INDEX

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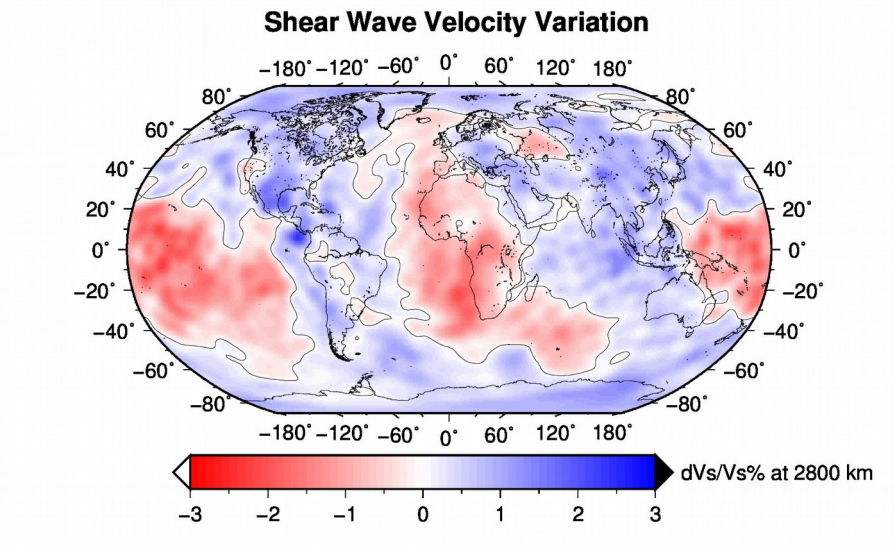


Figure 1a S40RTS tomography at CMB

Fig1

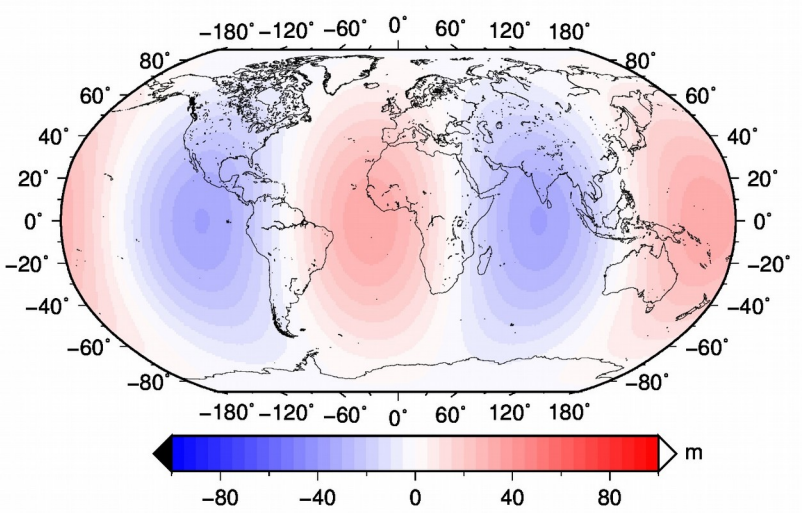


Figure 1b degree 2 observed geoid

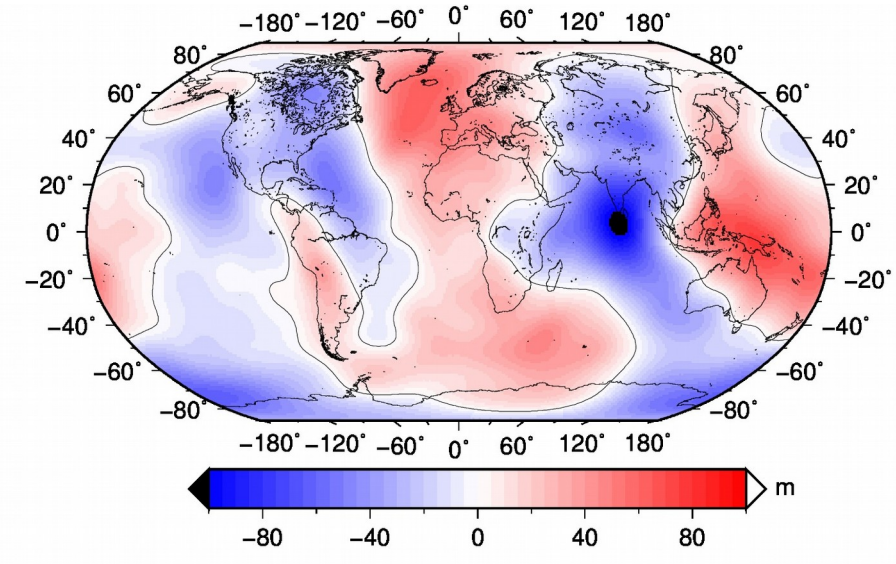


Figure 1c degree 2~20 observed geoid
(the same degree range as CitcomS Output)

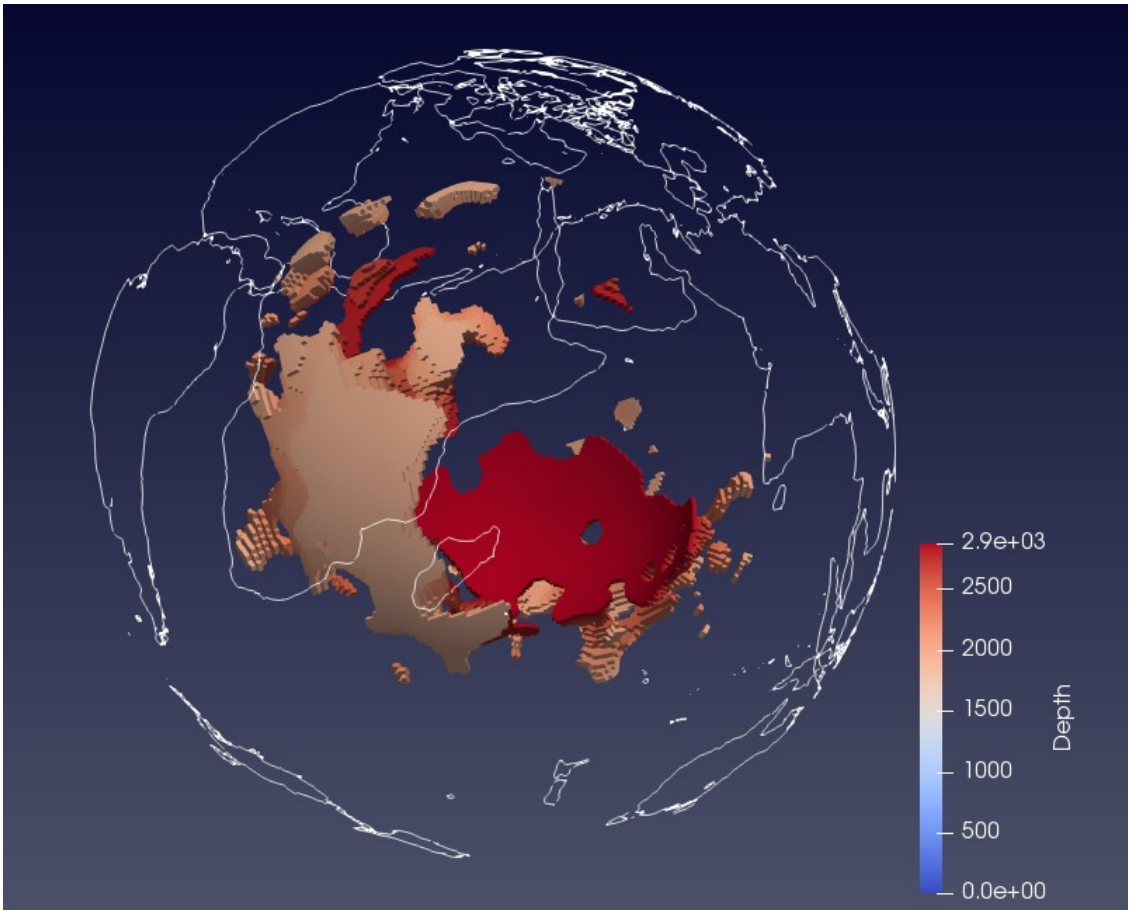


Figure 1d Threshold of T and Dpeth for LLSVPs in Paraview

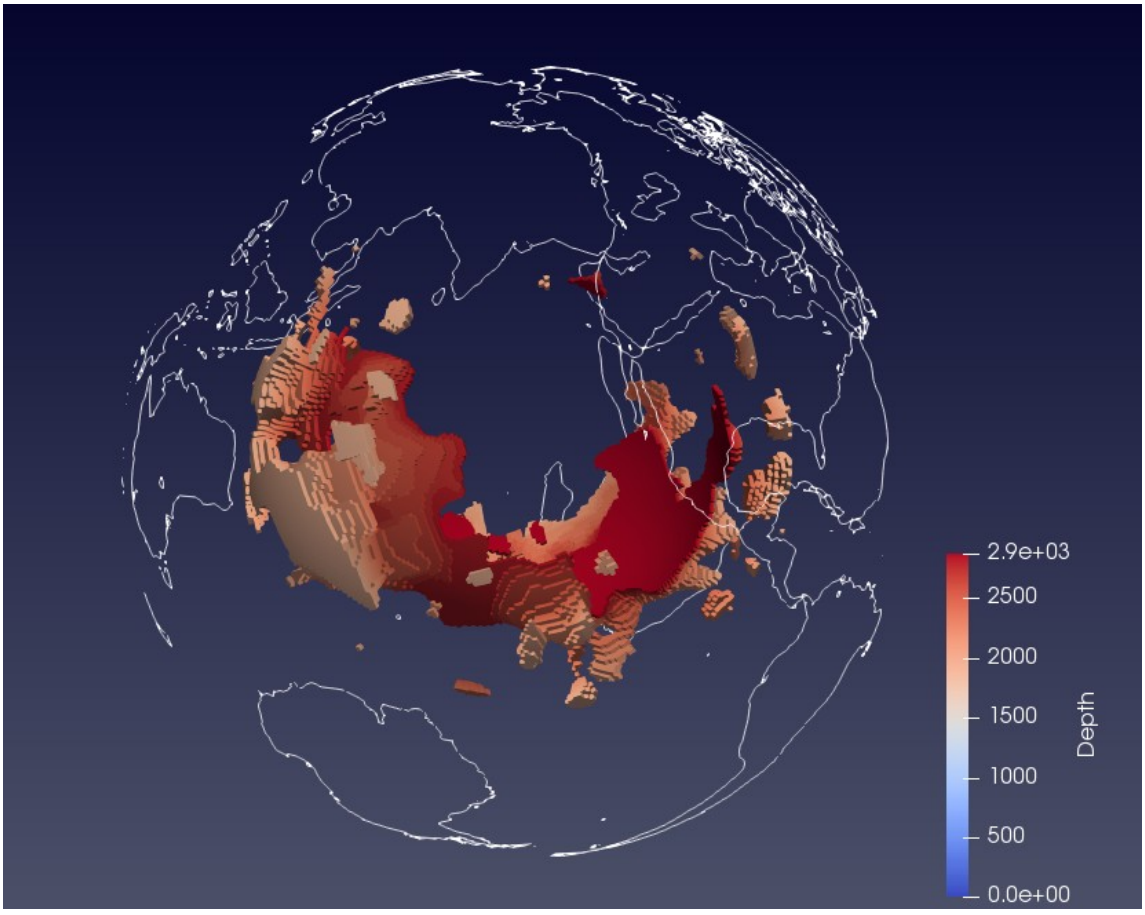
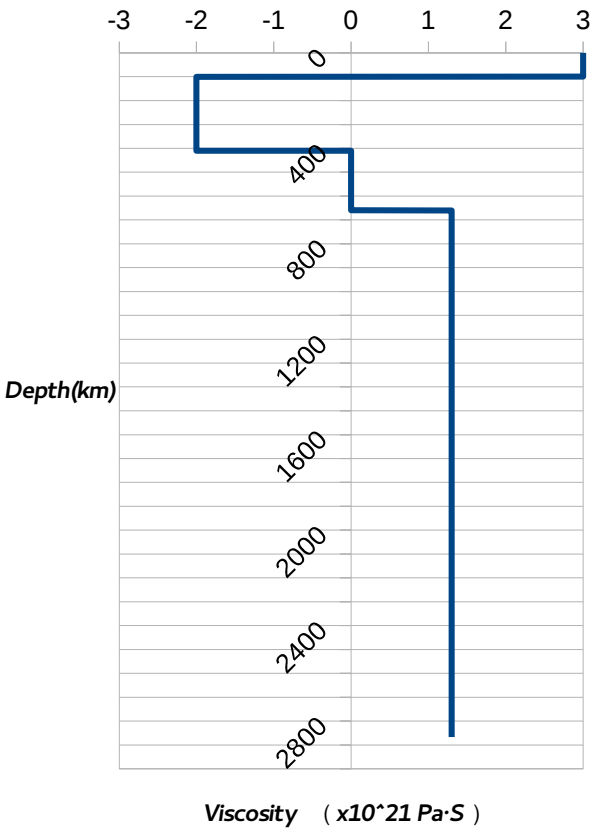


Figure 1e Threshold of T and Dpeth for LLSVPs in Paraview

2a



2b

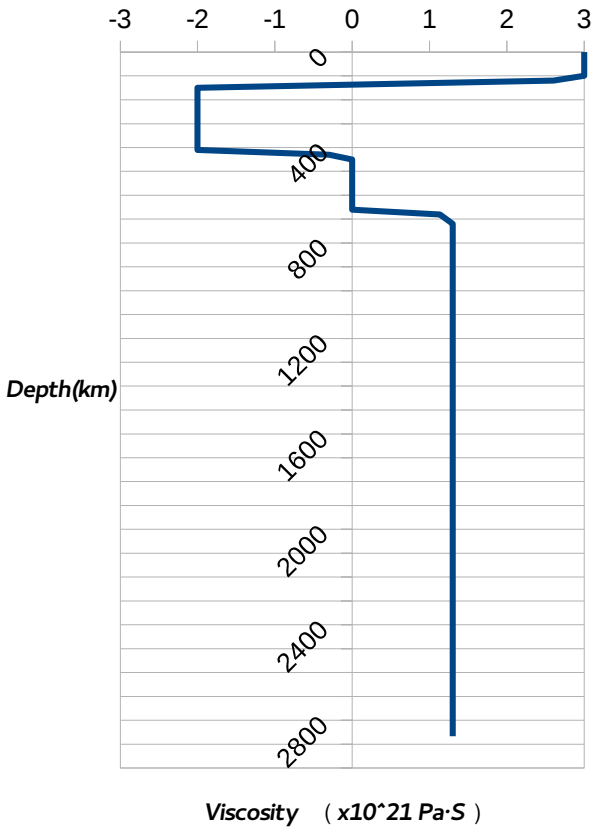
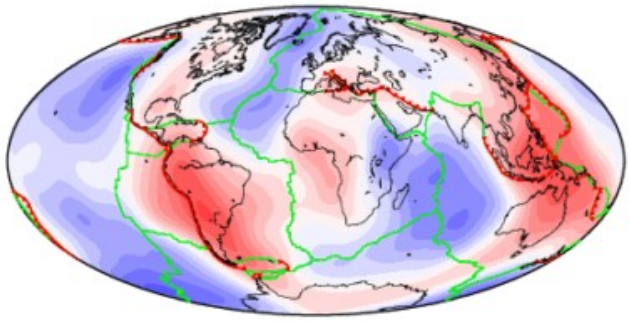


