TABLE DR1. PARAMETERS ACCEPTED IN NUMERICAL EXPERIMENTS

Parameter	Sediments	Felsic crust	Mafic crust	Mantle
Density, ρ (kg/m^3)	2670	2800	3000	3300
Thermal expansion, α, (K^{-1})	$3.7 \cdot 10^{-5}$	$3.7 \cdot 10^{-5}$	$2.7 \cdot 10^{-5}$	$3.0 \cdot 10^{-5}$
Elastic moduli, K, G, (GPa)	55, 36	55, 36	63, 40	122, 74
Heat capacity, C_p, (J/kg/K)	1200	1200	1200	1200
Heat conductivity, λ, (W/K/m)	2.5	2.5	2.5	3.3
Heat productivity, A, (μW/m^3)	1.3	1.3	0.3	0
Initial friction angle, ϕ, (degree)	3 … 30	30	30	30
Initial cohesion, C_h, (MPa)	1 …20	20	40	40
Normal plastic strain softening*	10-times linear decrease of ϕ and C_h from 0.5 to 1.5 strain			
Power law constant, log(A), (Pa^{-n}s^{-1})	-28.0	-28.0	-21.05	-16.3
Power law exponent, n	4.0	4.0	4.2	3.5
Creep activation energy, E_a,(kJ/mol)	223	223	445	535
Viscous softening	10-times linear decrease of log viscosity from 0.5 to 1.5 strain			

Sources for creep-laws: sediments and felsic crust – wet quartzite by Gleason and Tullis (1995); mafic crust – Pikwitonei granulite by Wilks and Carter (1990); mantle – dry peridotite by Hirth and Kohlstedt (1996).

*In some runs we implemented a very intensive softening in sedimentary layer: 10-times drop of the friction angle from 0 to 0.02 strain.

REFERENCES CITED

Gleason, G.C., and Tullis, J., 1995. A flow law for dislocation creep of quartz aggregates determined with the molten salt cell: Tectonophysics, v. 247, p. 1-23.

Hirth, G., and Kohlstedt, D.L., 1996, Water in the oceanic upper mantle: implications for rheology, melt extraction and the ovolution of the lithosphere: Earth Planet. Sci. Lett., v. 144, p. 93-108.

Wilks, K.R., and Carter, N.L., 1990, Rheology of some continental lower crustal rocks: Tectonophysics, v. 182, p. 57-77.

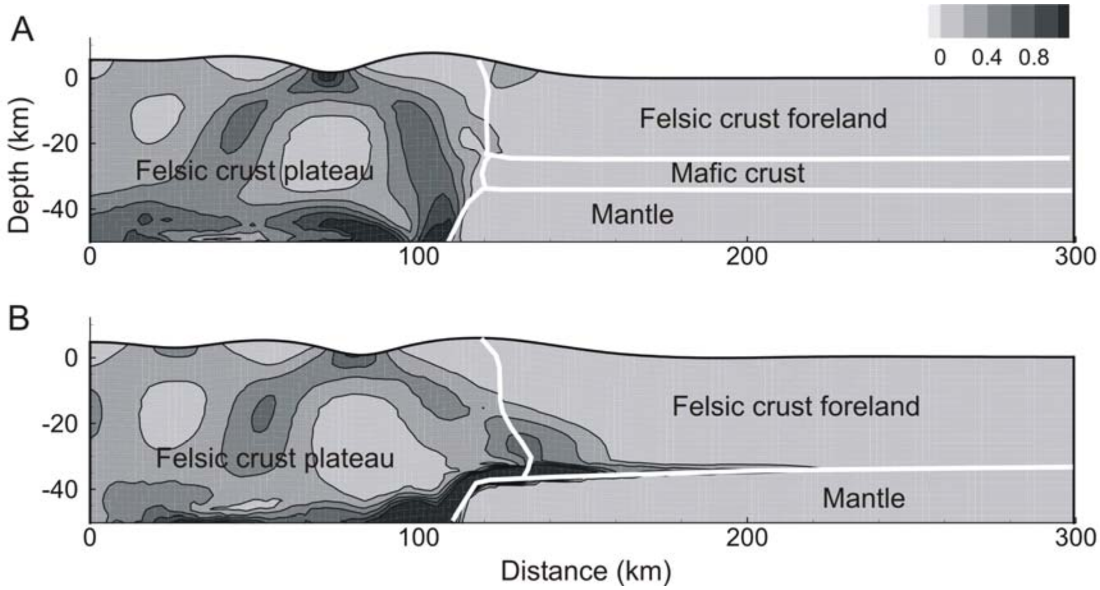

Figure DR1. This figure demonstrates that compositional variations of the foreland crust cannot account for the thick-skinned deformation style in the Puna foreland. Shown is the finite strain after 50 km of shortening. White solid lines – boundaries of lithological units. Upper panel (A) is our first end-member model ("cold" shield, no weak sediments) used as a reference model for this experiment (see Fig. 3A, main text). Lower panel (B) - the same model setup but the entire foreland crust is felsic and, hence, rheologically weaker. Even in this extreme case the foreland crust remains undeformed, the fact which bolsters the thermal explanation for the thick-skinned tectonics in the Puna foreland.