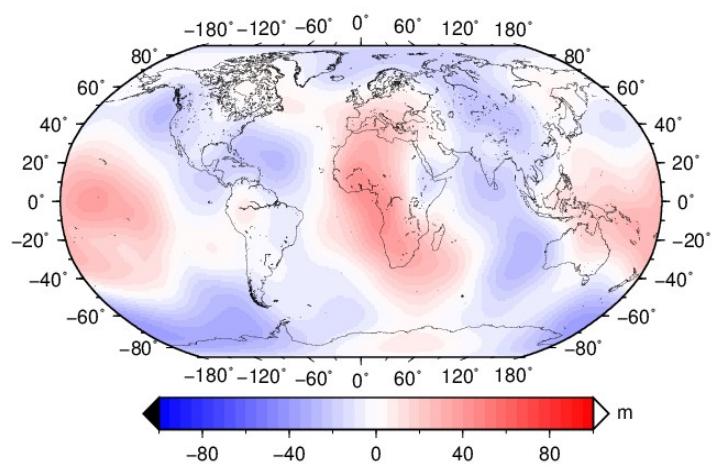


r2_s_2c

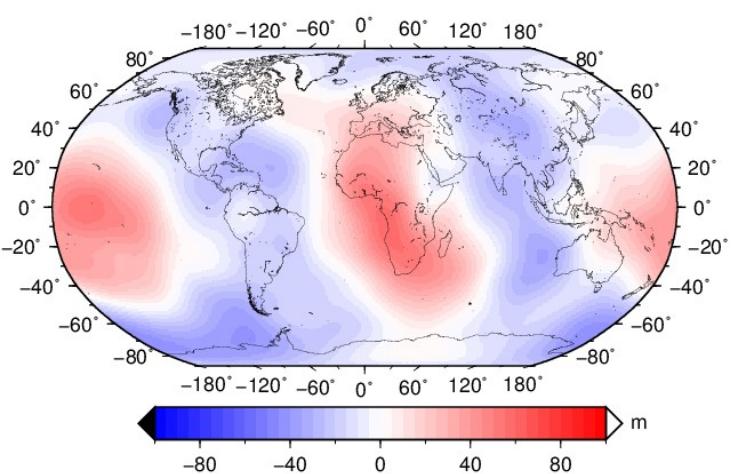
Fig13



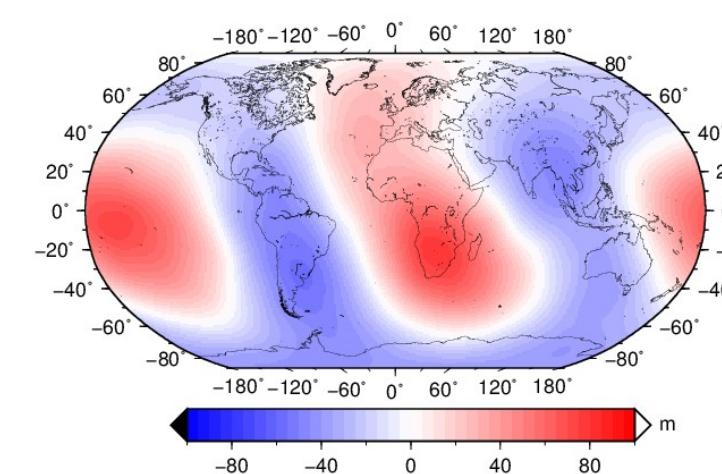
r2_s_3c



r2_s_4c3



r1_s_5c



r1_s_6c

Figure 13 Geoid output
r2->smoothing times for viscosity at refined coordinate
s_b->simple scaling, from benchmark 1
1~6c->viscosity structure modified from the combination of
benchmark1&2,in Fig 14