Fig2

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

3a



3b

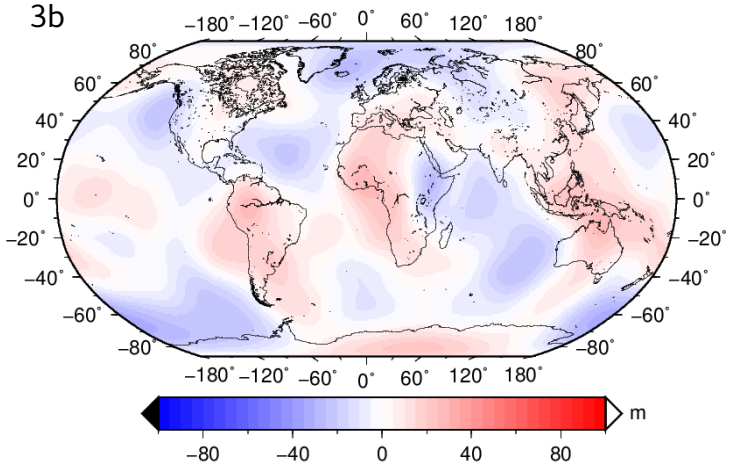
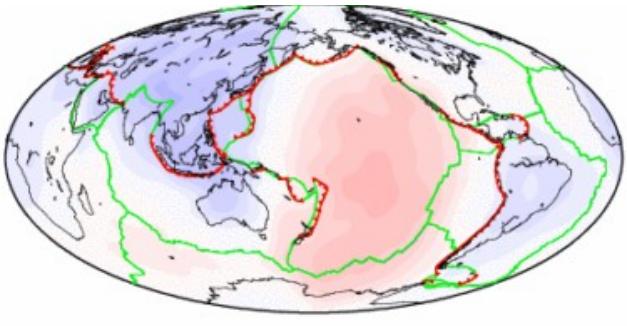


Figure 3 Geoid of Benchmark 1
a:from paper;b:from CitcomS

4a



4b

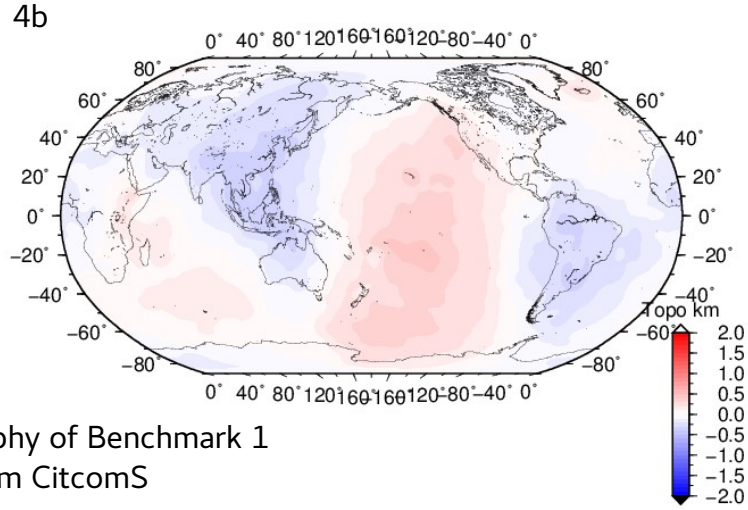


Figure 4 Dynamic Topography of Benchmark 1
a:from paper;b:from CitcomS

5a

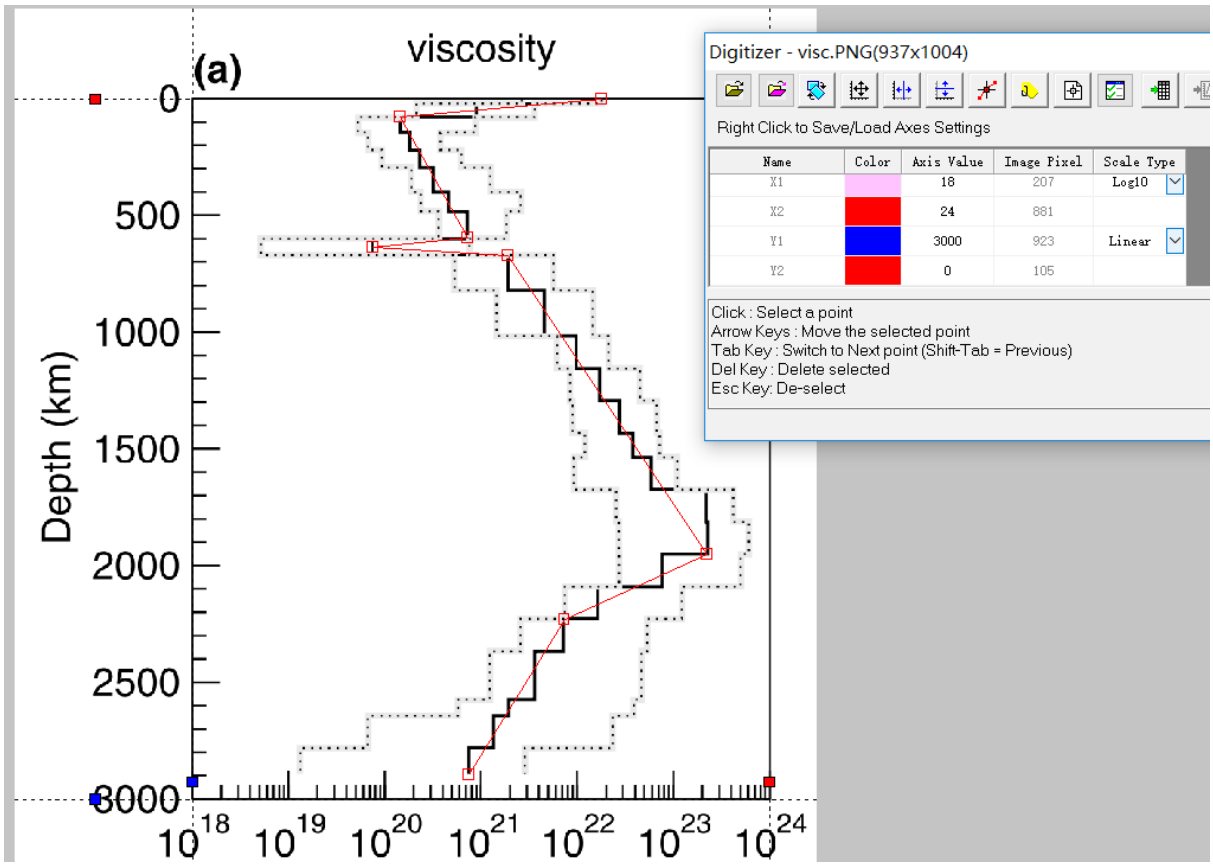
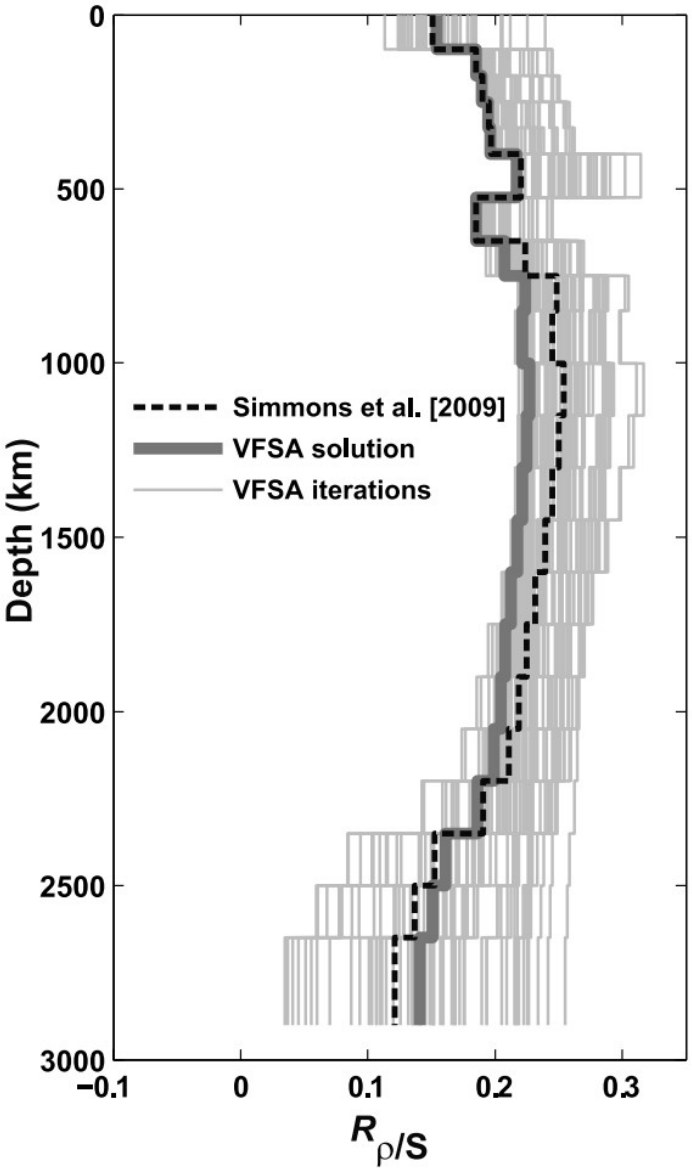


Figure 5 Background of Benchmark2
a:Viscosity;b:scaling(VFSA solution)

