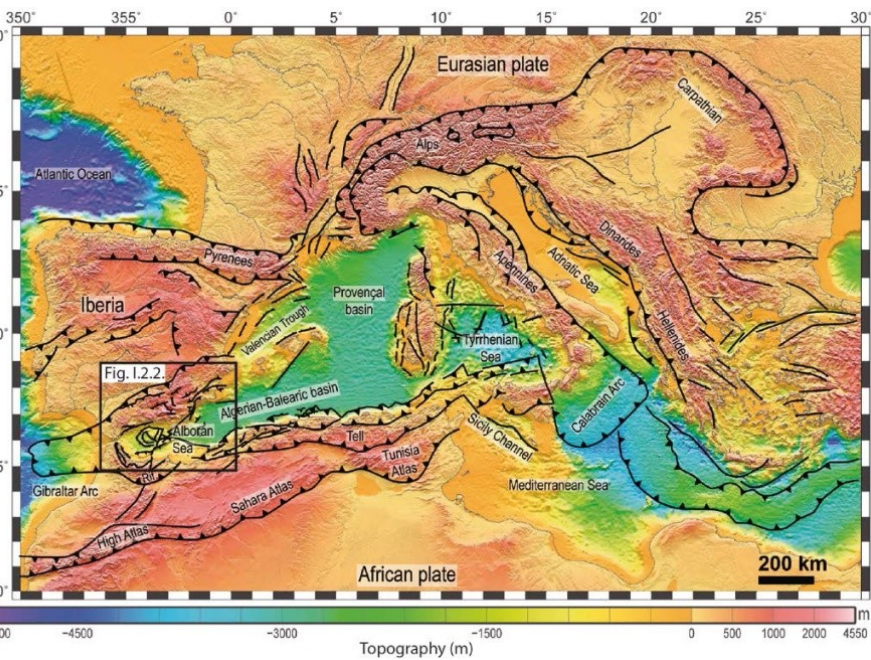


Brittle-ductile analogue models of fold-and-thrust belts developed during progressive arching: the effect of viscous basal layer pinch-outs

