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Supplement of

Three-dimensional approach to understanding the relationship between the Plio-Quaternary stress field and tectonic inversion in the Triassic Cuyo Basin, Argentina

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Supplement A

Site	latitude South	longitude West	n	nT	σ1	σ2	σ3	ϕ	α	Tectonic regime
1	33°05´58´´	69°13´08´´	17	19	285/002	194/012	024/078	0.53	11	reverse faulting
2	33°05´17´´	69°12´48´´	13	13	114/005	205/006	345/082	0.51	8	reverse faulting
3	33°05´33"	69°12´55´´	10	10	108/001	199/011	014/079	0.56	7	reverse faulting
4	33°06´32´´	69°07´28´´	14	15	114/000	204/009	021/081	0.55	12	reverse faulting
5	33°08´06´´	69°07´33´´	11	11	277/002	007/001	128/087	0.49	11	reverse faulting
6	33°09´58´´	69°07´40´´	8	8	286/005	016/002	126/085	0.5	6	reverse faulting
7	33°17´10´´	69°05´11´´	10	10	280/012	036/064	185/023	0.24	16	strike-slip/reverse faulting
8	33°17´35´´	69°04´53´´	10	10	280/011	071/077	188/006	0.23	17	strike-slip/reverse faulting
9	33°16´26´´	69°03´30´´	12	13	080/005	312/081	171/007	0.52	10	strike-slip faulting
10	33°18´13´´	69°03´36´´	10	10	073/005	322/76	164/013	0.52	8	strike-slip faulting
11	33°17´16´´	69°02´18´´	12	12	088/016	269/074	178/000	0.52	8	strike-slip faulting
12	33°17´50´´	69°00´43´´	10	10	250/075	096/013	005/006	0.43	18	normal faulting
			137	141						

Supplement B of

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Giambiagi et al.

The slip-tendency is based on Amonton´s law that governs fault reactivation

$$\tau = \mu_s \sigma'_n \qquad (1)$$

Where τ and σ'_n are the shear and effective normal stress acting on a plane of weakness and μ_s is the sliding friction coefficient. It assumes that slip occurs in the direction of resolved shear stress (Wallace-Bott hypothesis) if it is larger than the frictional resistance of the fault (μ_s) (Jaeger and Cook, 1976). Stability is determined by the slip tendency, which is the ratio of shear stress to normal stress acting on a plane. Unstable planes are those where

$$T_S = \tau / \sigma'_n > \mu_s \qquad (2)$$

Considering a reasonable range for the parameters on the right-hand side of equation (2), one can use the slip tendency pattern to provide useful constraints on fault reactivation.

We estimate the stress magnitudes at depth considering that the frictional strength of faults and fractures (μ) distributed throughout the upper crust limits the maximum differential effective stress ($\sigma'_1 - \sigma'_3$) = [(σ_1-P_f)-(σ_3-P_f)] at depth (Jaeger and Cook, 1976; Zoback and Townend, 2001):

$$\frac{\sigma'1}{\sigma'3} \leq \left\lfloor (u^2+1)^{1/2} + u \right\rfloor^2 \qquad (3)$$

Using (3) and different values of frictional coefficient, 0.4, 0.6 and 0.8, we constrain the $\frac{\sigma'1}{\sigma'3}$ to 2.18, 3.1 and 4.31 respectively. We determine the value of σ_v at ~ 3.5 km depth using an average density of 2600 kg m^{-3}, which is kept constant in all domains.

With the Θ value $\left\lfloor \Theta = \left(\frac{\sigma2-\sigma3}{\sigma1-\sigma3}\right)\right\rfloor$ obtained from the dynamic analysis, we estimate SHmax and Shmin, which correspond to σ_1 and σ_2, and σ_1 and σ_3, for the northern and central-southern domains respectively.

In our slip-tendency analysis, two end-members are considered (Fig. 1): (1) pore pressure is assumed to be hydrostatic (overpressure = 0) or (2) frictional coefficient is assumed to be in agreement with laboratory measurements ($\mu_s = 0.6$, Jaeger and Cook, 1976; Byerlee, 1978). We neglect cohesion along pre-existing fault segments, as proposed by several field studies (Brace and Kohlstedt, 1980; Twiss and Moores, 1992).

Assuming hydrostatic pore pressure, we determine that either a high strength of the uppermost crust or a reduction in the frictional coefficient is needed to reactivate the fault segments Our analysis indicates that under conditions of hydrostatic pore pressure, either a reduced frictional coefficient or a high frictional strength of the crust is needed to reactivate the pre-existent normal fault in the central and southern domains (Figure A).