Fig 5,6

5b



6

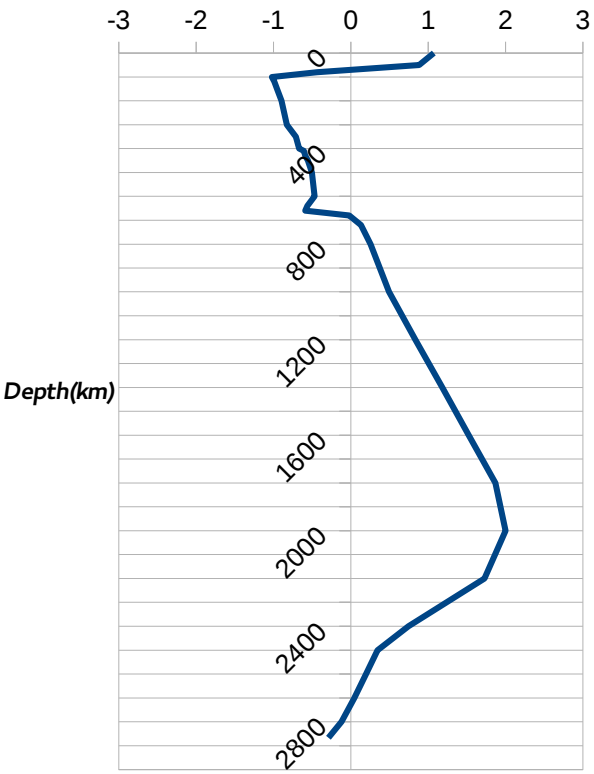


Figure 6 Viscosity output from CitcomS for Benchmark2

7a

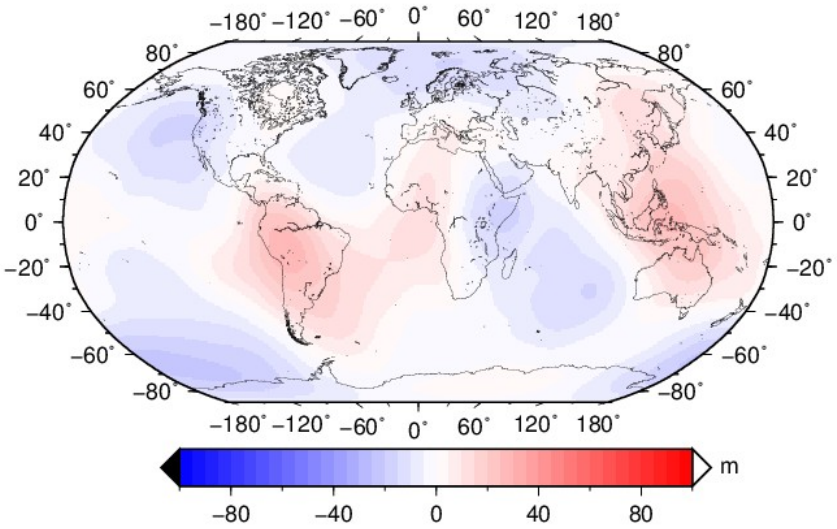


Figure 7a Geoid output of Benchmark2

Fig 7,8

7b

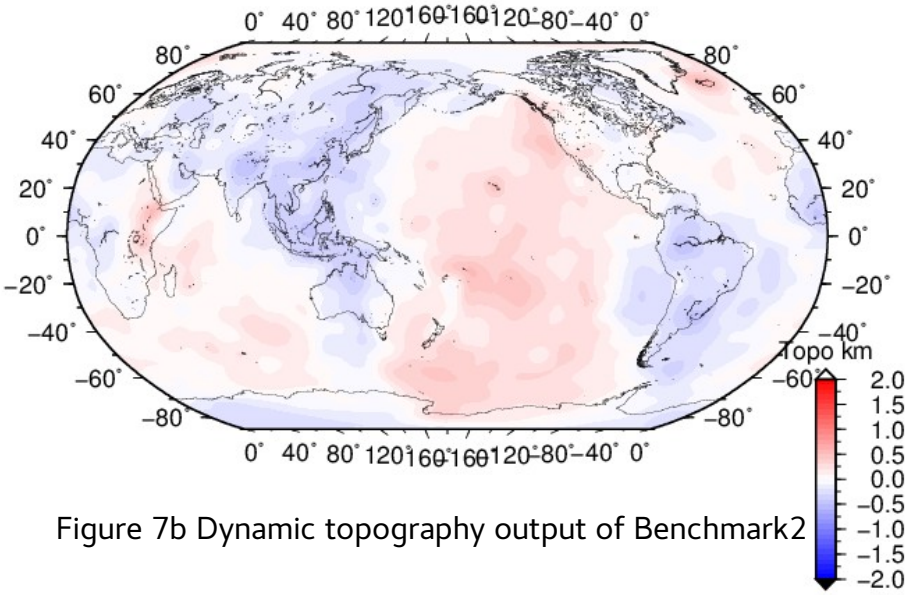


Figure 7b Dynamic topography output of Benchmark2

8

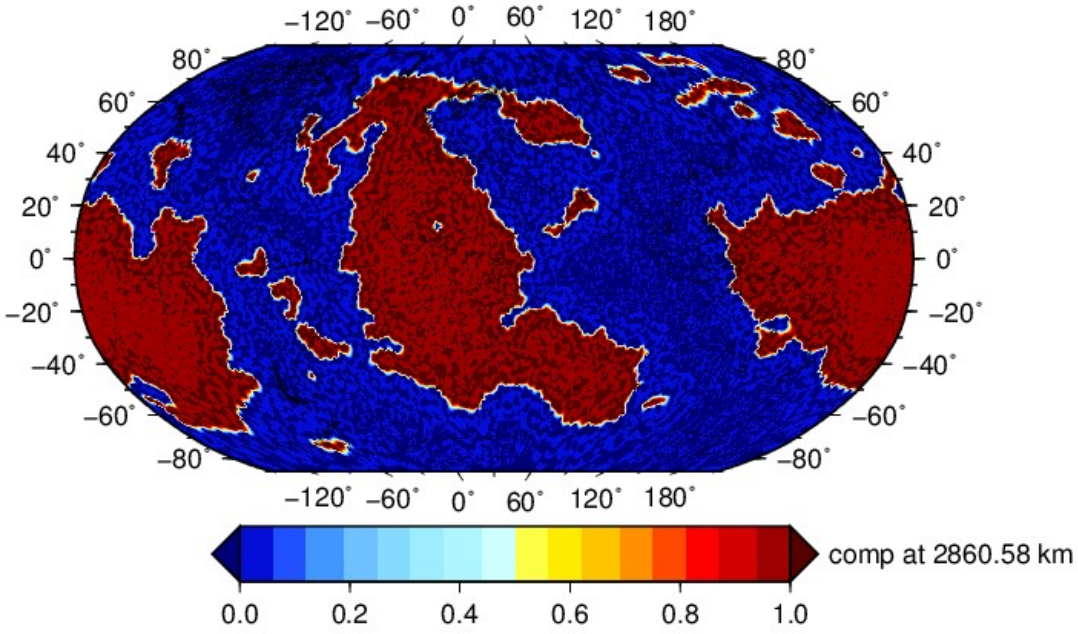
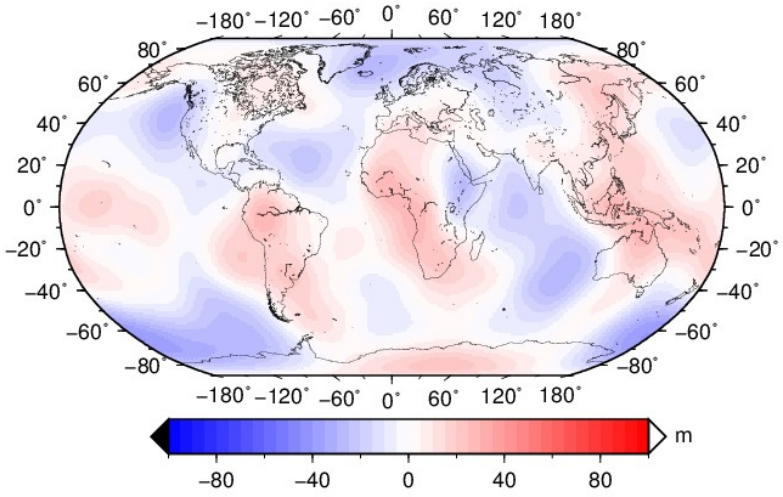
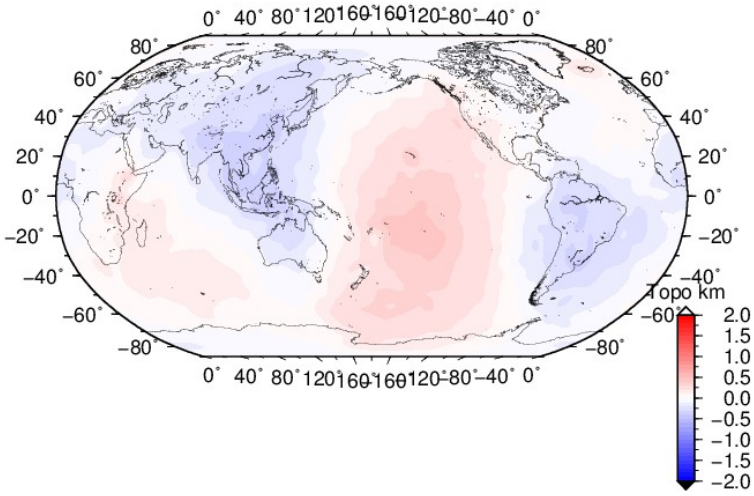


Figure 8 Composition field at CMB

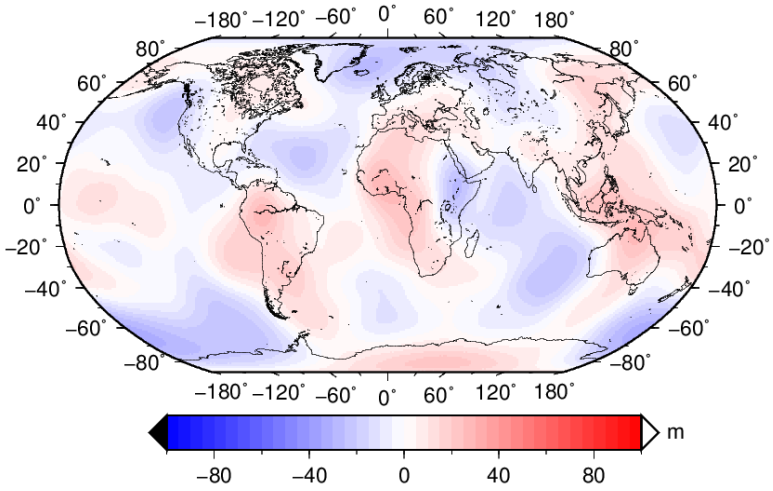


r_s_b0.1 geoid

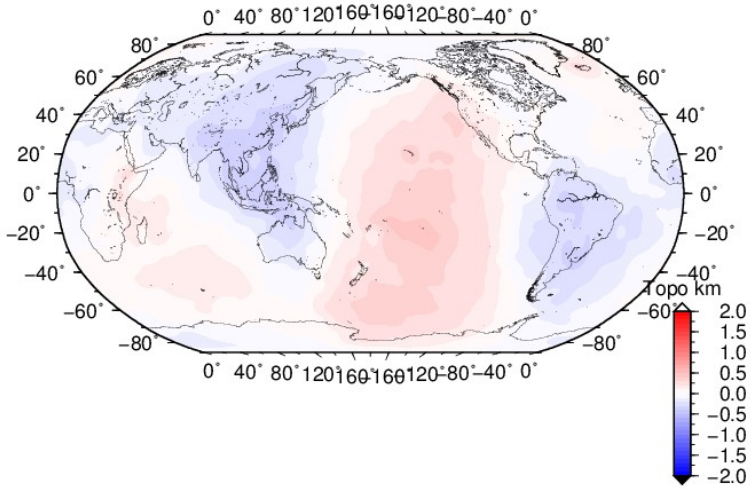


r_s_b0.1 topo

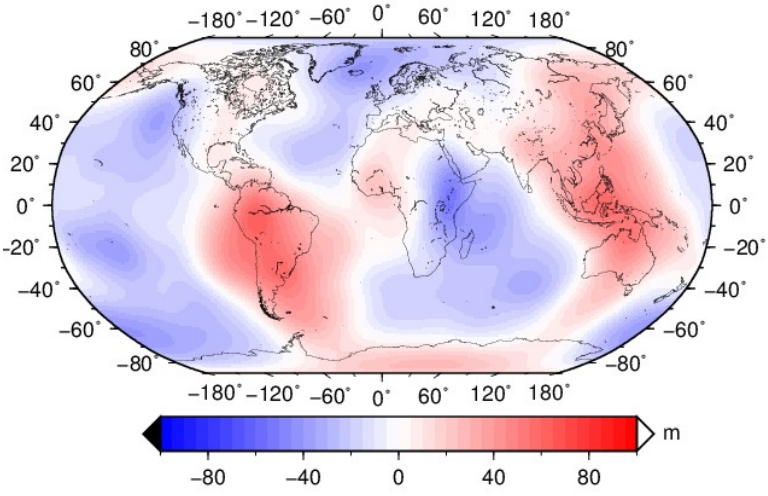
Fig9



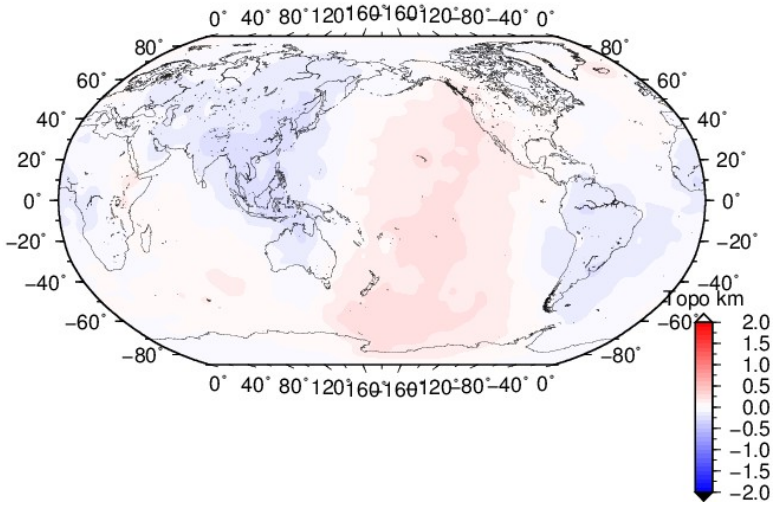
r_s_b geoid



r_s_b topo

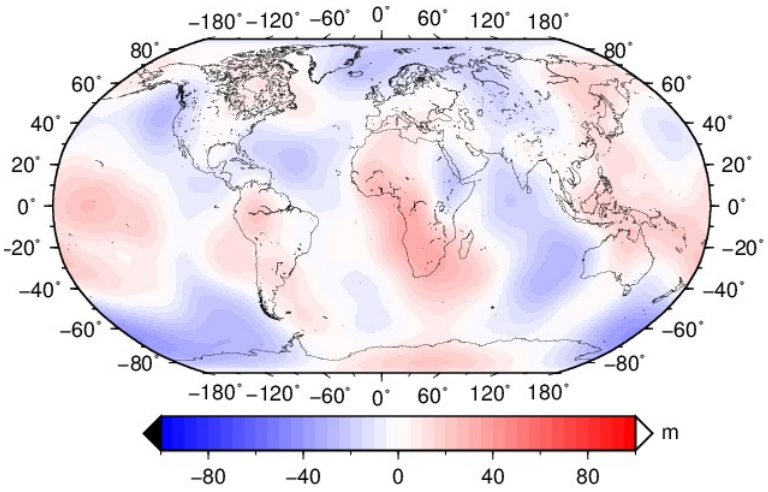


r_s_b10 geoid

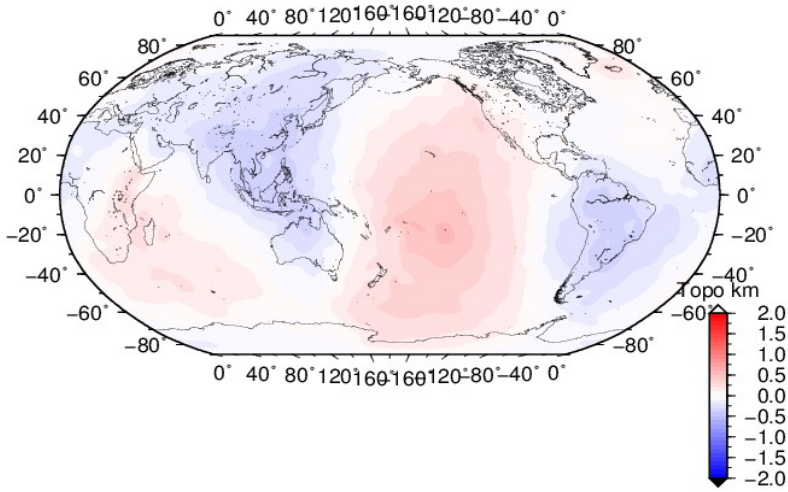


r_s_b10 topo

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)