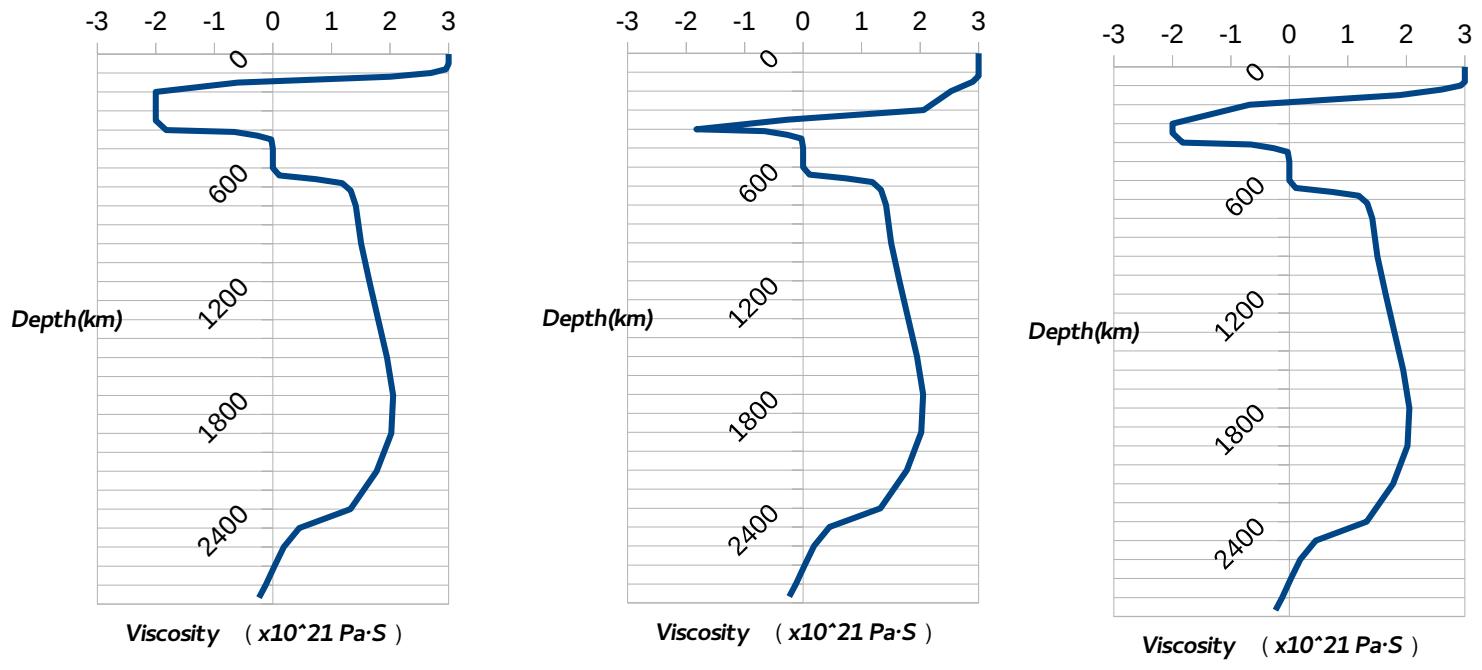


Fig14

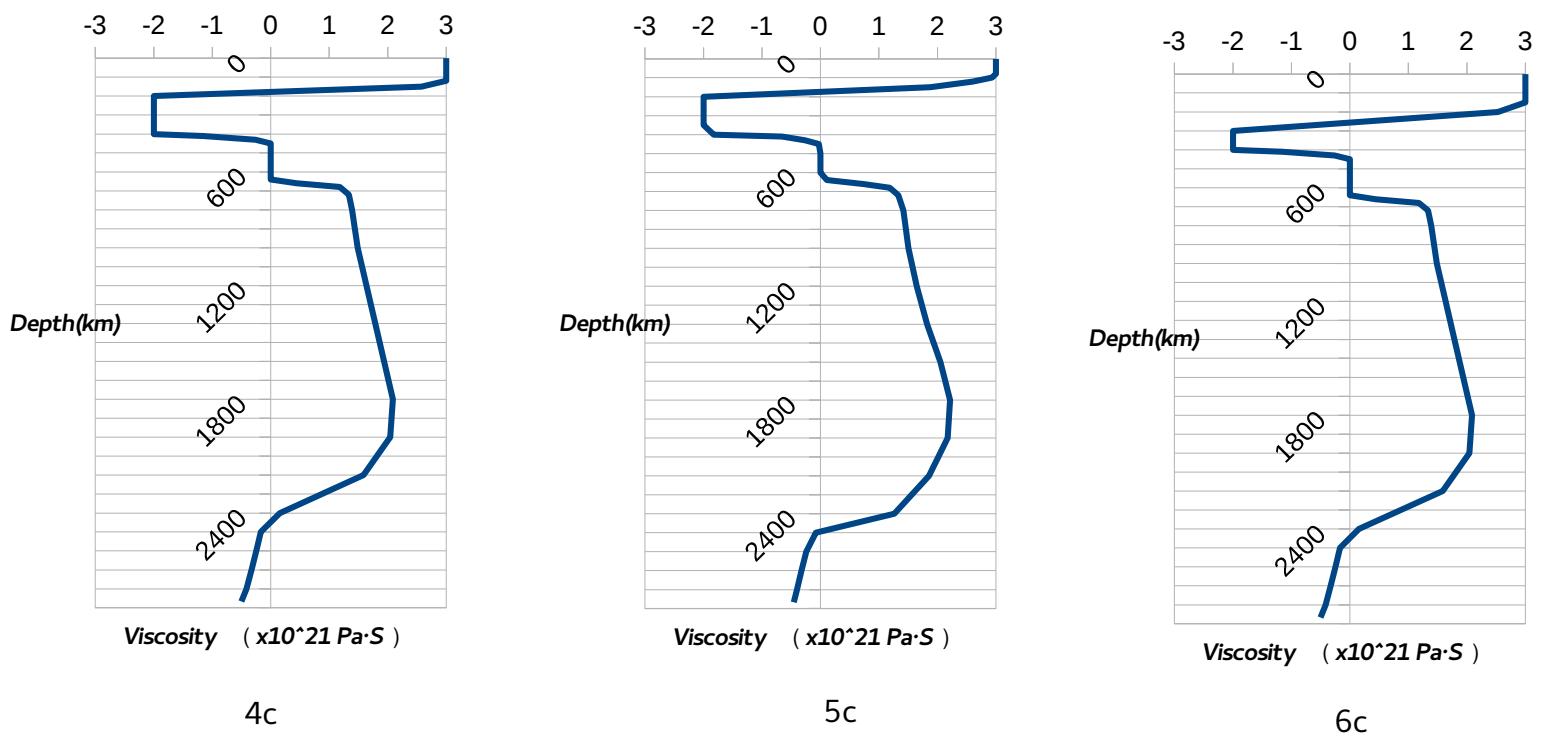
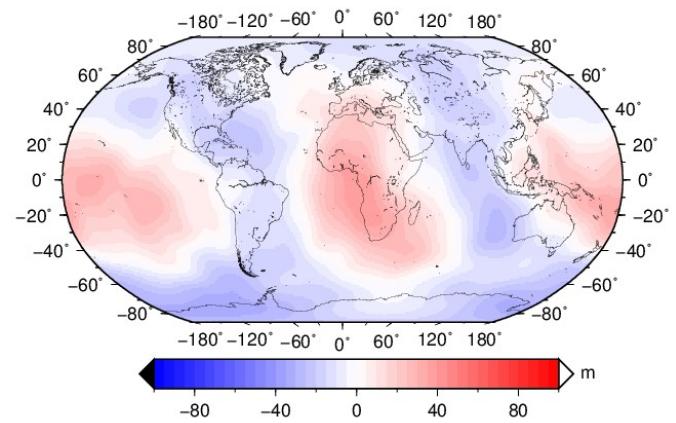
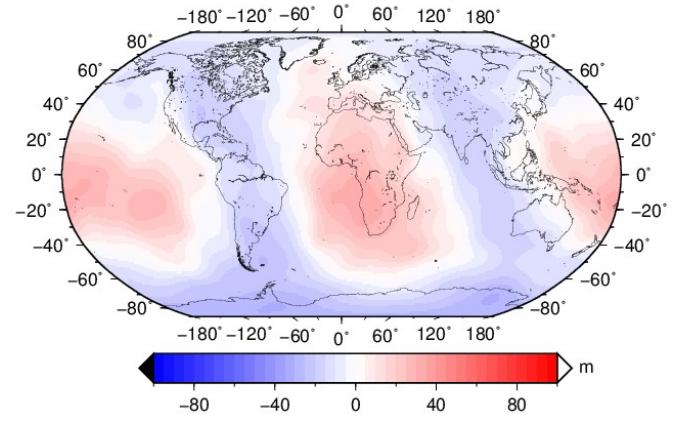


Figure 14
1~6c->viscosity structure modified from the combination of
benchmark1&2