If we assume Byerlee-type friction at ~3.5 km depth, the frictional coefficient should be set to 0.6, an overpressure = 40-60 MPa range was determined.

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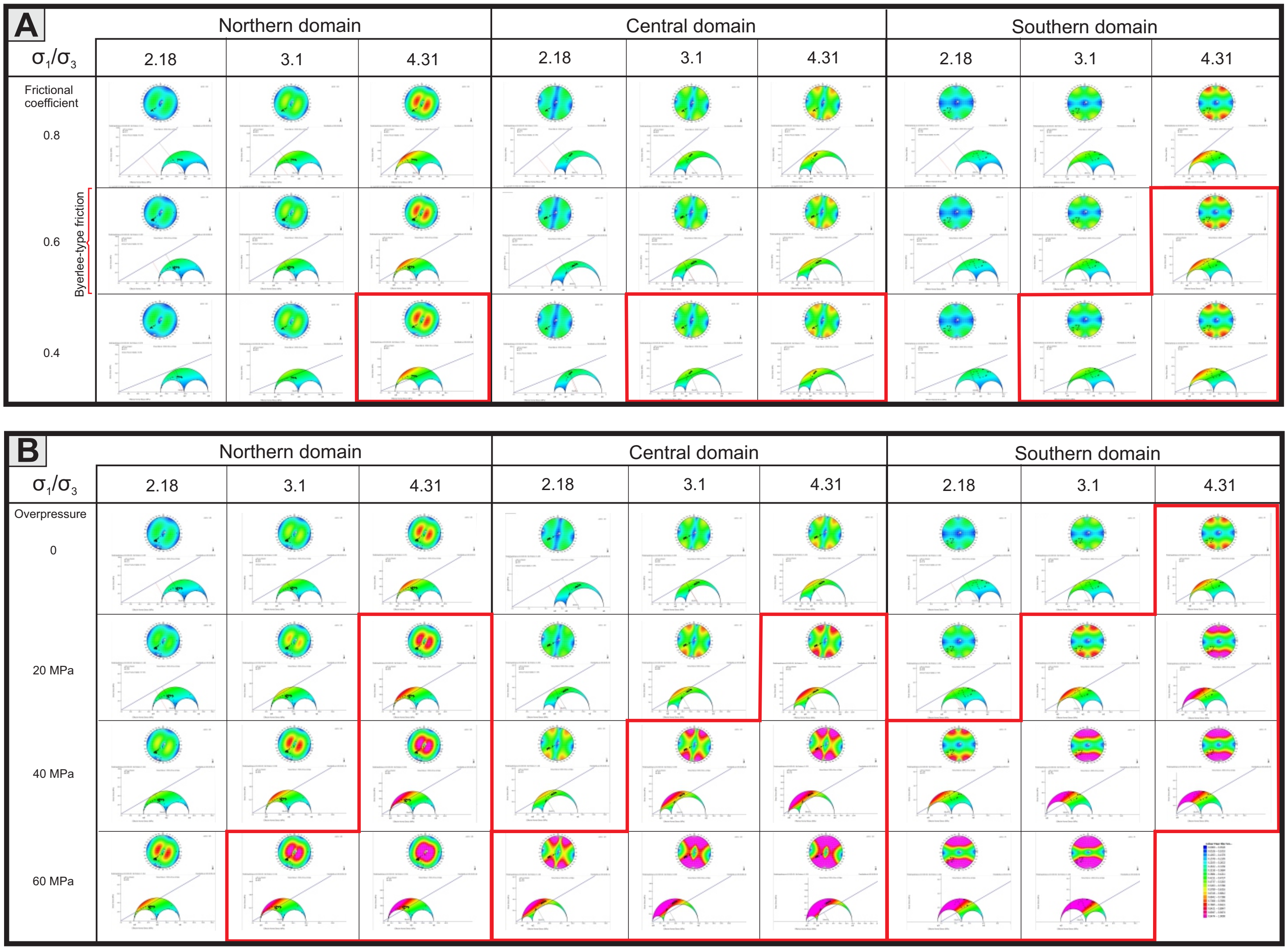
A
Northern domain
Central domain
Southern domain
σ_1/σ_3
2.18
3.1
4.31
2.18
3.1
4.31
2.18
3.1
4.31
Frictional coefficient
0.8
0.6
0.4
Byerlee-type friction
B
Northern domain
Central domain
Southern domain
σ_1/σ_3
2.18
3.1
4.31
2.18
3.1
4.31
2.18
3.1
4.31
Overpressure
0
20 MPa
40 MPa
60 MPa