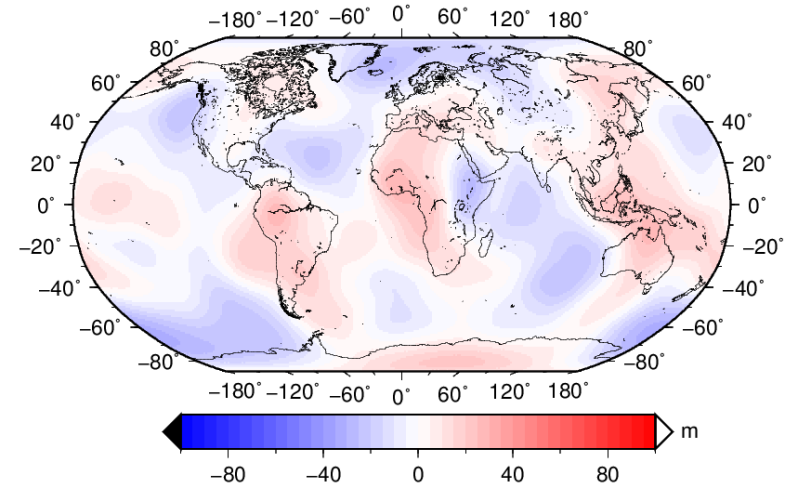


r_s_b0.01 geoid

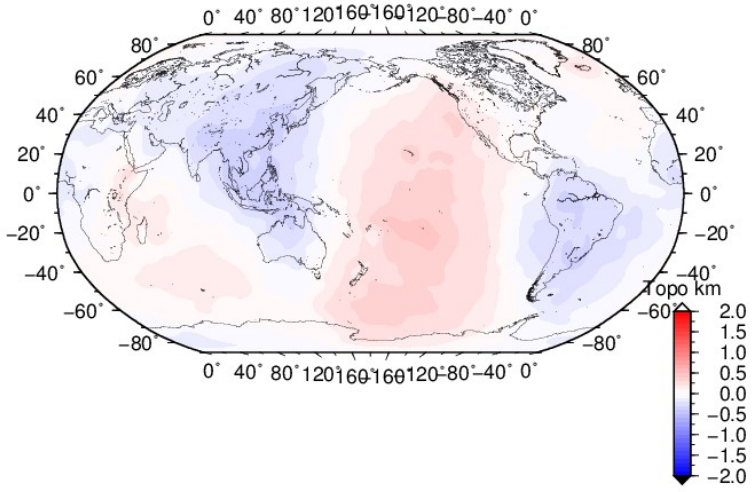


r_s_b0.01 topo

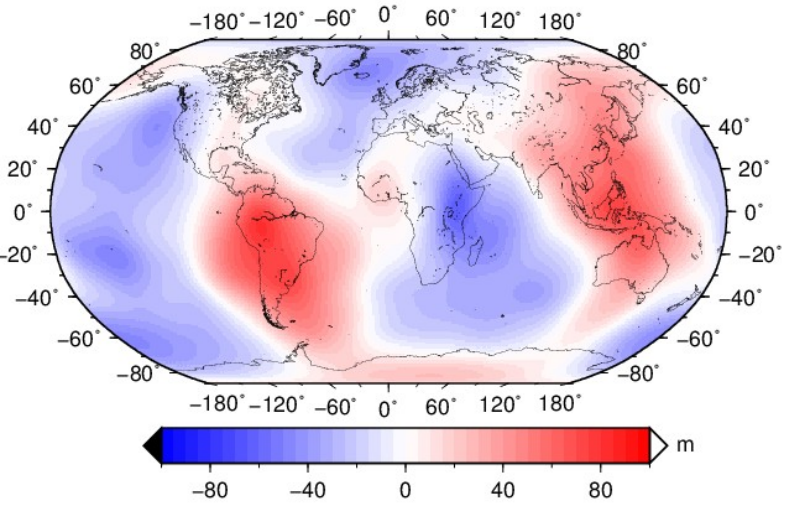
Fig10



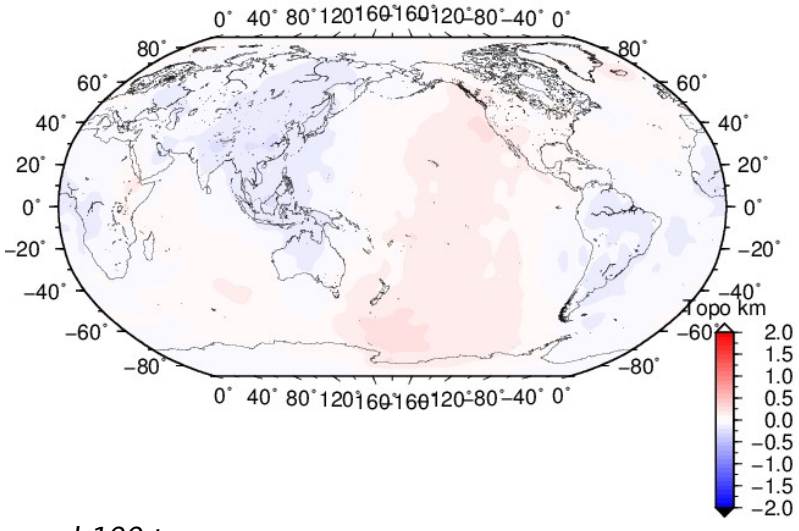
r_s_b geoid



r_s_b topo



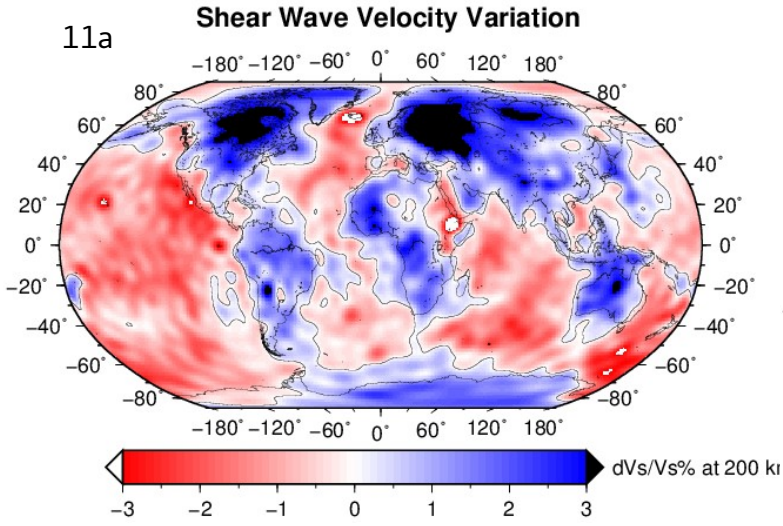
r_s_b100 geoid



r_s_b100 topo

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)

11a



11d

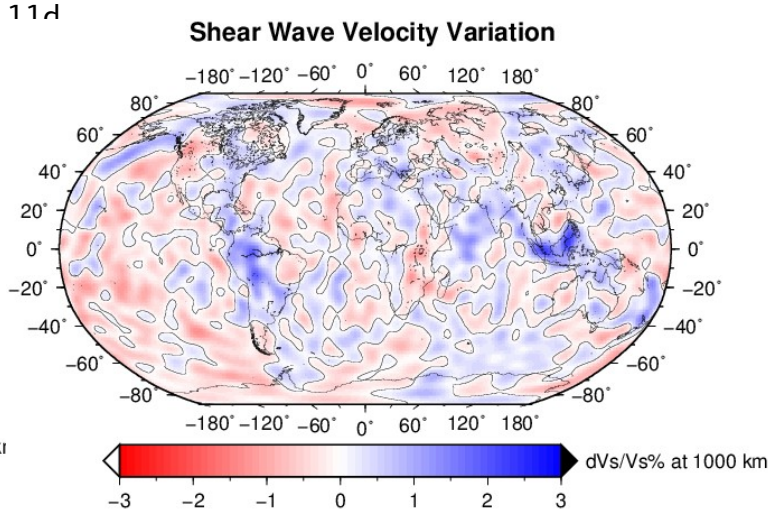
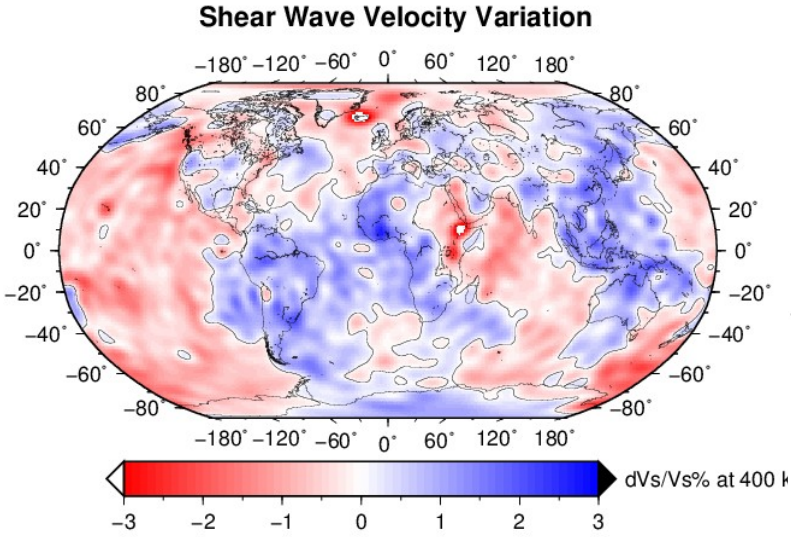
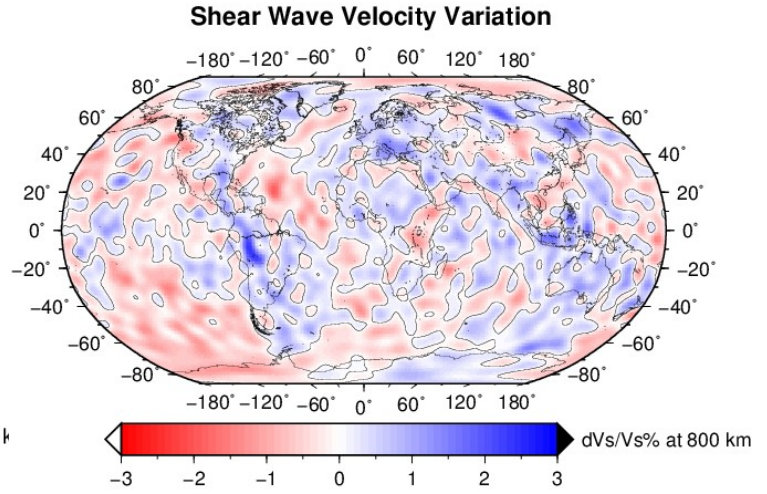


Fig11

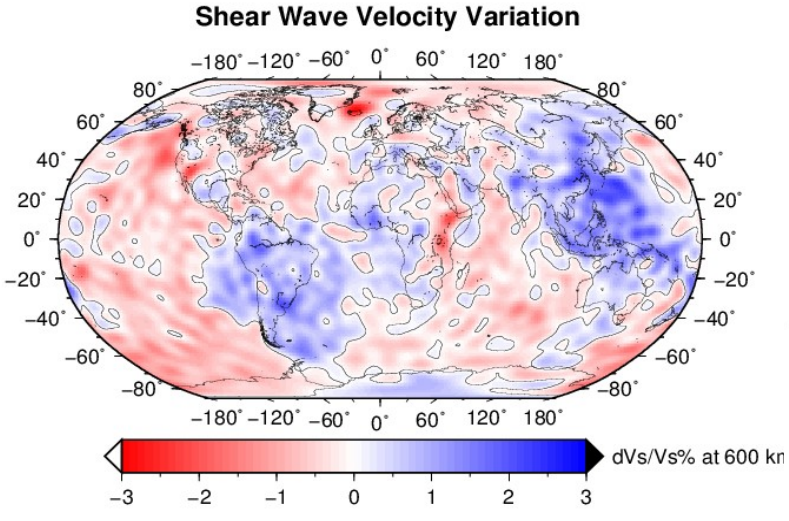
11b



11e



11c



11f

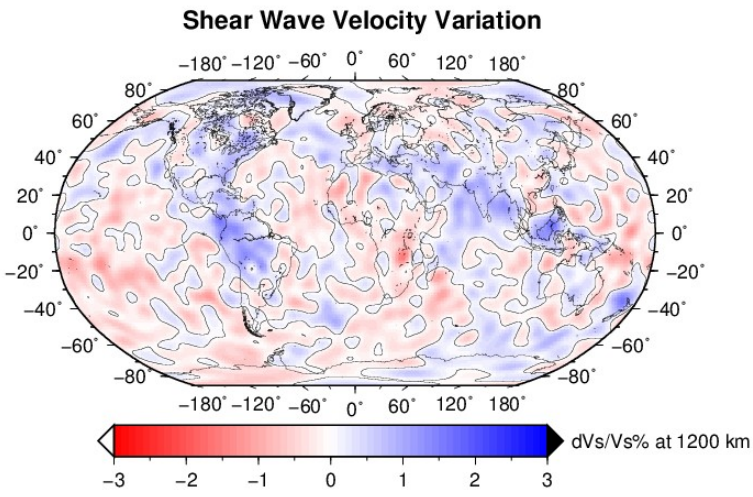
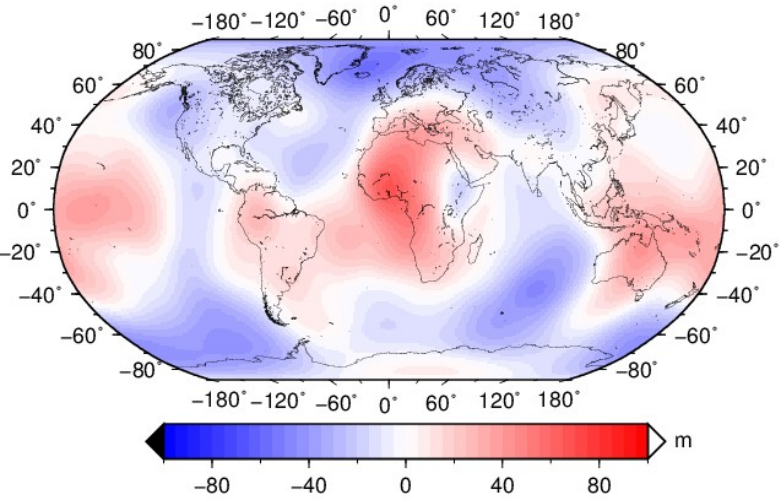
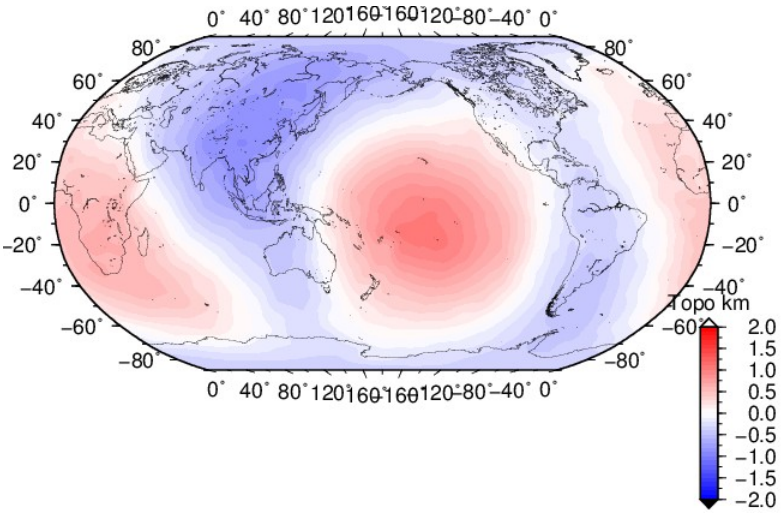