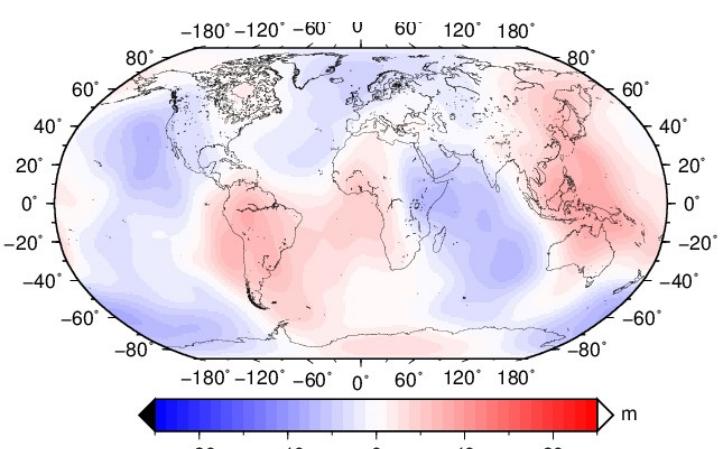


r2_s20_1c

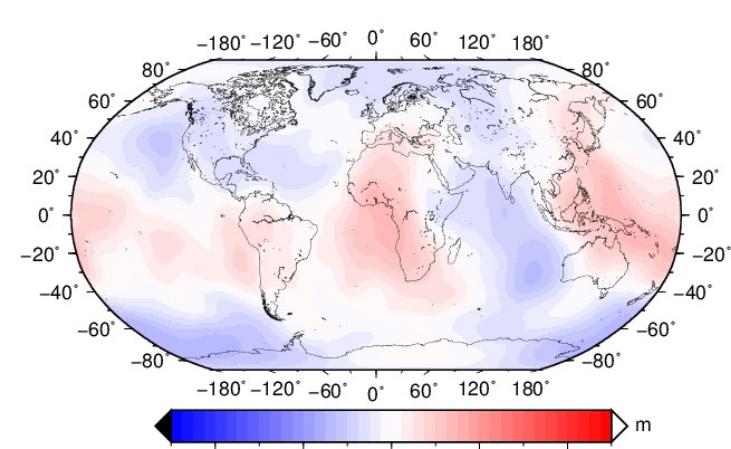


r2_s21_1c

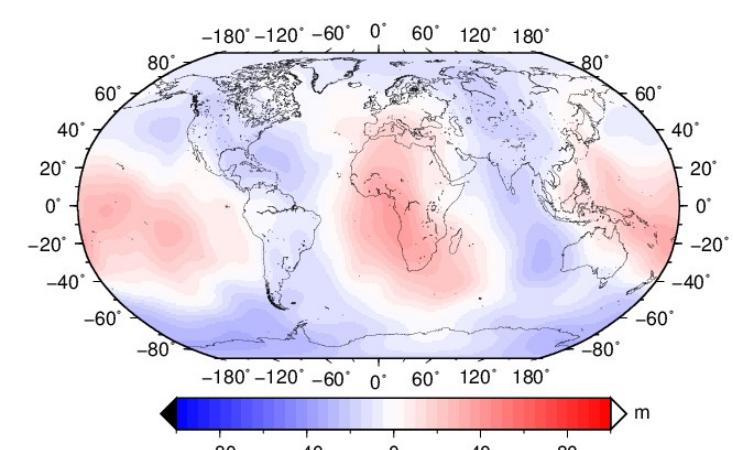
Fig15



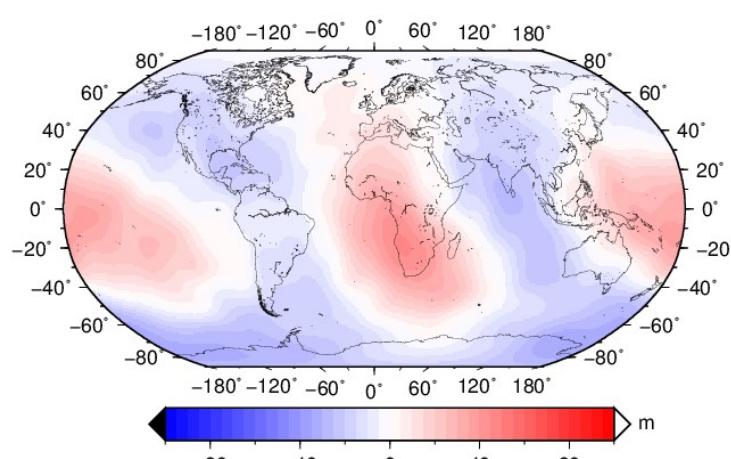
r2_s20_8c



r2_s20_9c

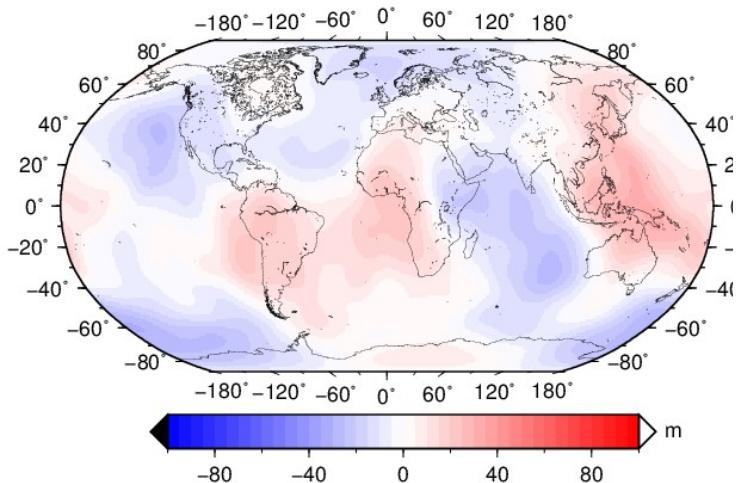


r2_s20_10c

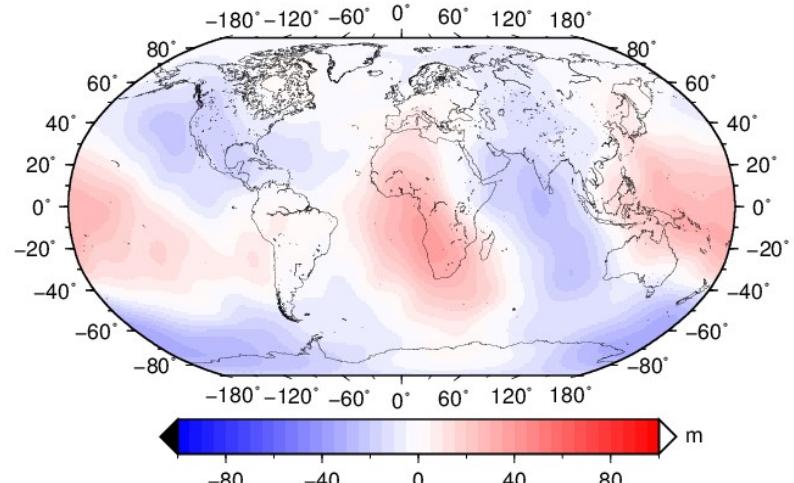


r2_s20_11c

Figure 15 Geoid output
 r2->smoothing times for viscosity at refined coordinate
 s20->simple scaling 20,in the thesis
 10c->viscosity structure from the combination of
 benchmark1&2,every layer is changed

