

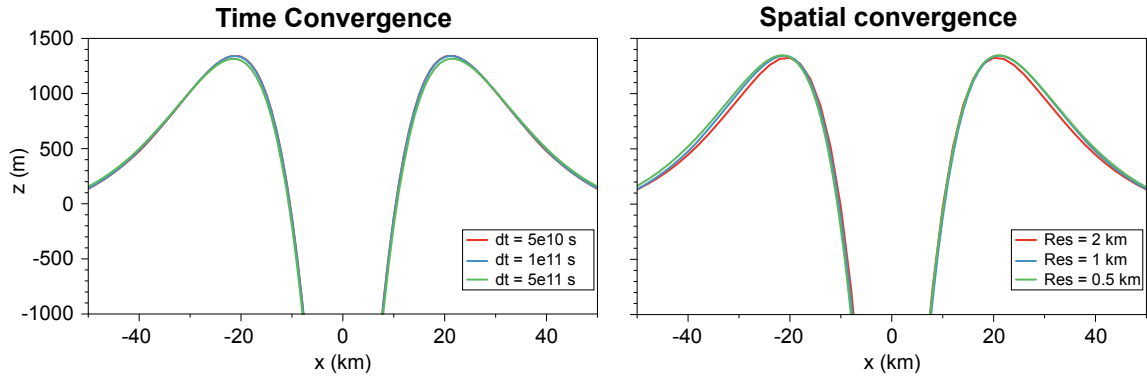


Figure S1: Convergence test. Topography of the model after 1.6 Myr for (left) different time steps (dt) and (right) different mesh-grid resolution (Res).

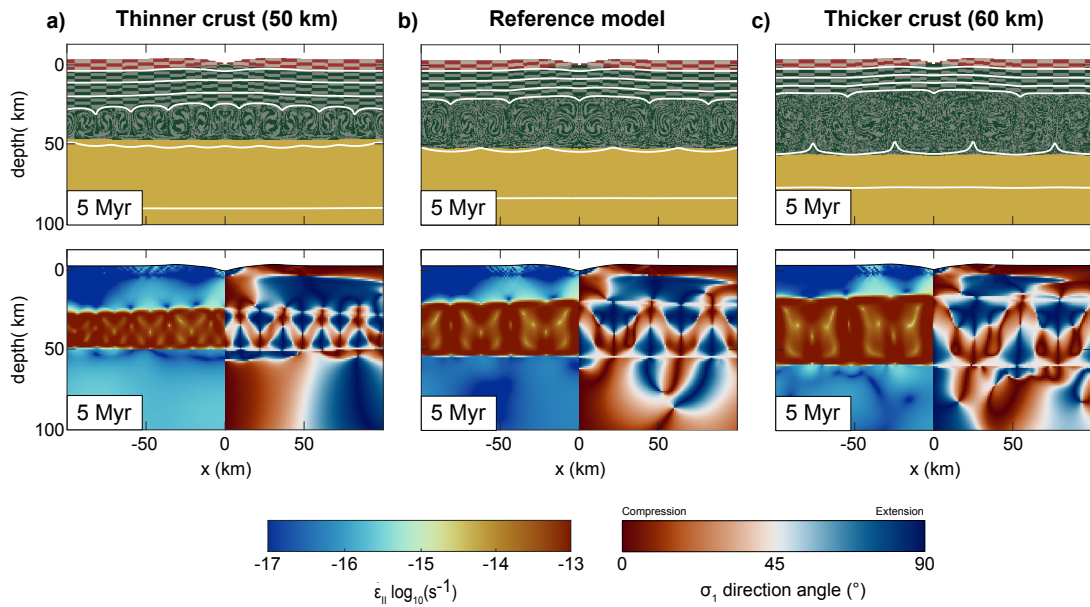


Figure S2: Models snapshots after 5 Myr for (a) a thin crust model (50 km), (b) the reference model (55km), and (c) a thick crust model (60 km). First line represents the material and thermal evolution. White lines represents each 200°C isotherm. Second line represents the second invariant of the strain rate (left) and the evolution of the σ_1 direction angle (right).