Figure 11 S40RTS Tomography from 200km to 1200km

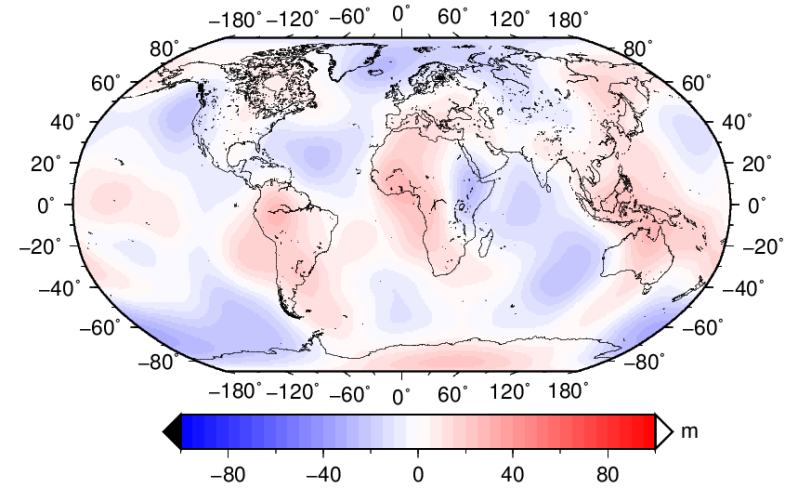


r_s_b_-0.5 geoid

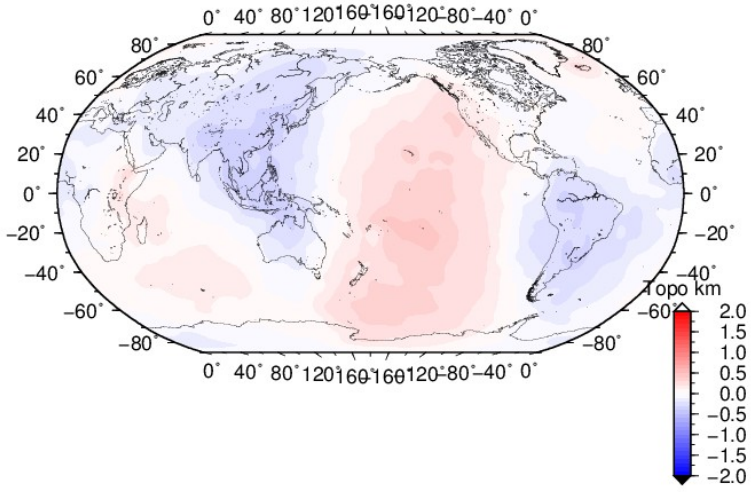


r_s_b_-0. 5 topo

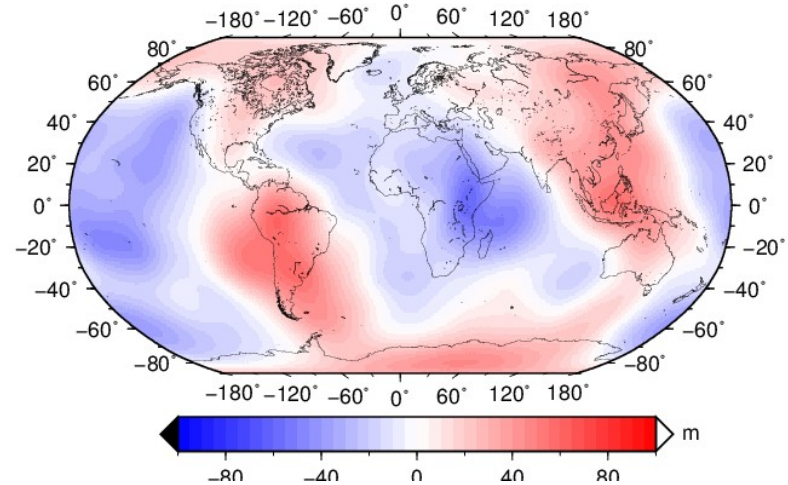
Fig12



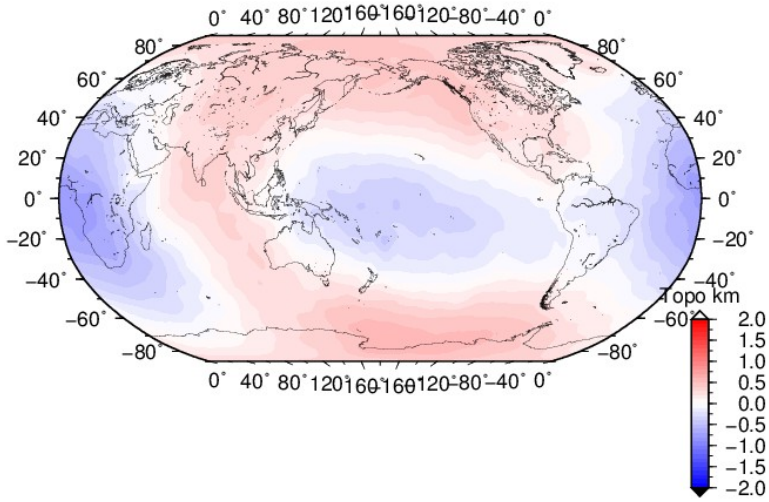
r_s_b geoid



r_s_b topo

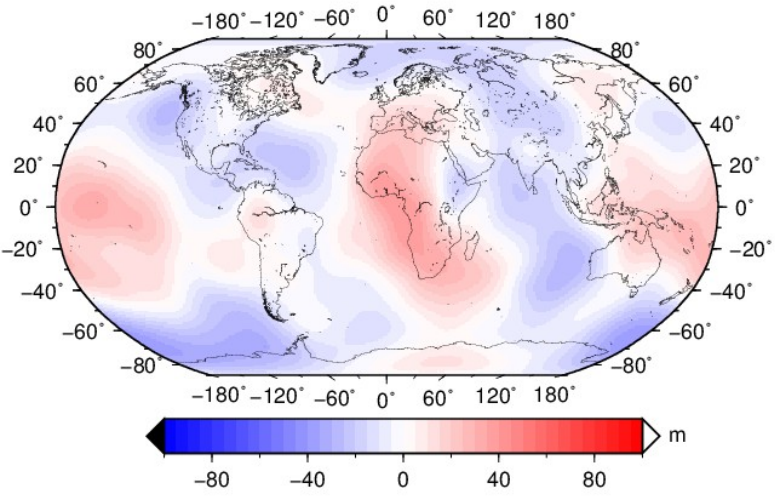


r_s_b_0.5 geoid

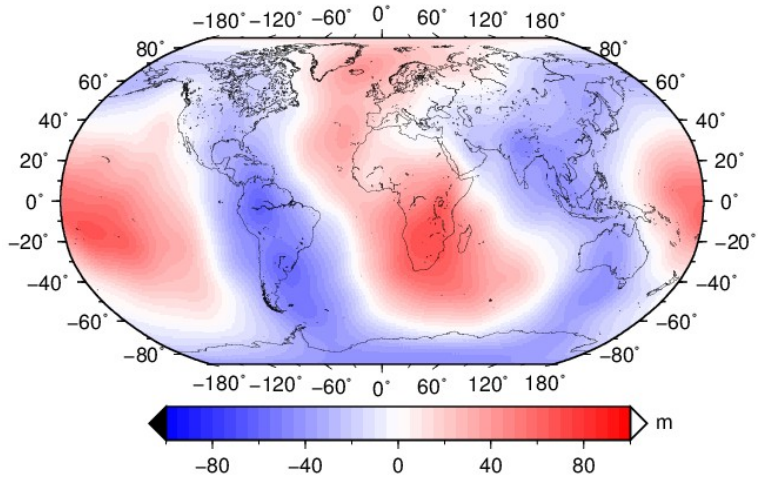


r_s_b_0.5 topo

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

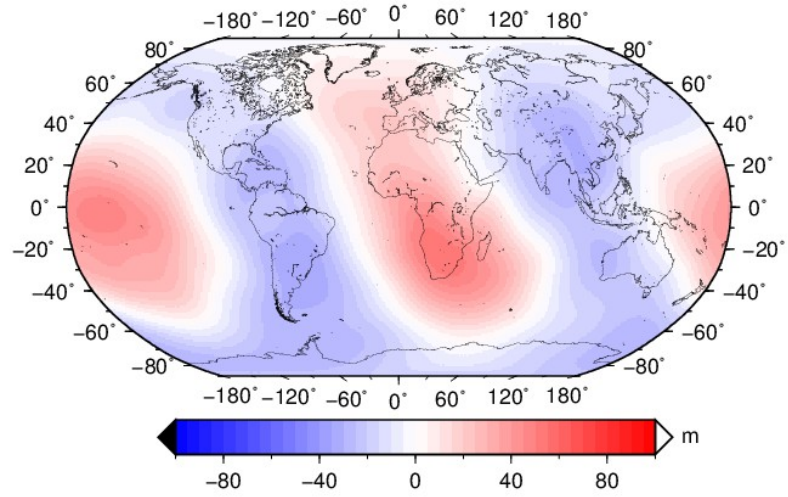


r2_s_1c

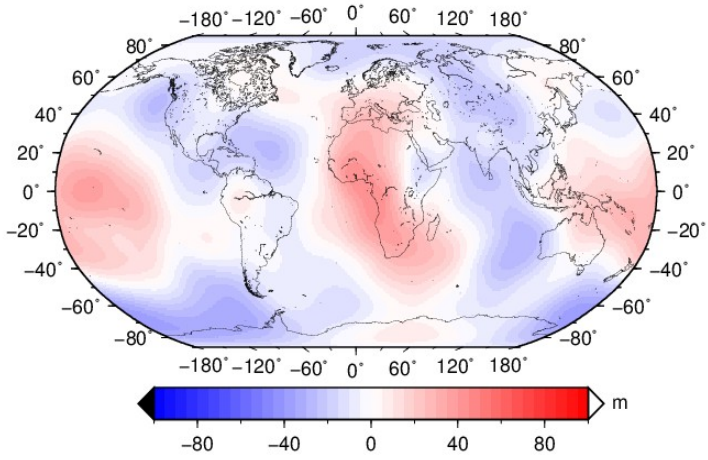


r2_s_2c

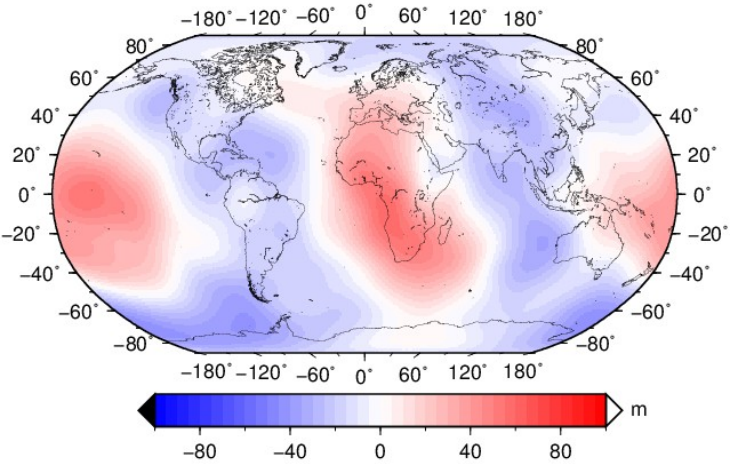
Fig13



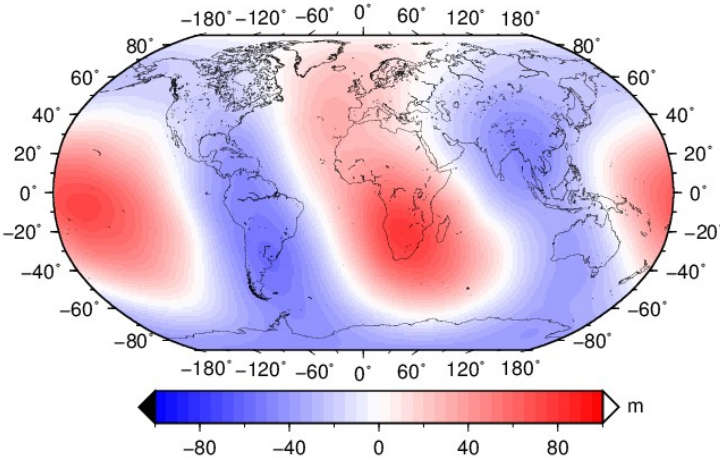
r2_s_3c



r2_s_4c3

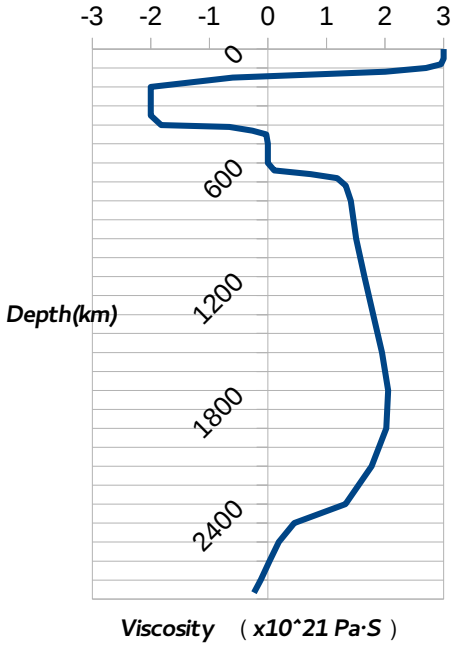


r1_s_5c

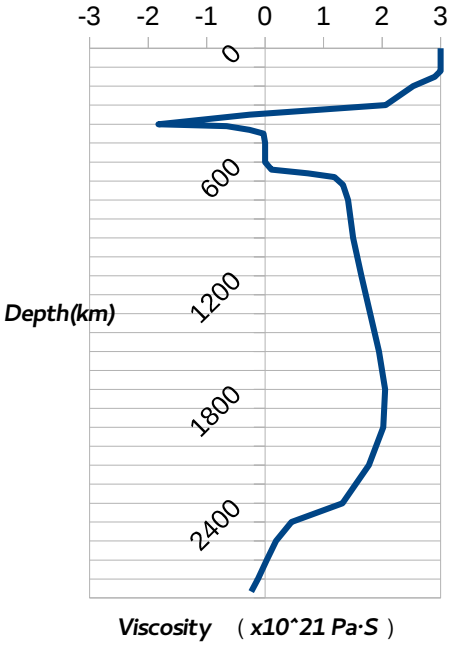


r1_s_6c

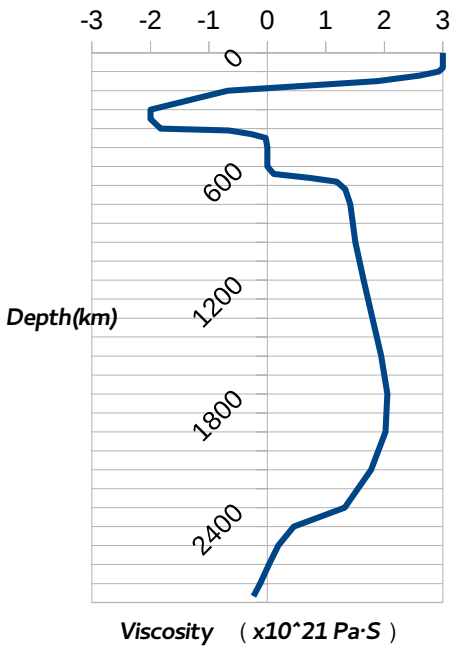
Figure 13 Geoid output
r2->smoothing times for viscosity at refined coordinate
s_b->simple scaling, from benchmark 1
1~6c->viscosity structure modified from the combination of benchmark1&2,in Fig 14