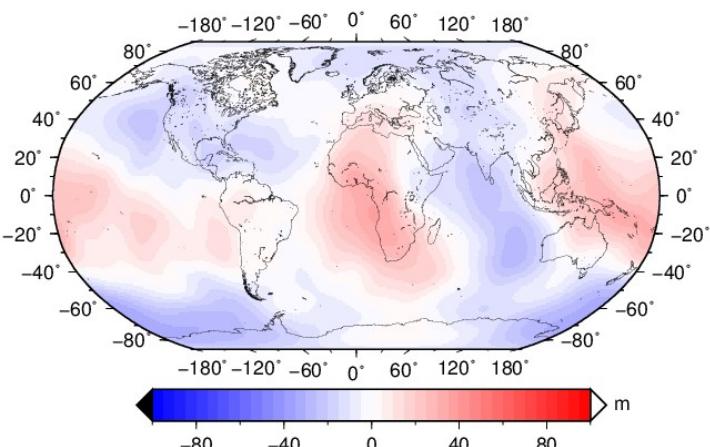


r2_s20_13c

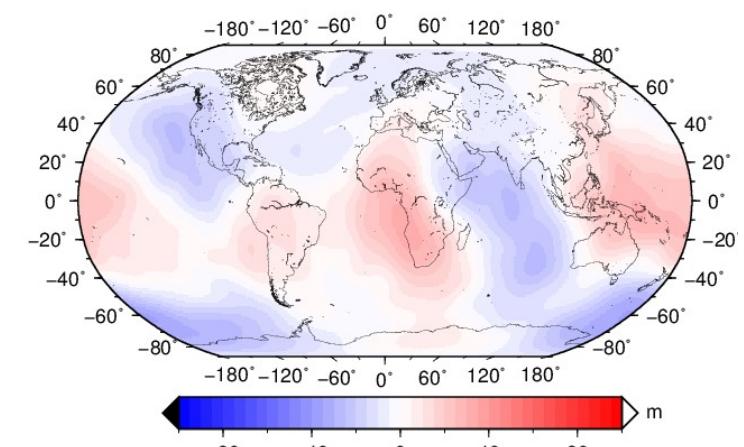


r2_s20_14c

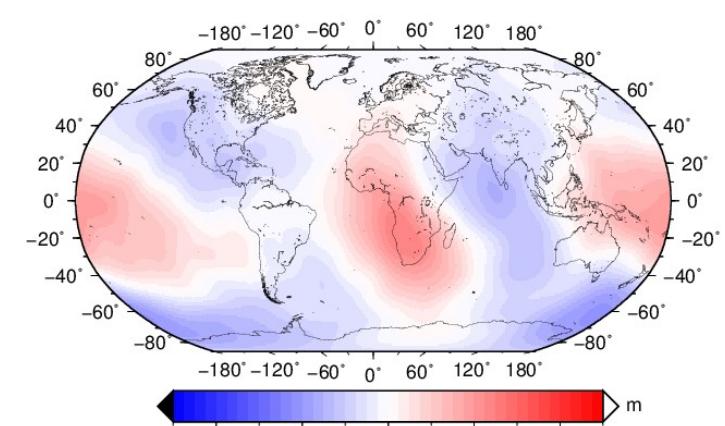
Figure 15



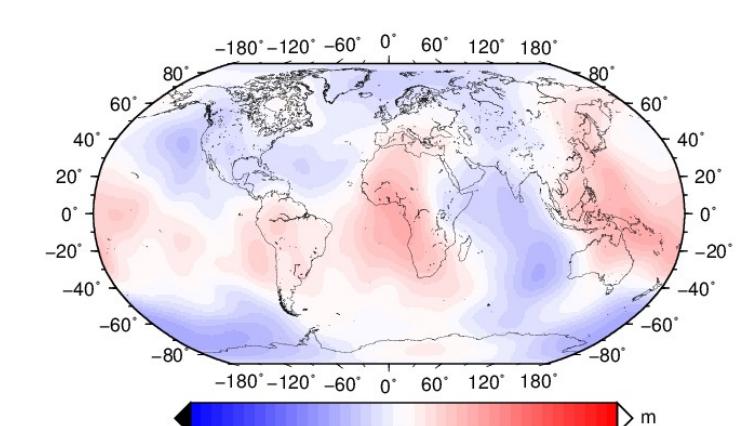
r2_s20_15c



r2_s20_16c



r2_s20_17c



r2_s20_18c

Figure 15 Geoid output
 r2->smoothing times for viscosity at refined coordinate
 s20->simple scaling 20,in the thesis
 8~22c->viscosity structure from the combination of
 benchmark1&2,every layer is changed

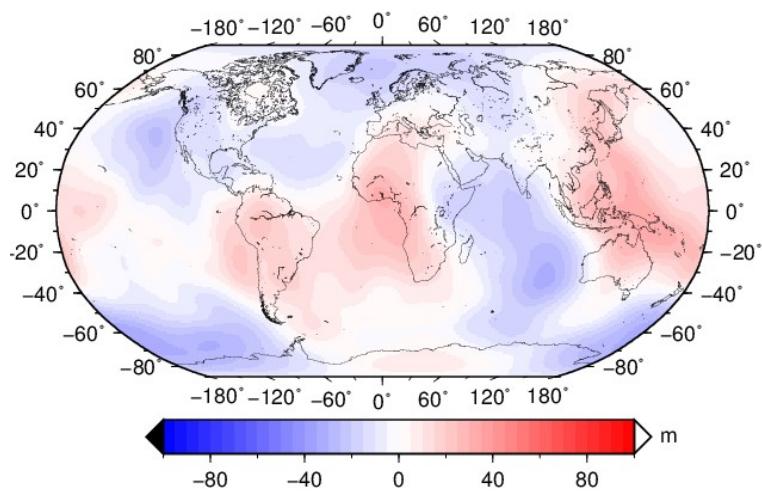
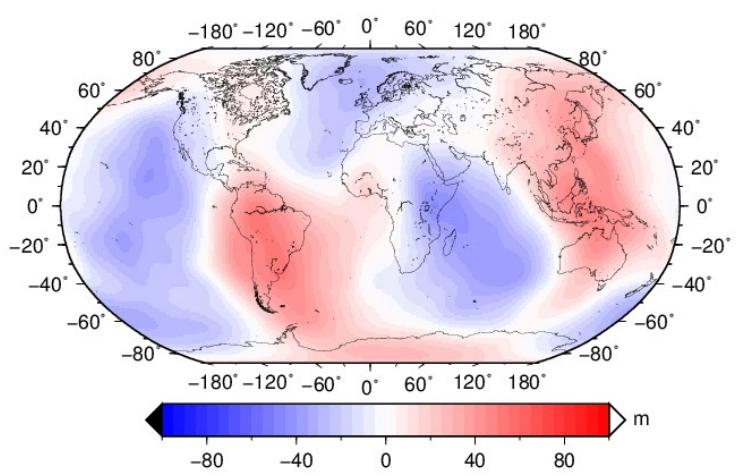