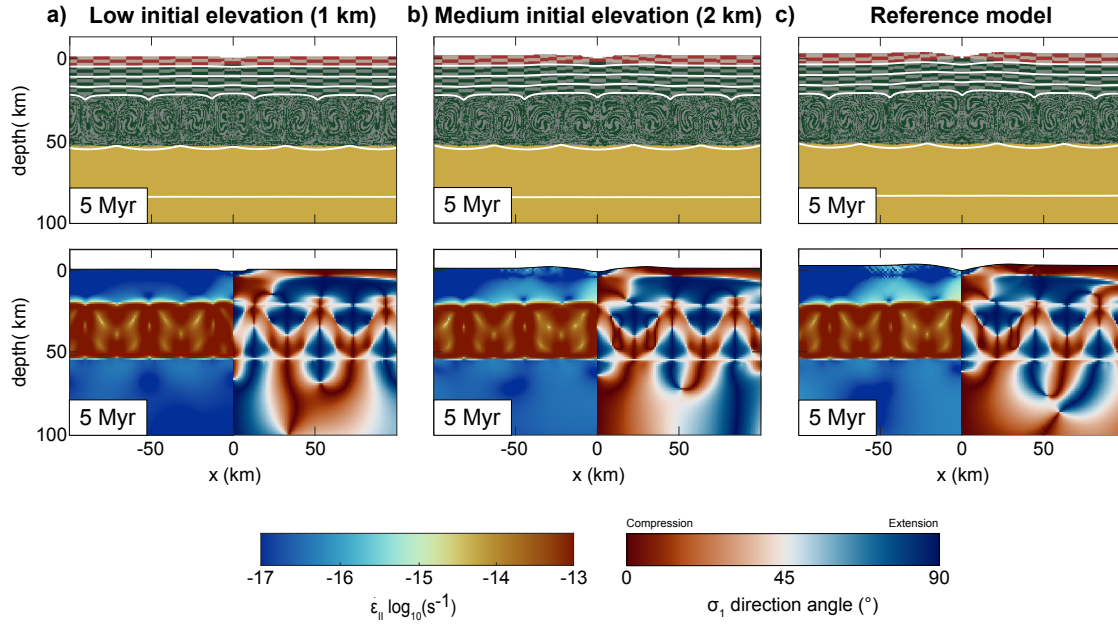


Figure S3: Models snapshots after 5 Myr for (a) low initial plateau elevation model (1 km), (b) a medium initial plateau elevation model (2 km), and (c) the reference model (3 km). First line represents the material and thermal evolution. White lines represent each 200°C isotherm. Second line represents the second invariant of the strain rate (left) and the evolution of the σ_1 direction angle (right).

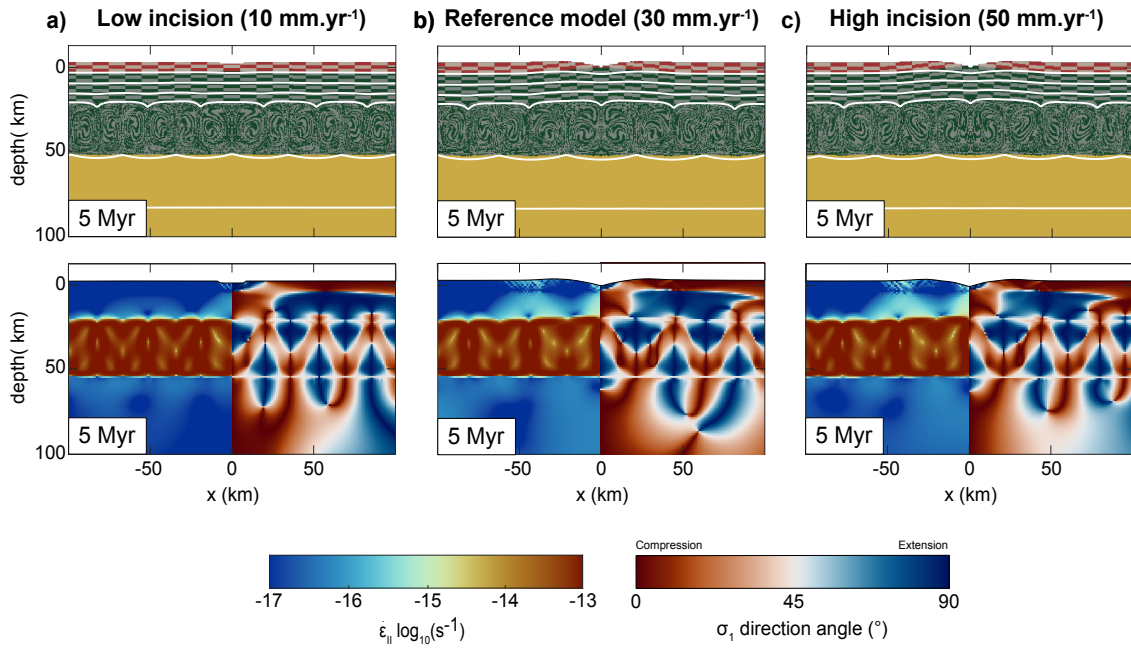


Figure S4: Models snapshots after 5 Myr for (a) low incision velocity model (10 mm.yr⁻¹), (b) the reference model (30 mm.yr⁻¹), and (c) a high incision velocity model (50 mm.yr⁻¹). First line represents the material and thermal evolution. White lines represent each 200°C isotherm. Second line represents the second invariant of the strain rate (left) and the evolution of the σ_1 direction angle (right).