1c

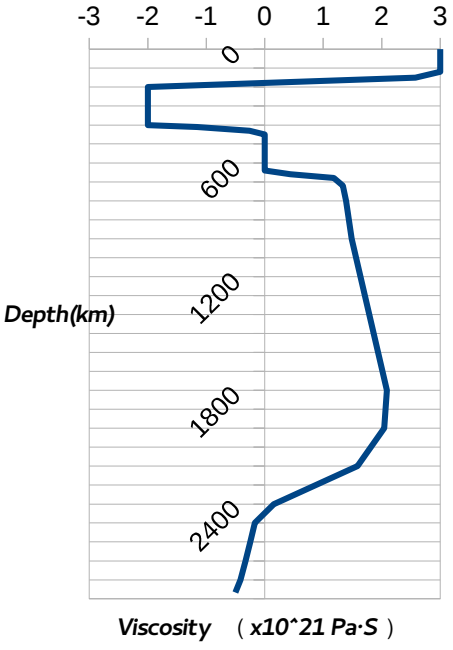


2c

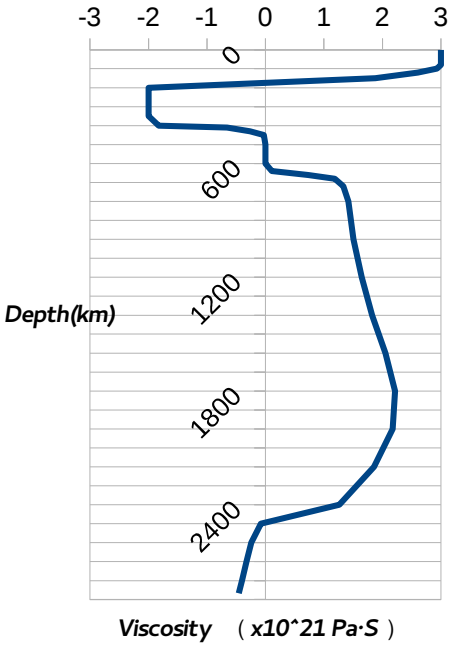


3c

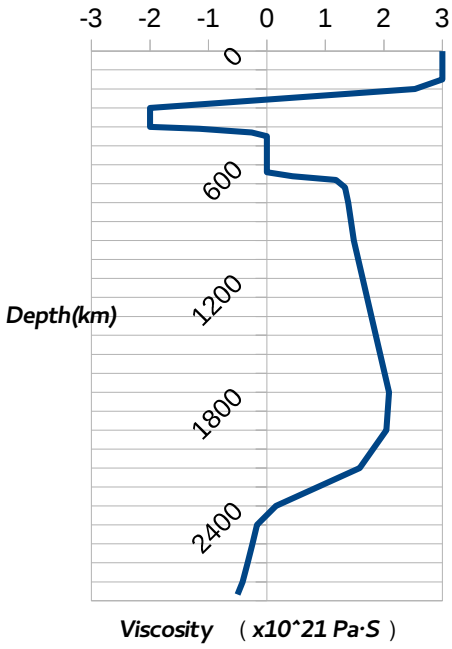
Fig14



4c

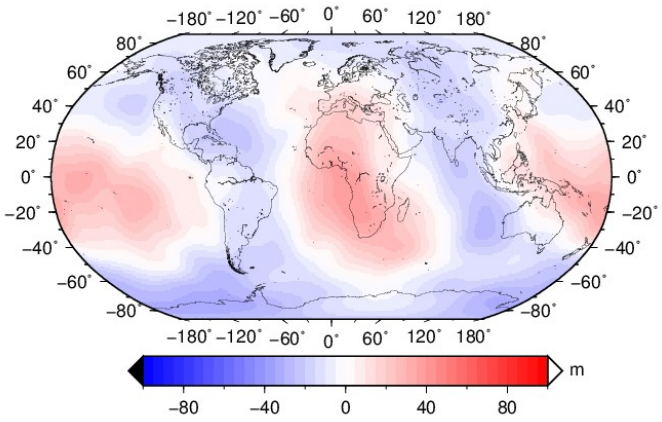


5c

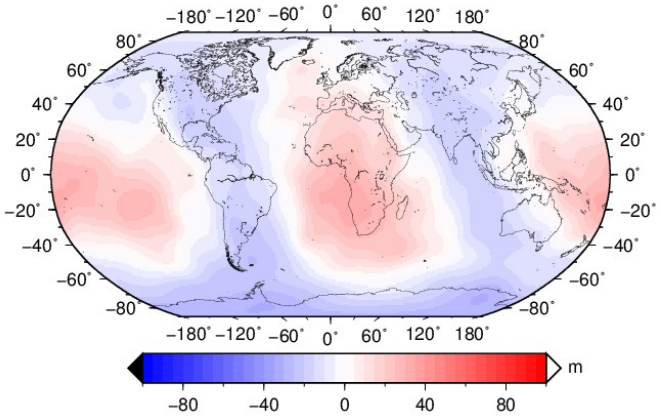


6c

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

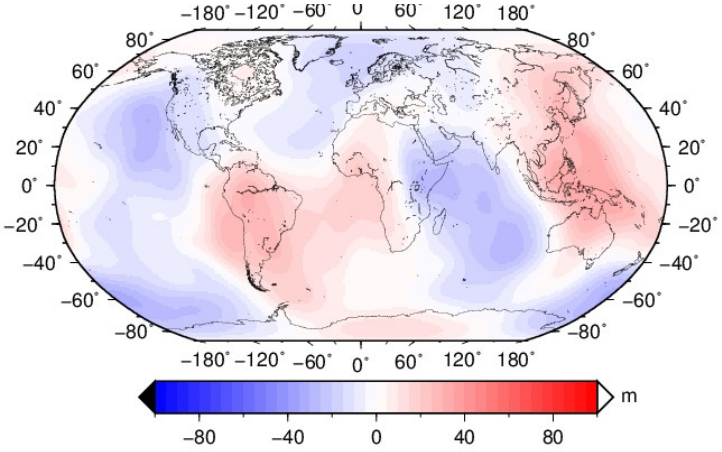


r2_s20_1c

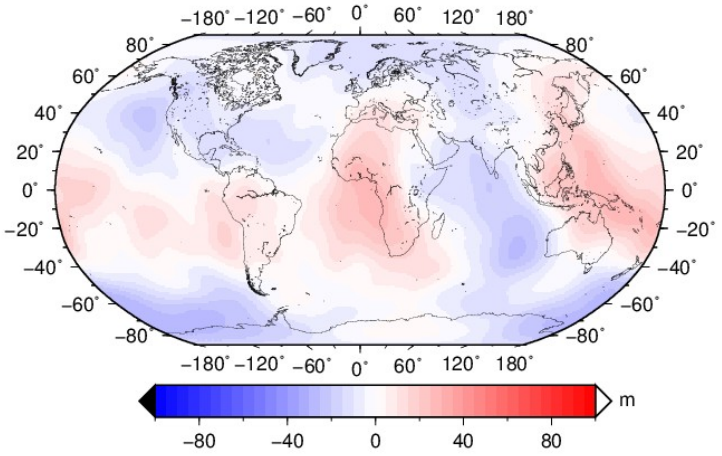


r2_s21_1c

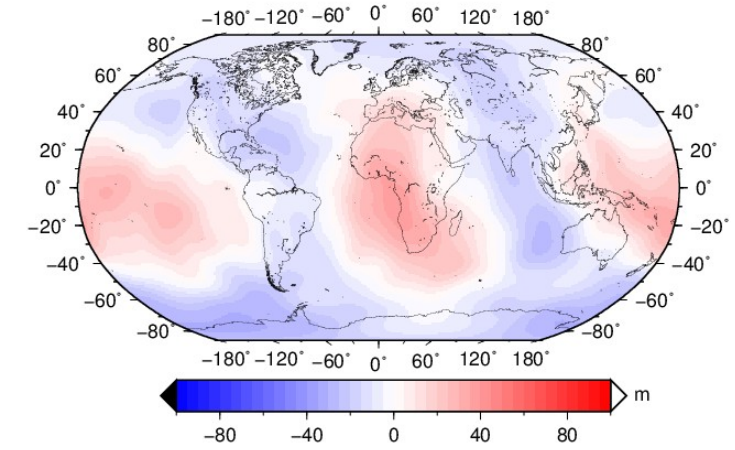
Fig15



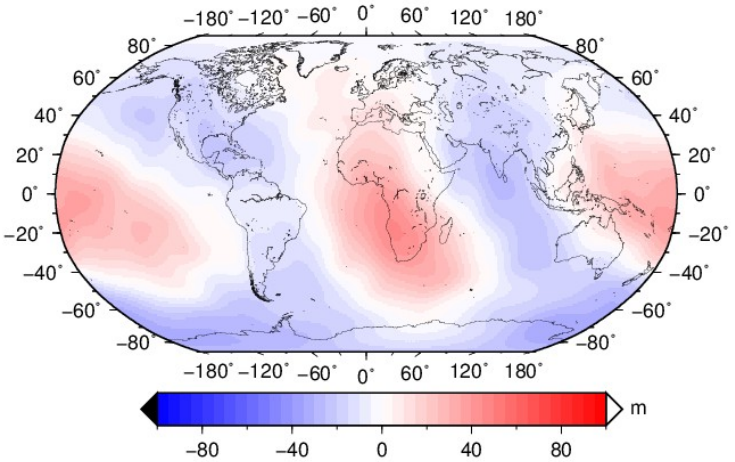
r2_s20_8c



r2_s20_9c

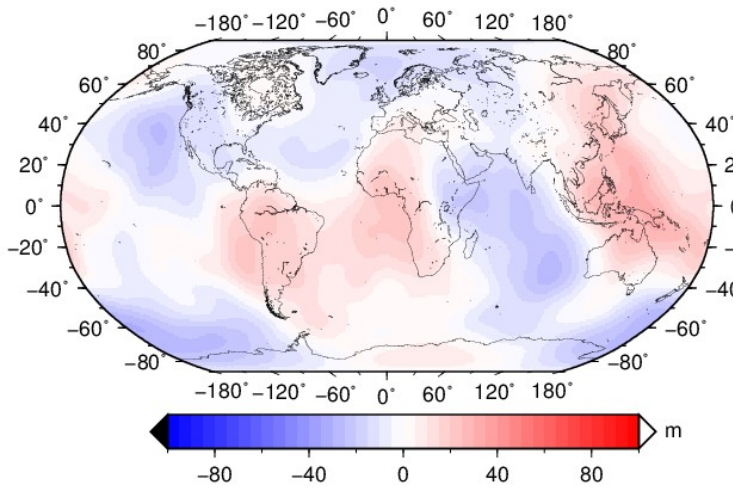


r2_s20_10c

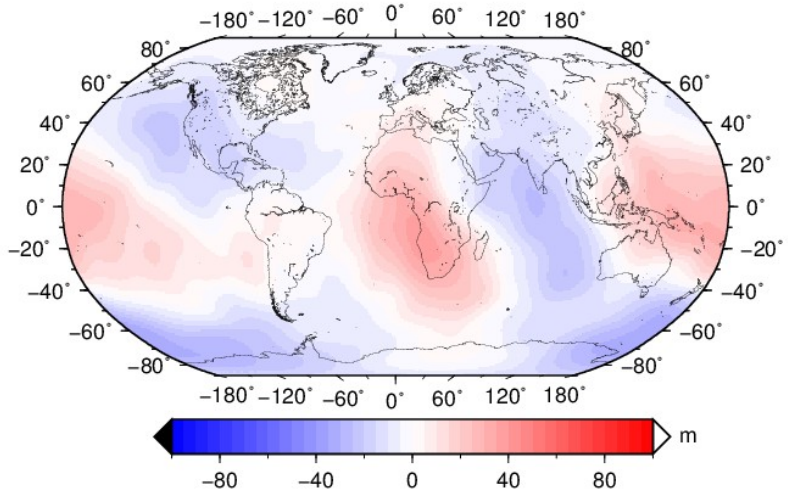


r2_s20_11c

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

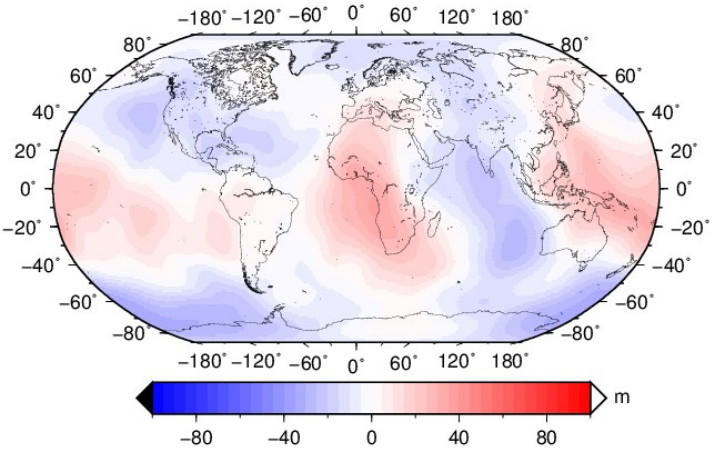


r2_s20_13c