Figure 15

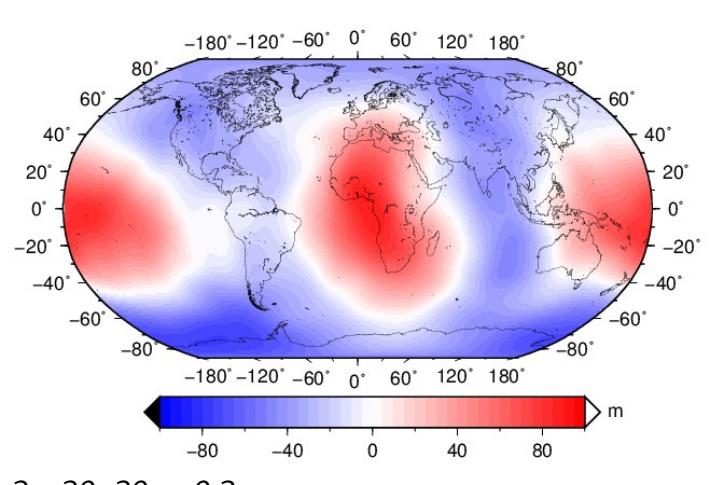
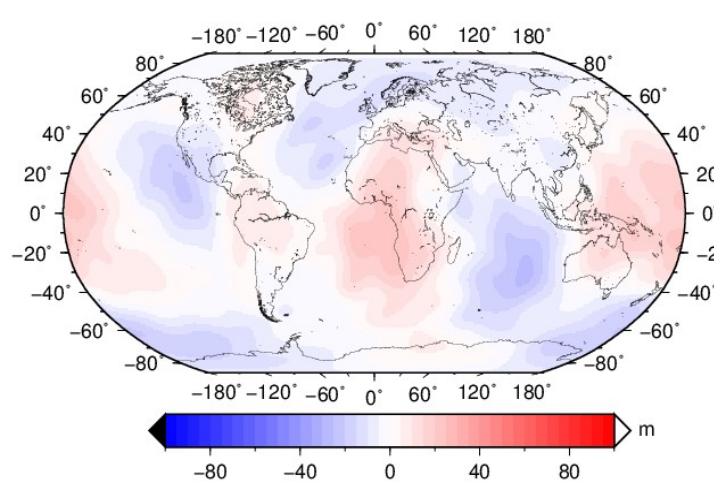
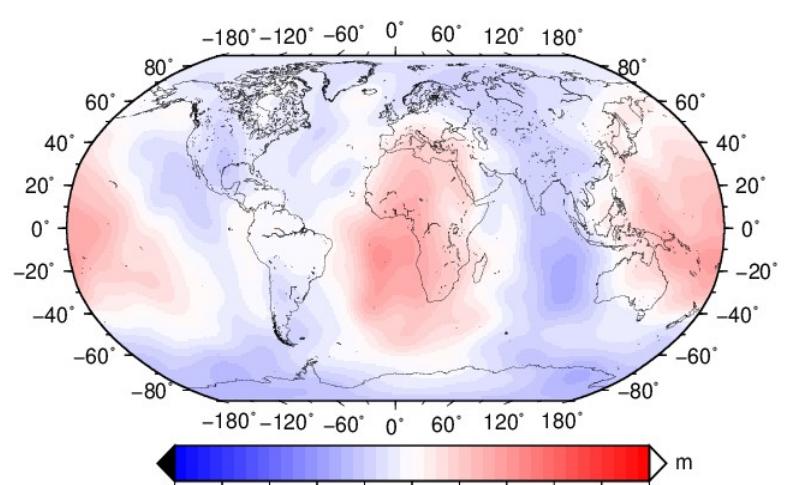
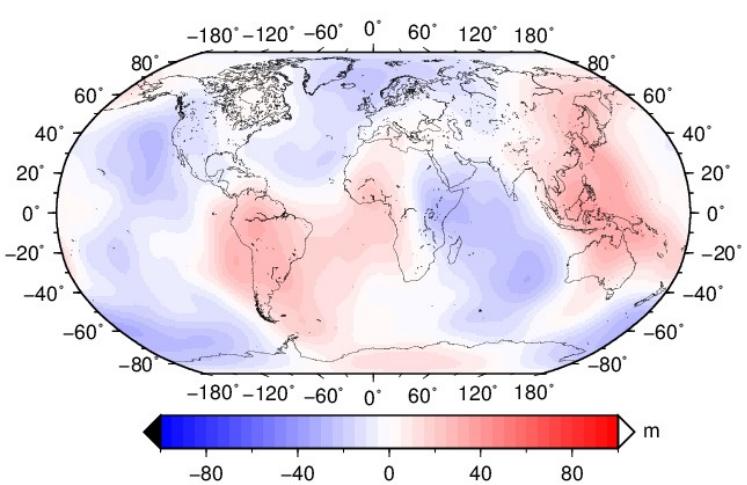


Figure 15 Geoid output
 r2->smoothing times for viscosity at refined coordinate
 s20->simple scaling 20,in the thesis
 8~22c->viscosity structure from the combination of
 benchmark1&2,every layer is changed