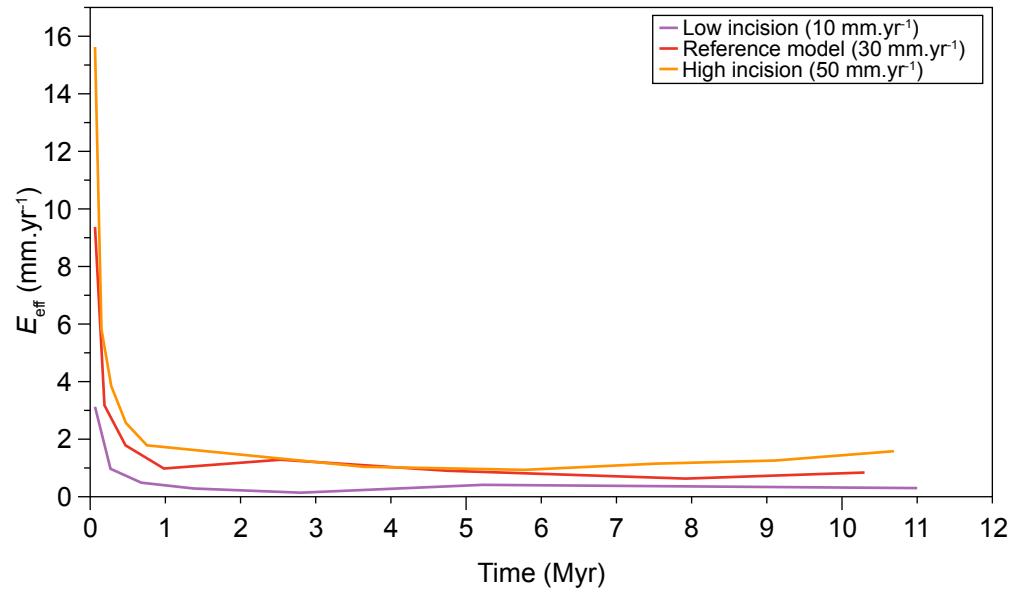


Figure S5: Time evolution of the effective erosion at the center of the valley (E_{eff}) for the low incision model (10 mm.yr⁻¹), the reference model 30 mm.yr⁻¹), and the high incision model (50 mm.yr⁻¹). All these models are performed with a initial plateau elevation of 3 km, and a crustal thickness of 55 km.

Model name	Crustal thickness (H) (km)	Initial plateau elevation (h_p) (km)	Incision velocity (V_i) (mm.yr ⁻¹)
40-1_Vi10	40	1	10
40-1_Vi30	40	1	30
40-1_Vi50	40	1	50
45-1_Vi10	45	1	10
45-1_Vi30	45	1	30
45-1_Vi50	45	1	50
45-2_Vi10	45	2	10
45-2_Vi30	45	2	30
45-2_Vi50	45	2	50
50-1_Vi10	50	1	10
50-1_Vi30	50	1	30
50-1_Vi50	50	1	50
50-2_Vi10	50	2	10
50-2_Vi30	50	2	30
50-2_Vi50	50	2	50
50-3_Vi10	50	3	10
50-3_Vi30	50	3	30
50-3_Vi50	50	3	50
55-1_Vi10	55	1	10
55-1_Vi30	55	1	30
55-1_Vi50	55	1	50
55-2_Vi10	55	2	10
55-2_Vi30	55	2	30
55-2_Vi50	55	2	50
55-3_Vi10	55	3	10
55-3_Vi30	55	3	30
55-3_Vi50	55	3	50
55-4_Vi10	55	4	10
55-4_Vi30	55	4	30
55-4_Vi50	55	4	50
60-2_Vi10	60	2	10
60-2_Vi30	60	2	30
60-2_Vi50	60	2	50
60-3_Vi10	60	3	10
60-3_Vi30	60	3	30
60-3_Vi50	60	3	50
60-4_Vi10	60	4	10
60-4_Vi30	60	4	30
60-4_Vi50	60	4	50
65-3_Vi10	65	3	10
65-3_Vi30	65	3	30
65-3_Vi50	65	3	50
65-4_Vi10	65	4	10
65-4_Vi30	65	4	30
65-4_Vi50	65	4	50
65-5_Vi10	65	5	10
65-5_Vi30	65	5	30
65-5_Vi50	65	5	50

Table S1: Models name and parameters used in the parametric study.