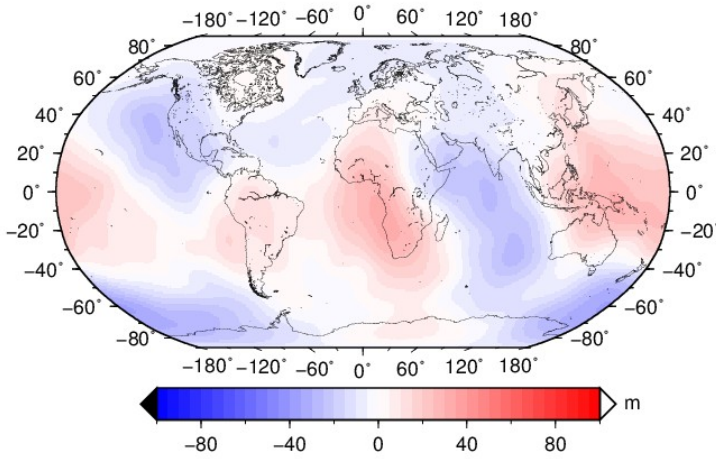


r2_s20_14c

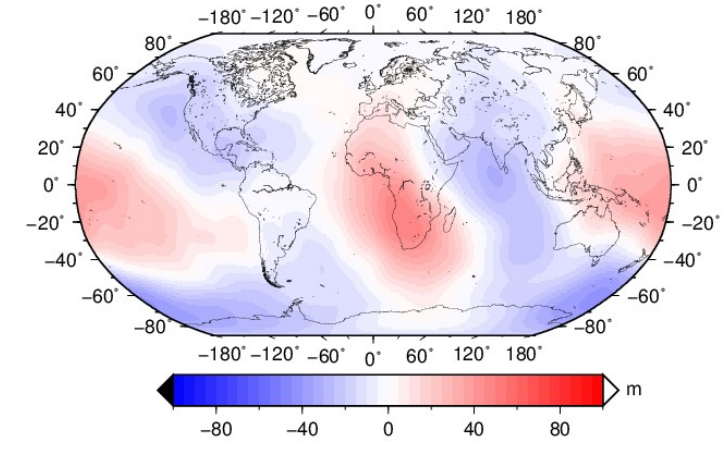
Figure 15



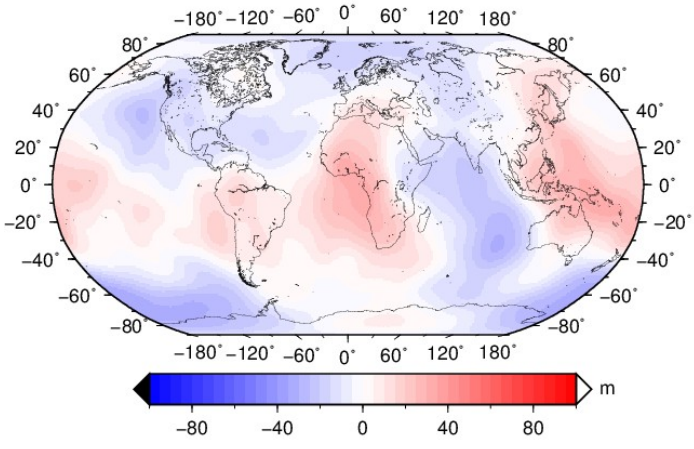
r2_s20_15c



r2_s20_16c

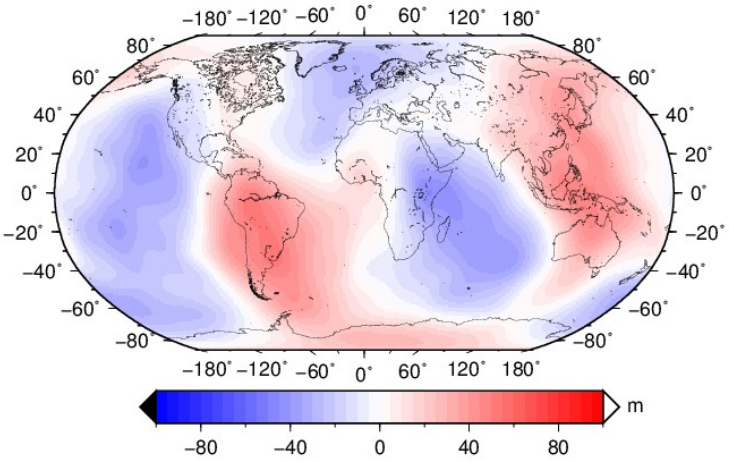


r2_s20_17c

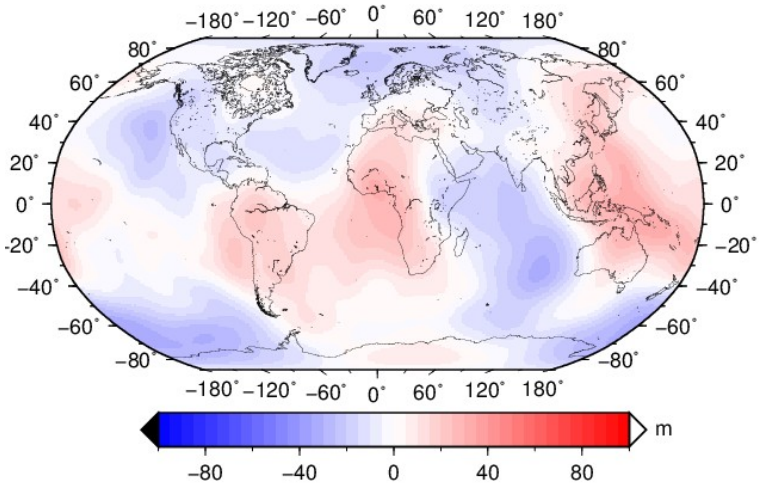


r2_s20_18c

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

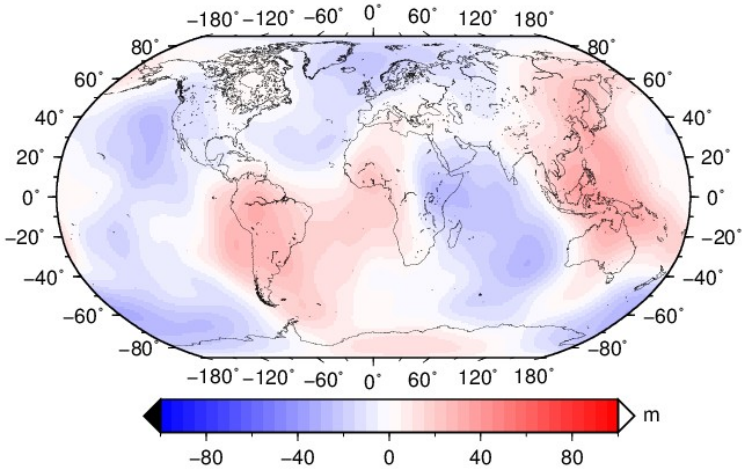


r3_s20_19c

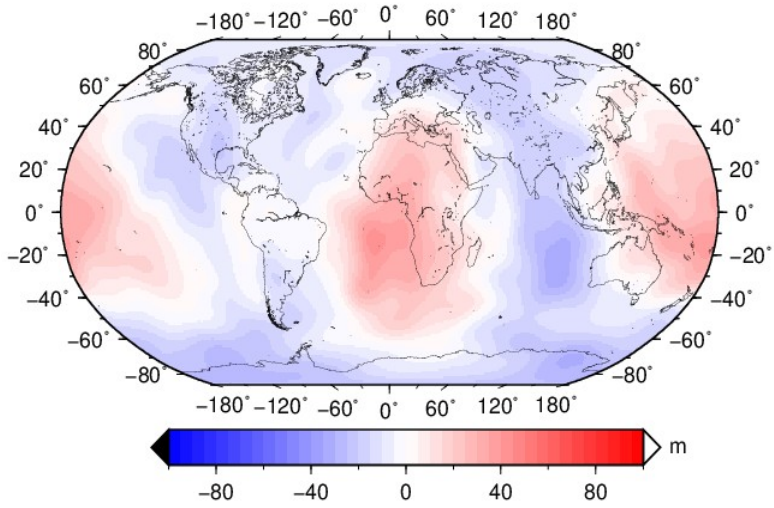


r2_s20_20c

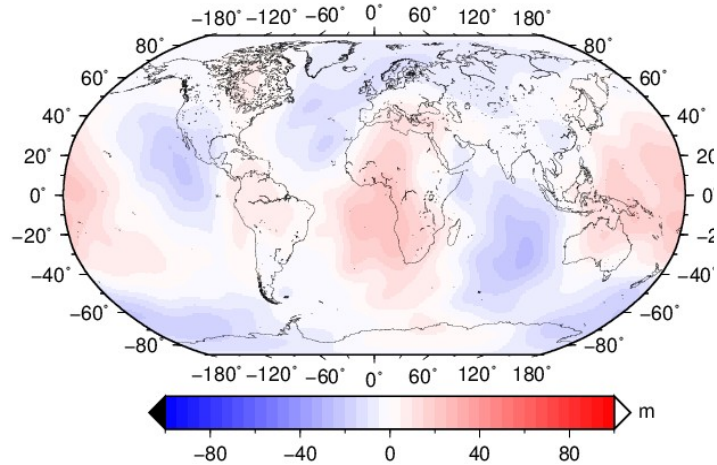
Figure 15



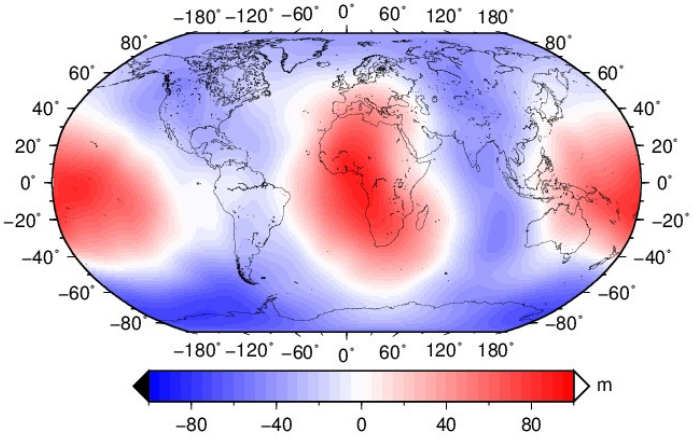
r2_s20_21c



r2_s22_20c



s22_22c



r2_s20_20c_-0.2

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

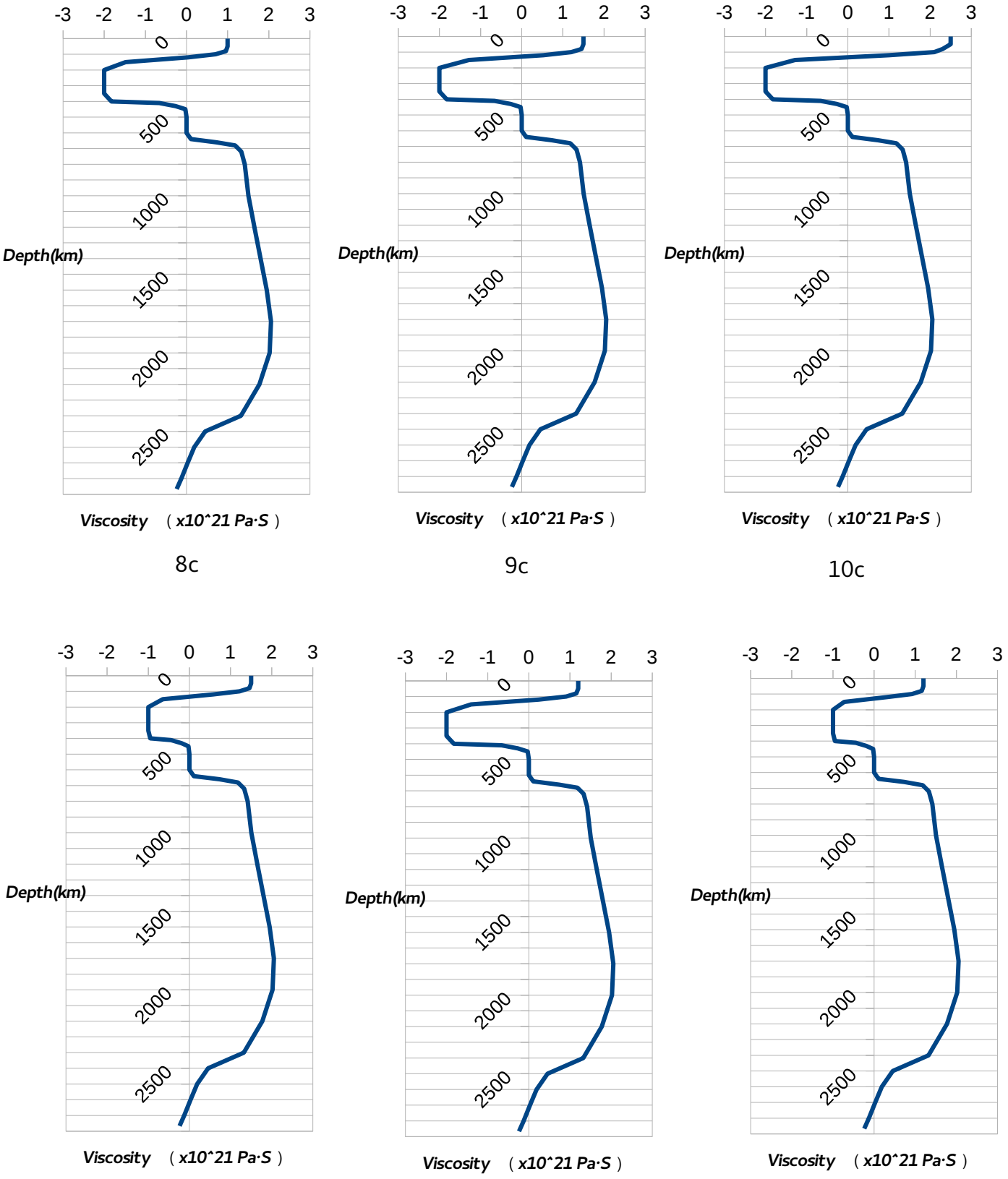
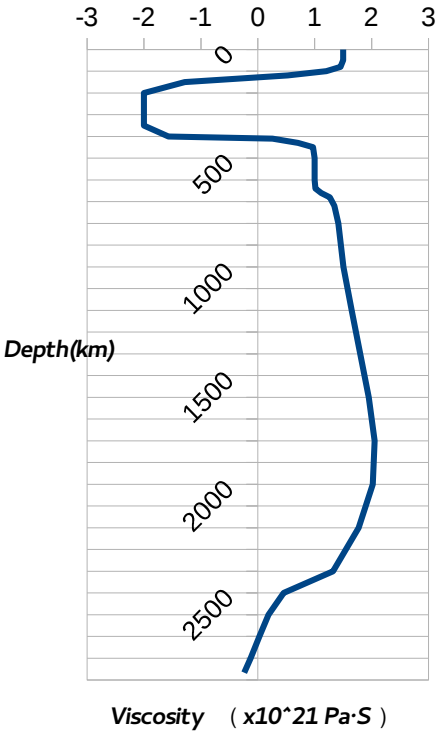
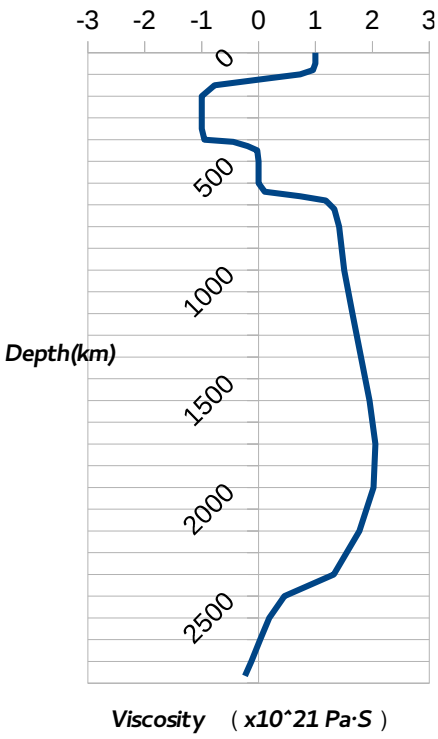