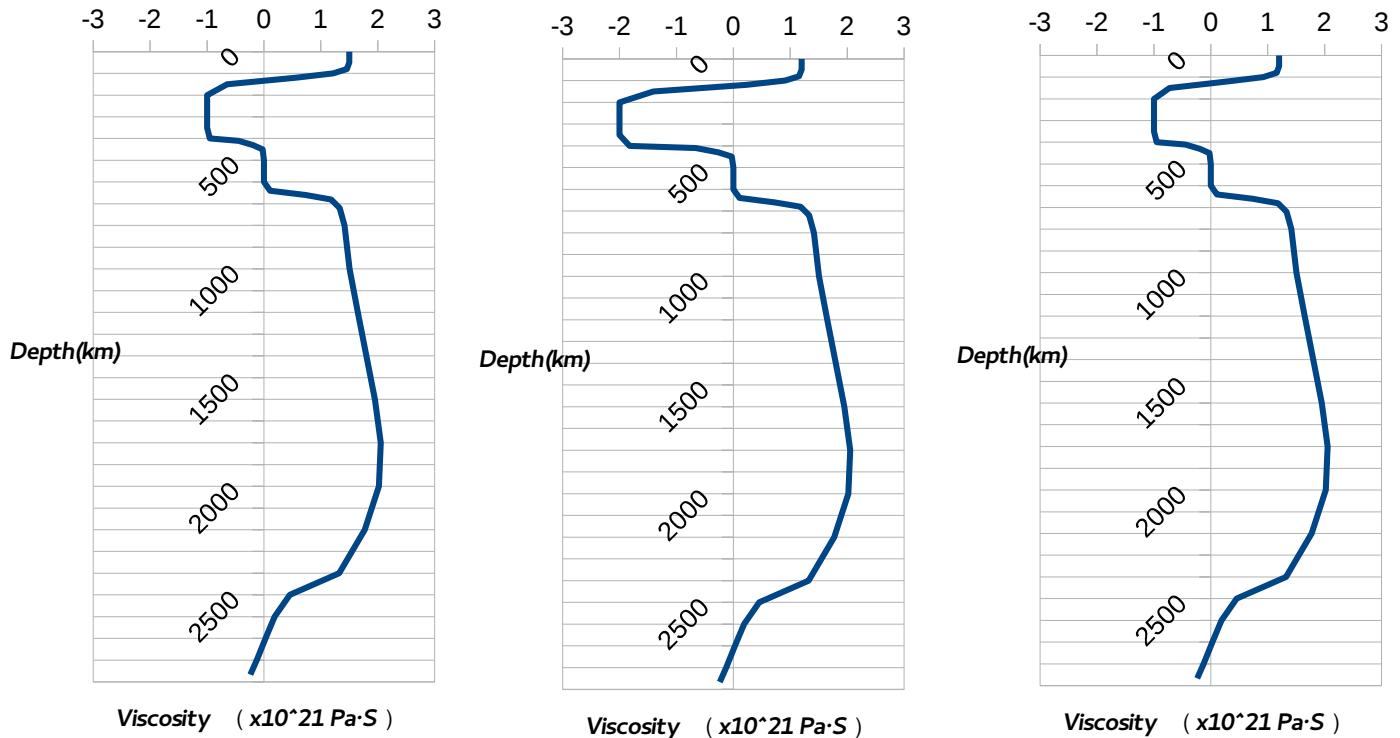
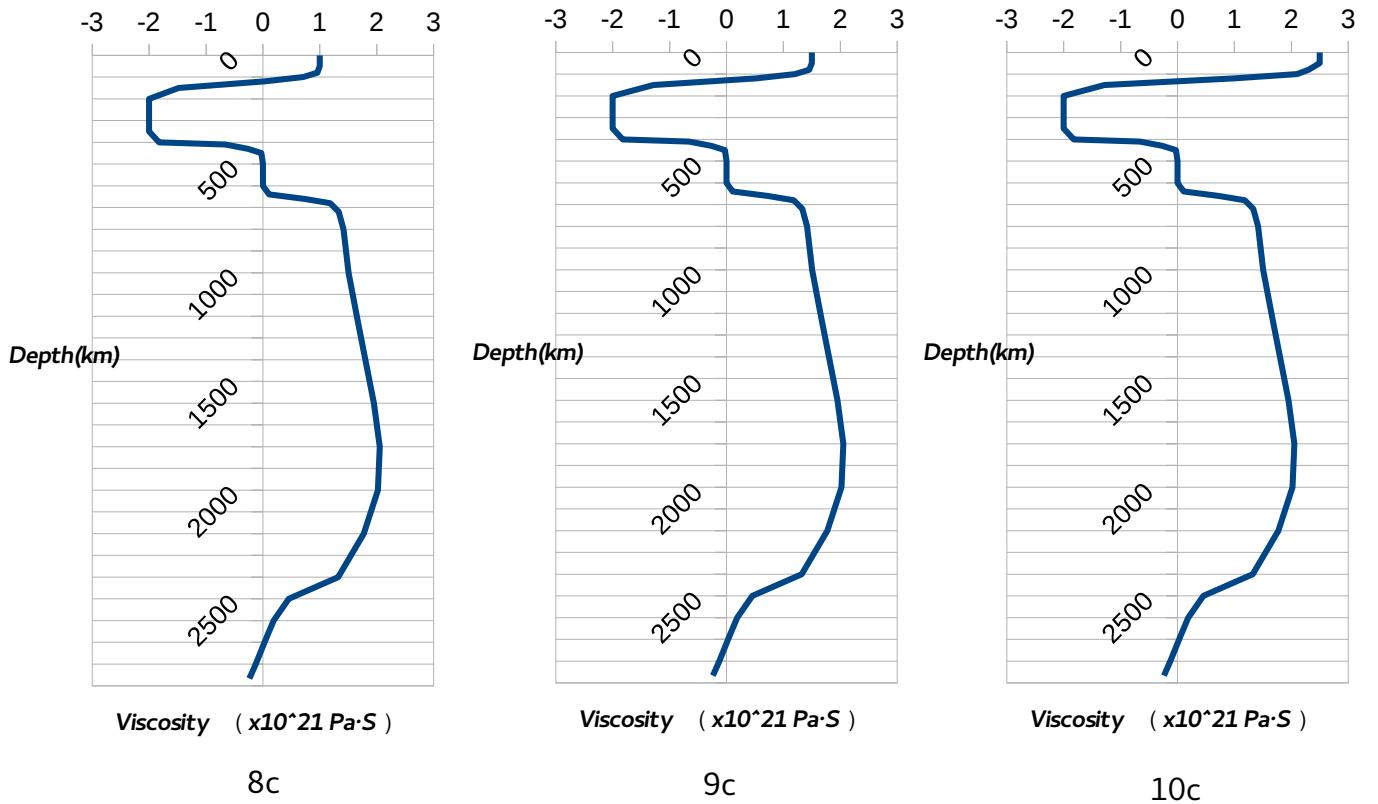


Fig16

11c

12c

14c

Figure 16
8~22c->viscosity structure from the combination of
benchmark1&2,every layer is changed

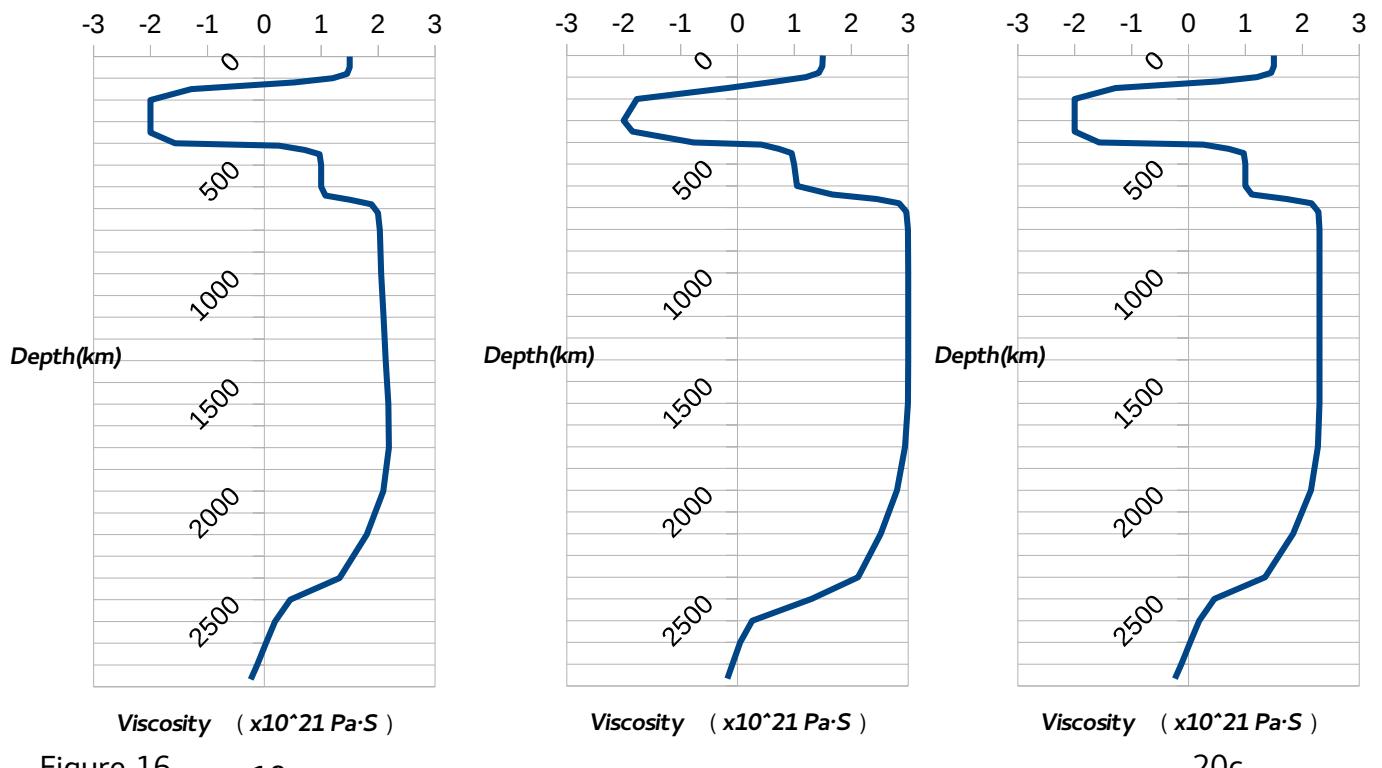
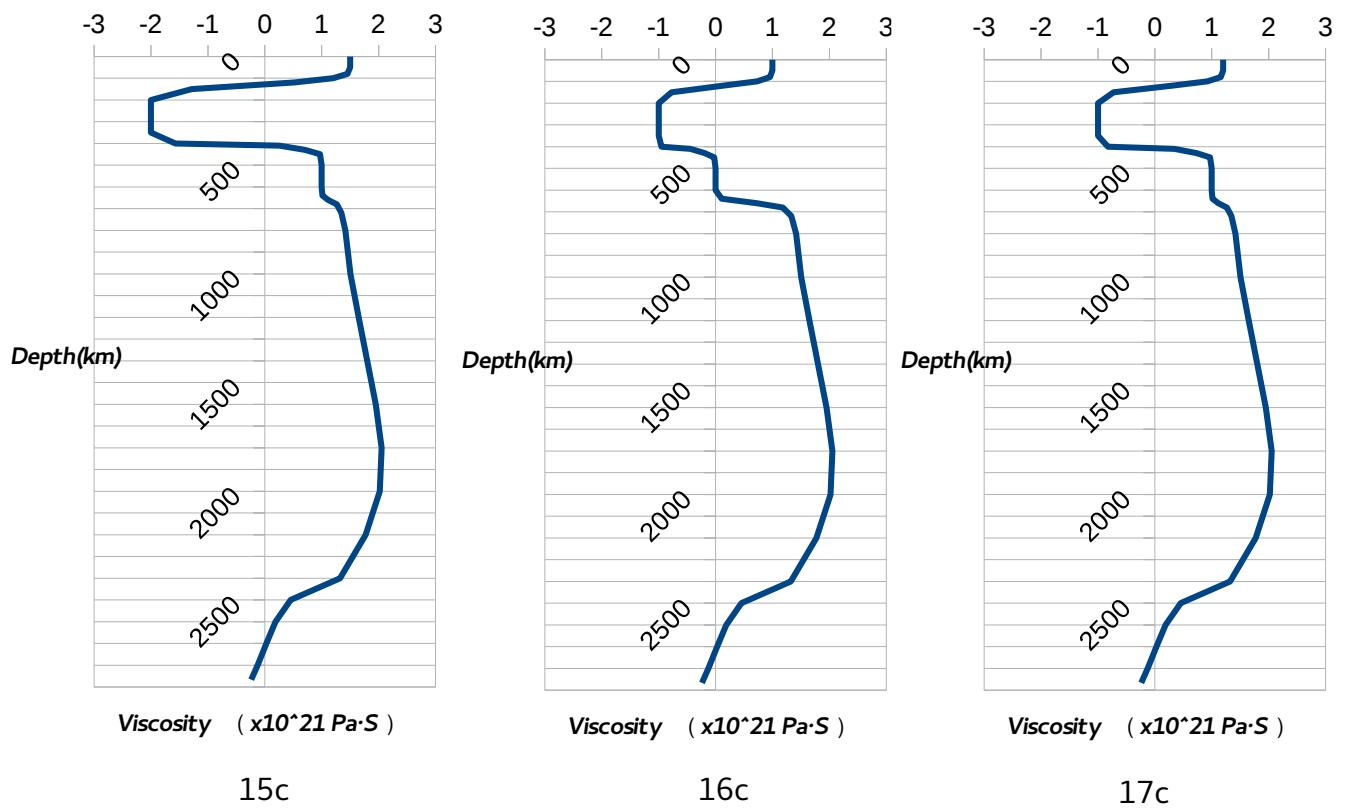
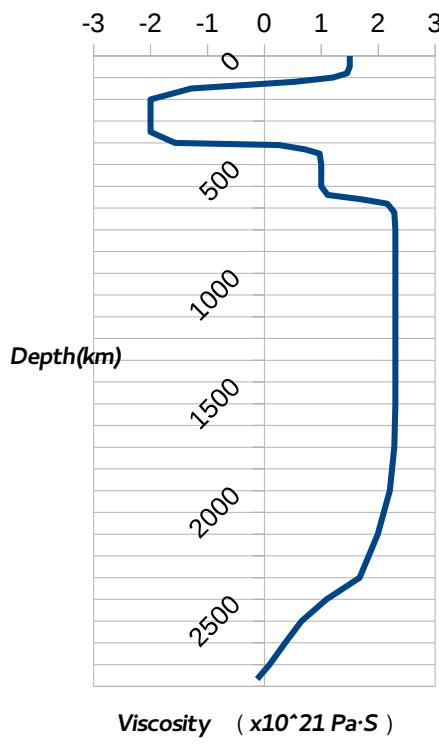
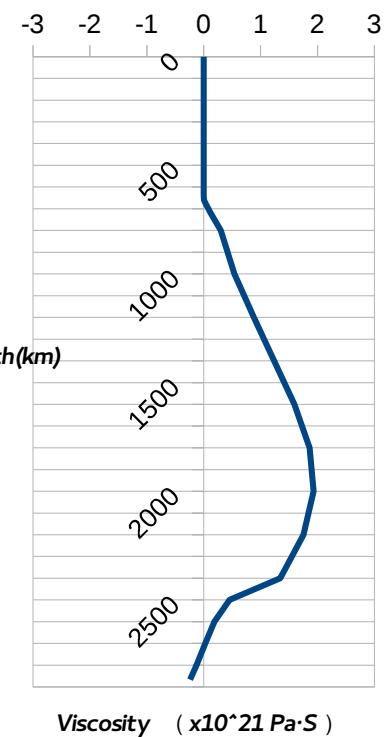


Figure 16
8~22c->viscosity structure from the combination of
benchmark1&2,every layer is changed



21c



22c

Figure 16
8~22c->viscosity structure from the combination of
benchmark1&2,every layer is changed