Fig16

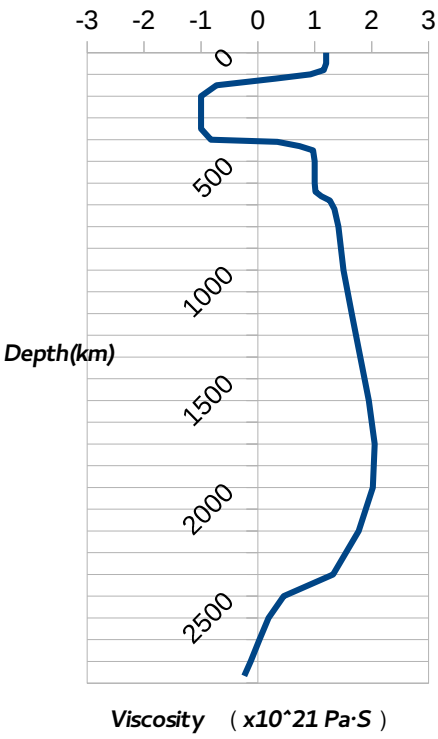
Figure 16
8~22c->viscosity structure from the combination of benchmark1&2,every layer is changed



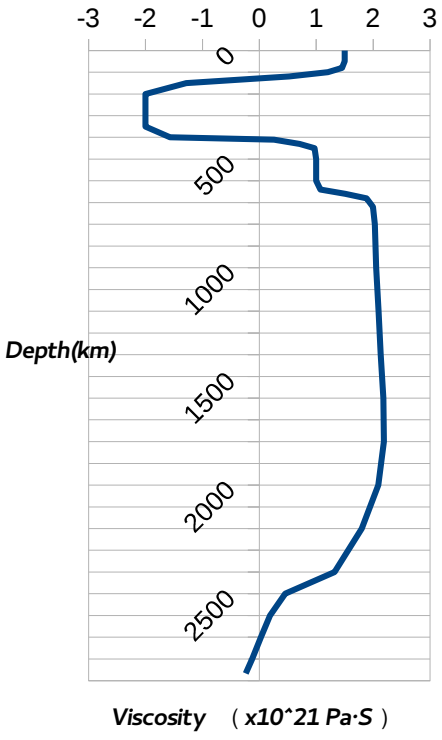
15c



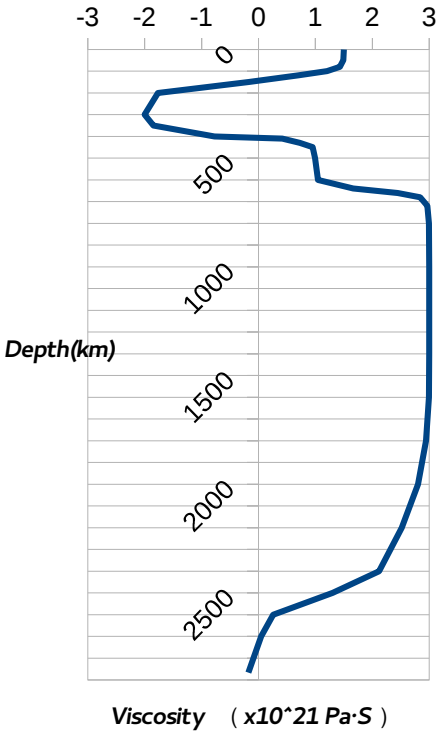
16c



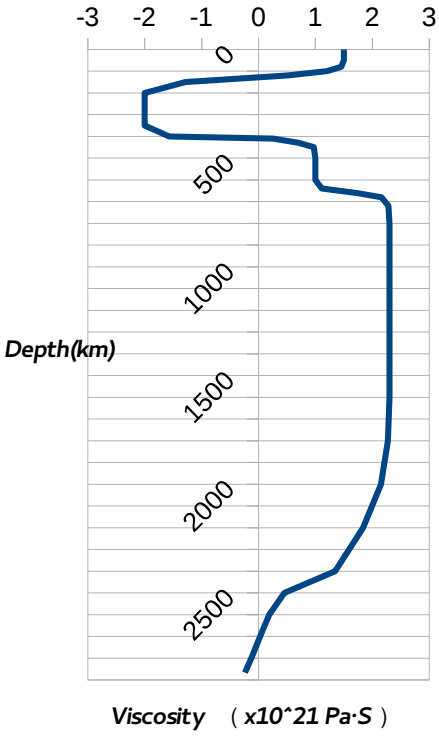
17c



18c



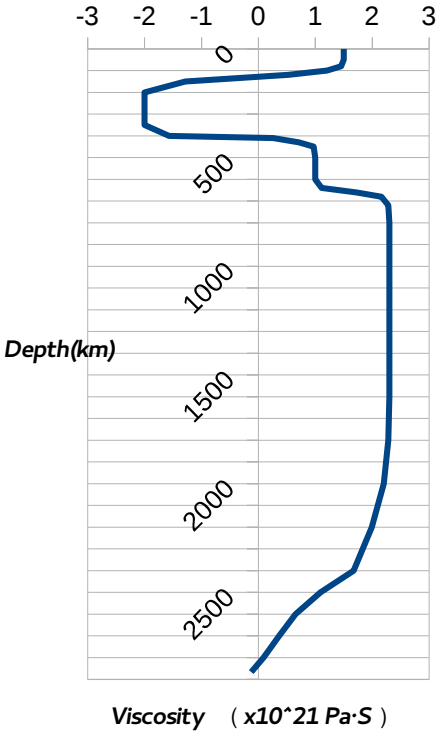
19c



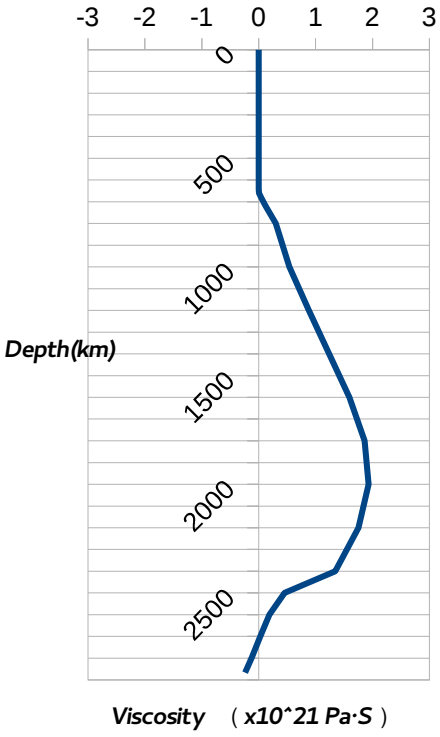
20c

Figure 16

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

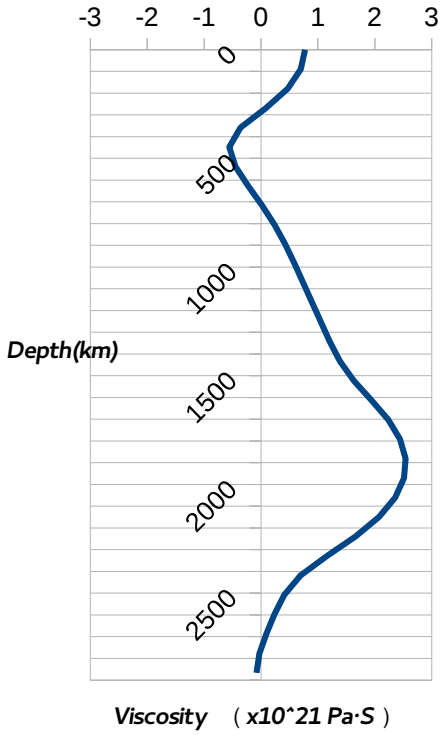
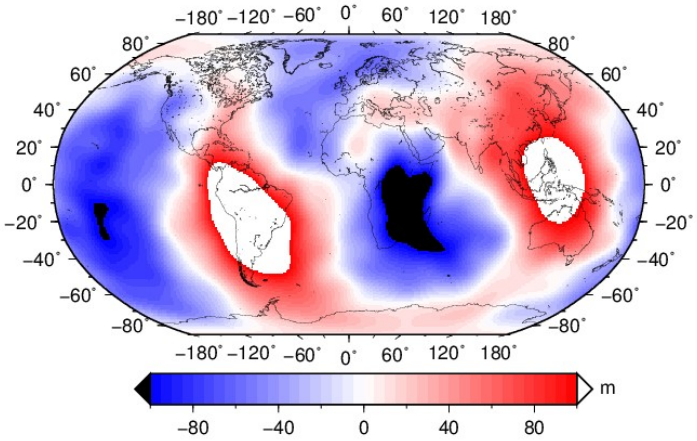
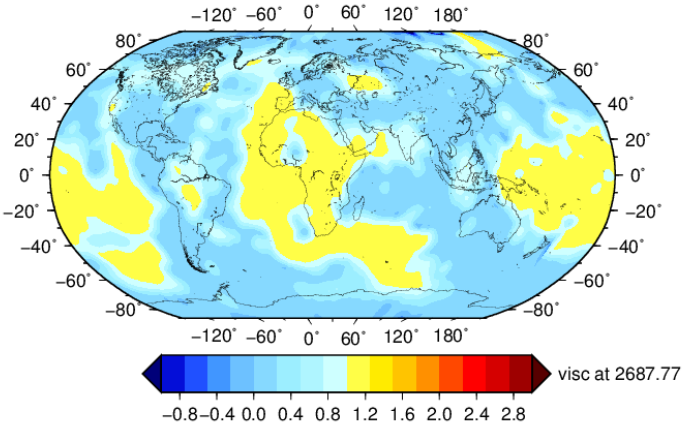


Fig17

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

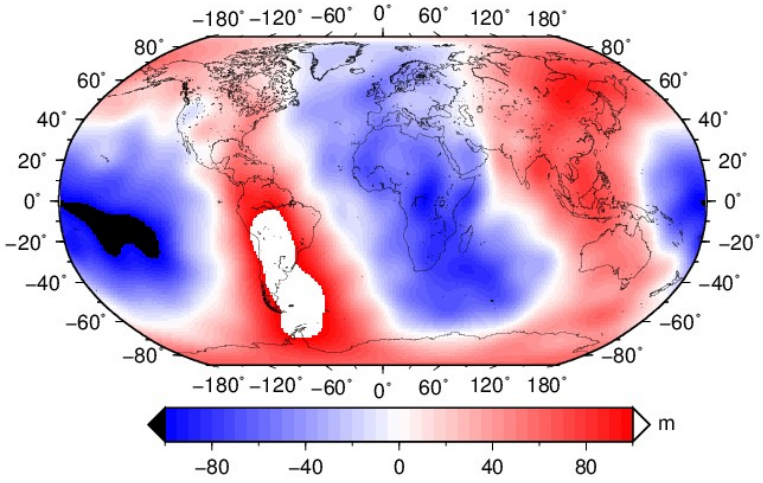


s7_n10_-0.5 geoid

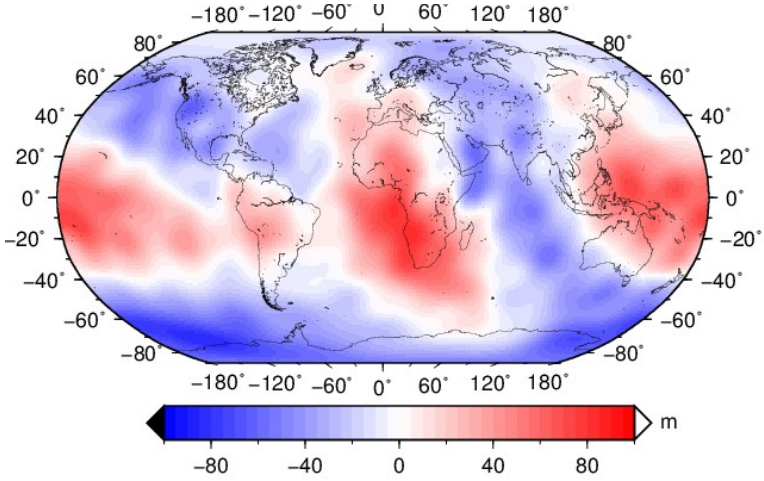


s7_n10_-0.5 LVV(10^ (21+x) Pa·S)

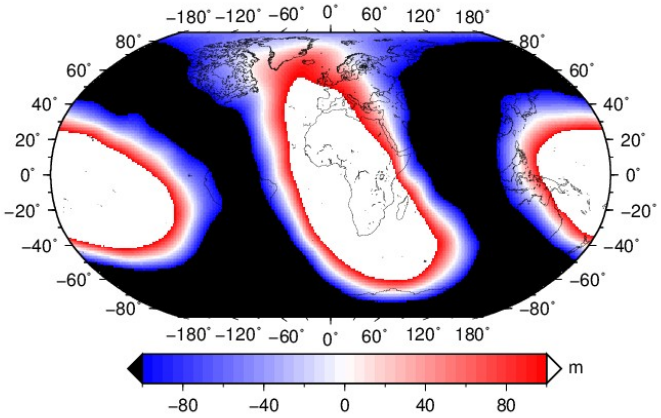
Fig18



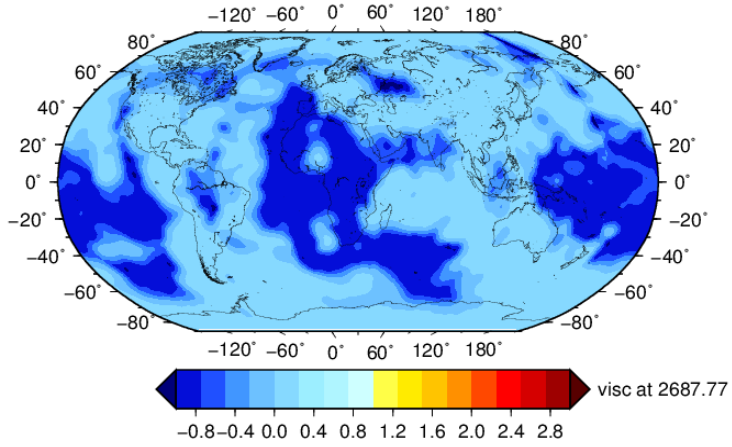
s7_n_-0.5 geoid



s7_n0.5 geoid(best fit earlier)



s7_n0.1_-0.5 geoid



s7_n0.1_-0.5 LVV(x10^(21+x) Pa·S)

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