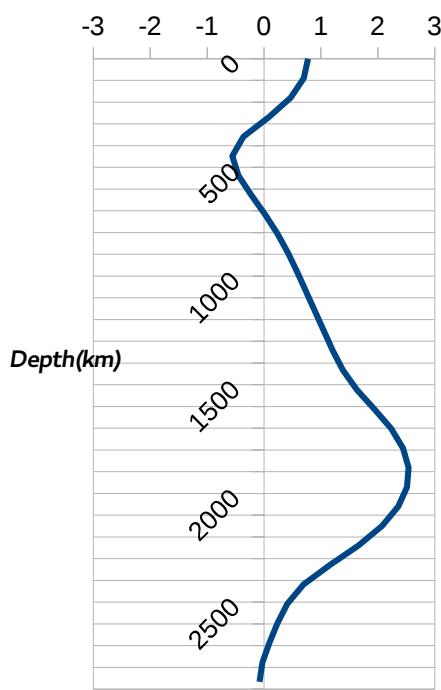


Fig17

Figure17 5 times smoothing of
Simmon's(benchmark2) viscosity

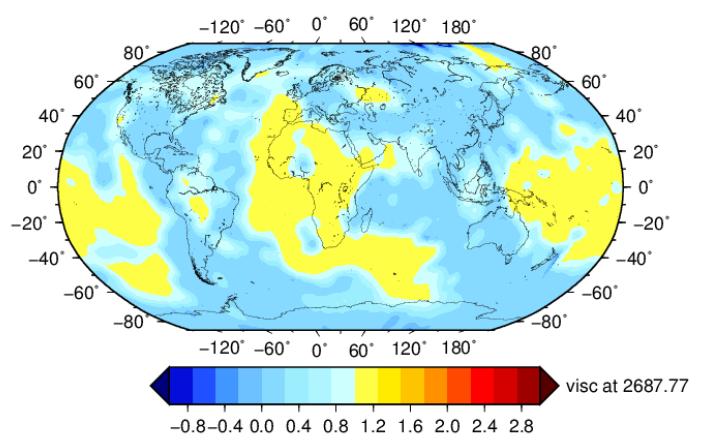
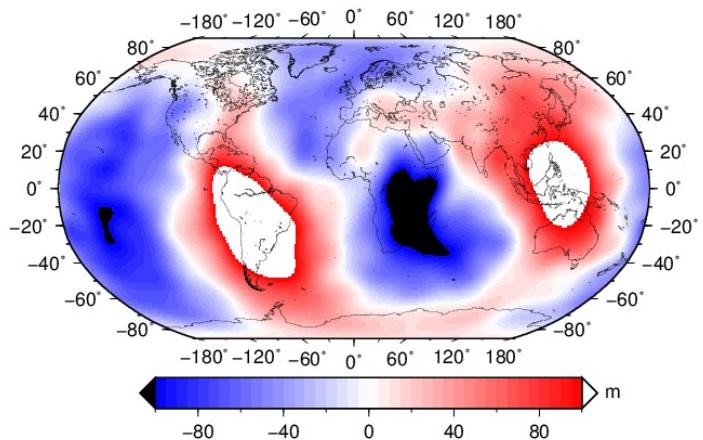


Fig18

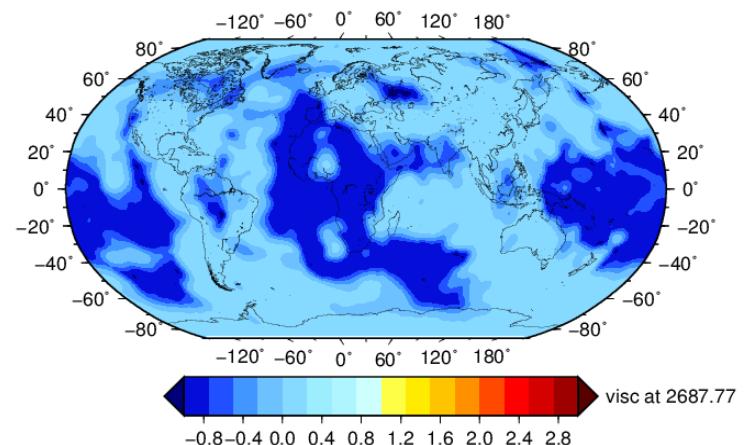
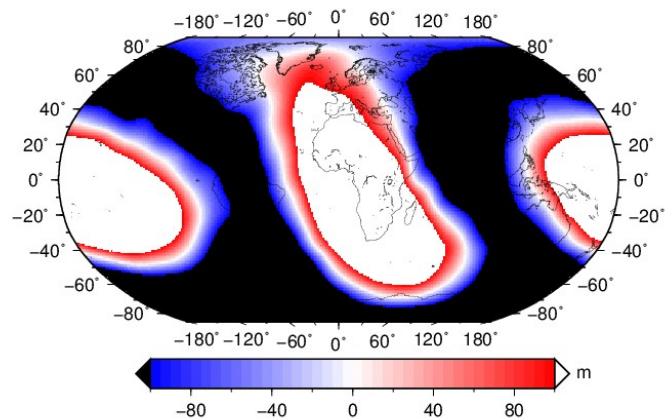
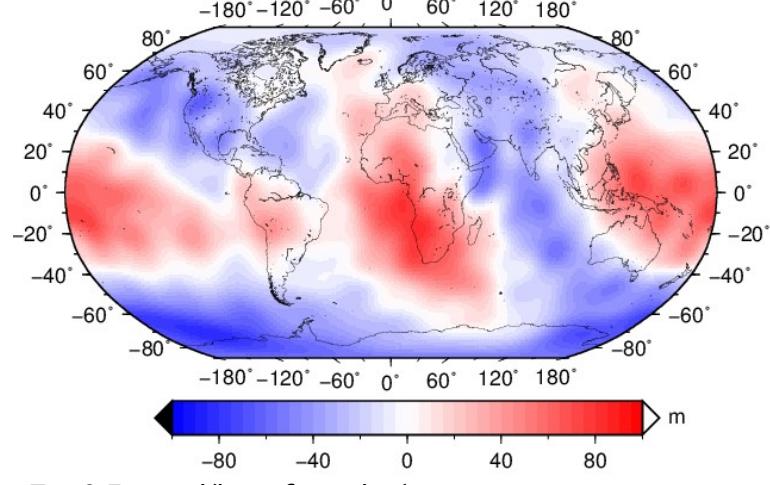
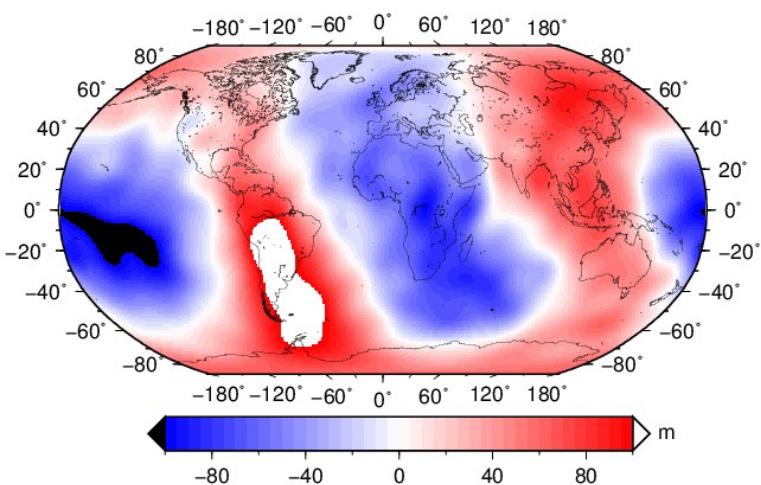


Figure 18 Geoid output and Lateral viscosity variation(LVV)
without prefix r-> uniform coordinate(radius)

s7->simple scaling 7,in the thesis
n->viscosity in Fig17,0.1~10->composition dependent viscosity
-0.5,0.5->chemical buoyancy ratio