Alejandro Jiménez-Bonilla, Ana Crespo-
Blanc, Juan Carlos Balanyá, Inmaculada
Expósito, and Manuel Díaz-Azpiroz
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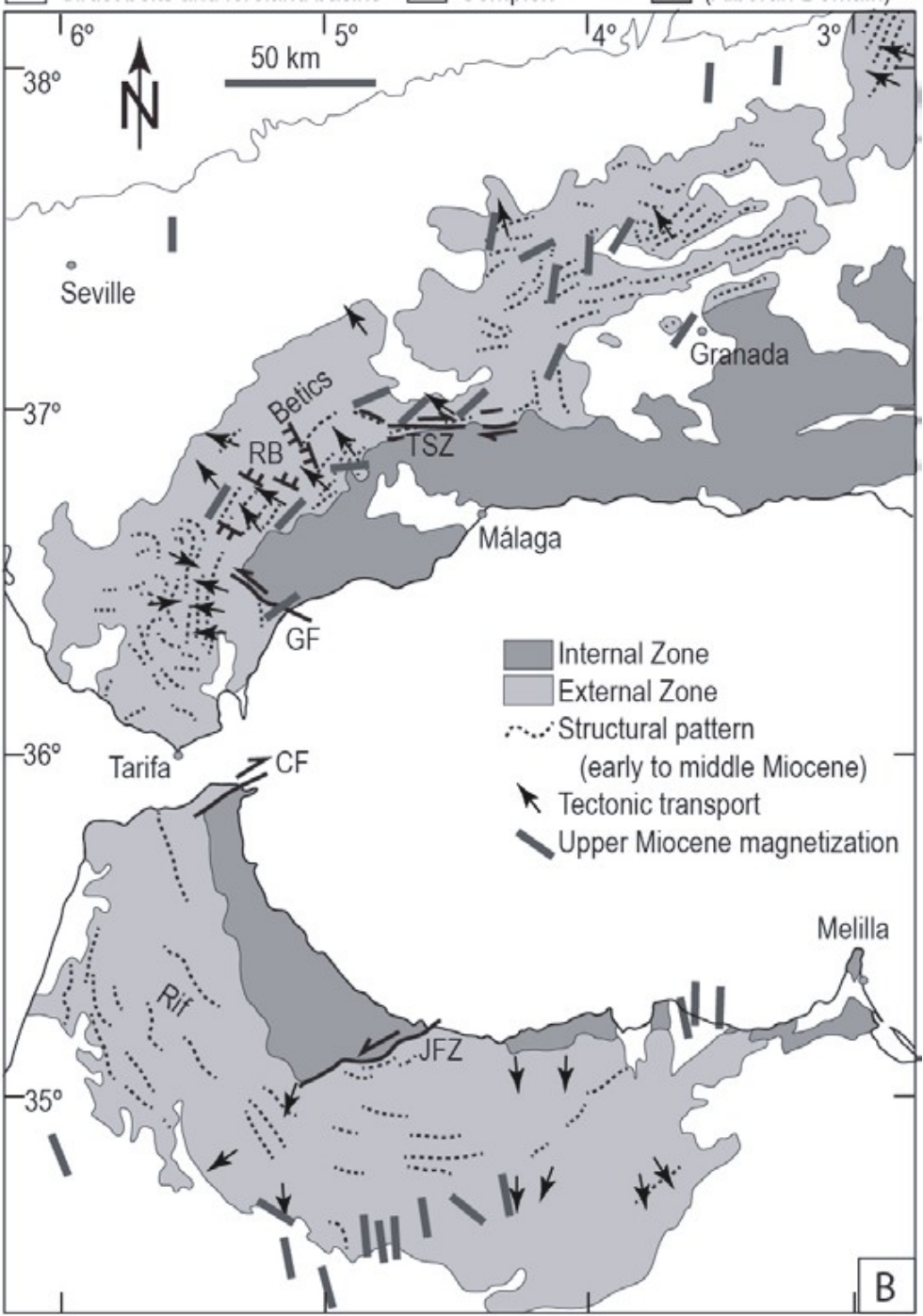


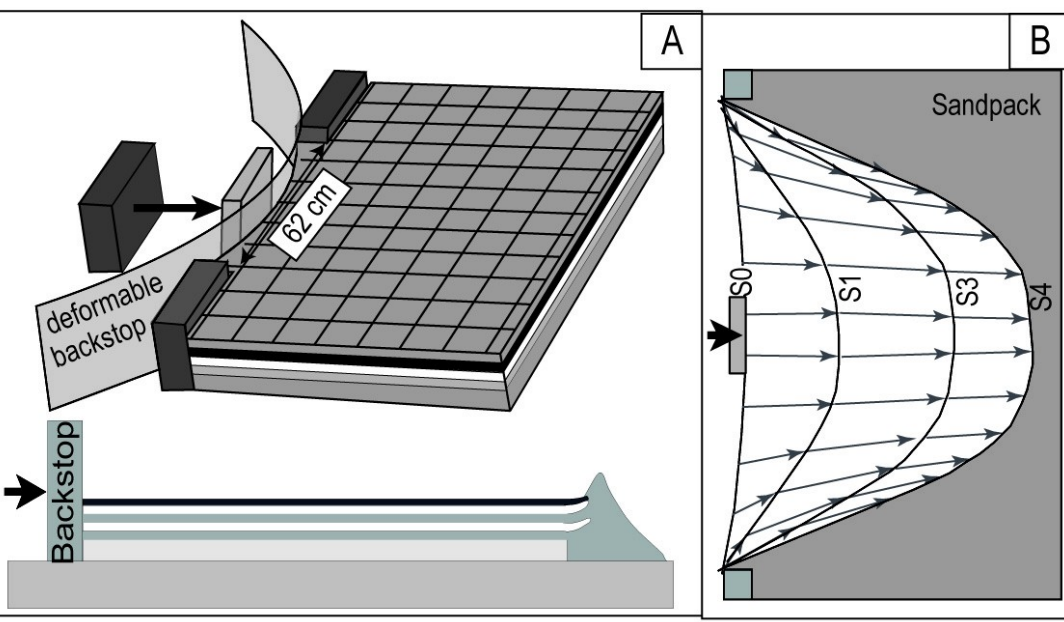
1. INTRODUCTION



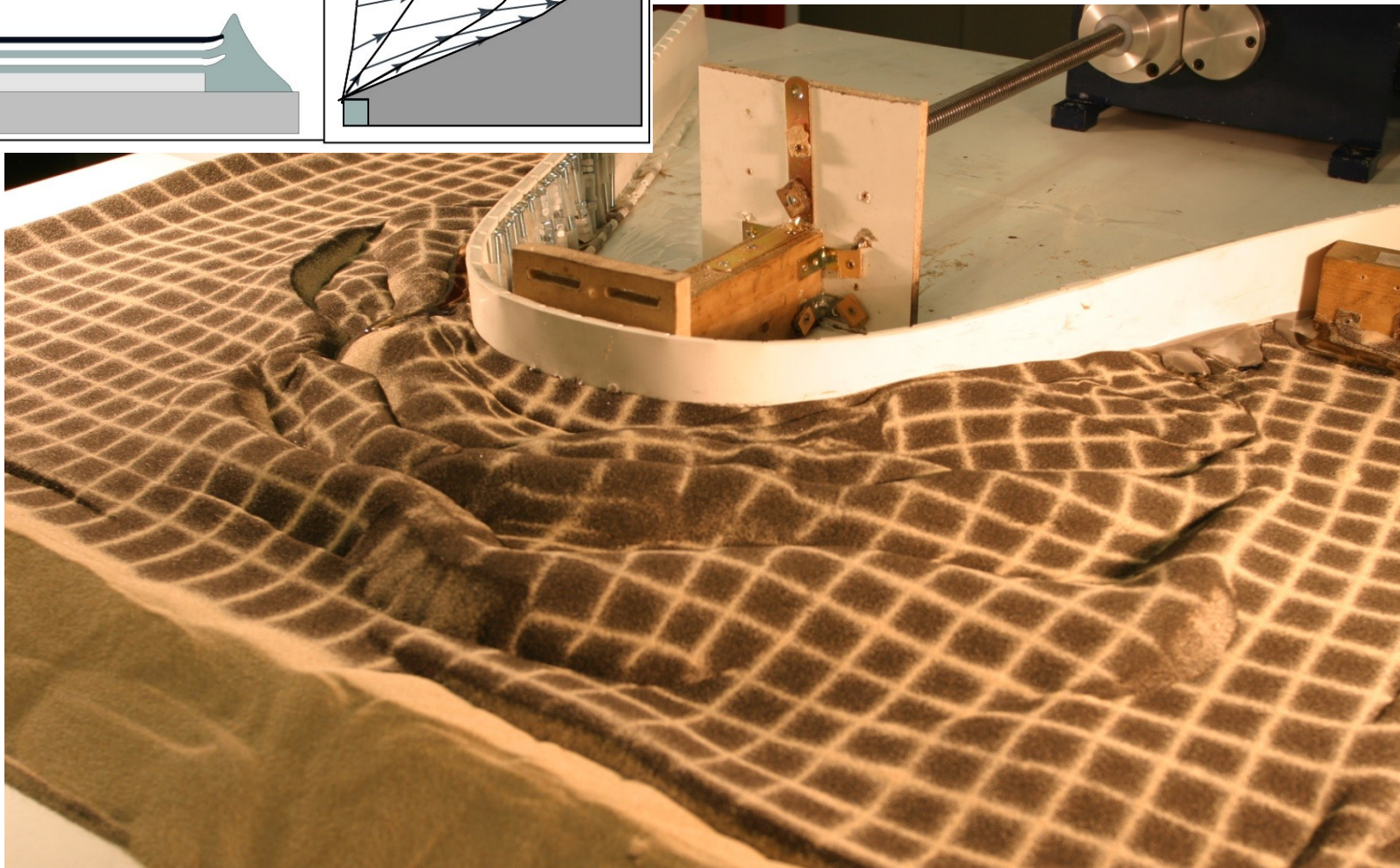
The Gibraltar Arc within the Mediterranean region

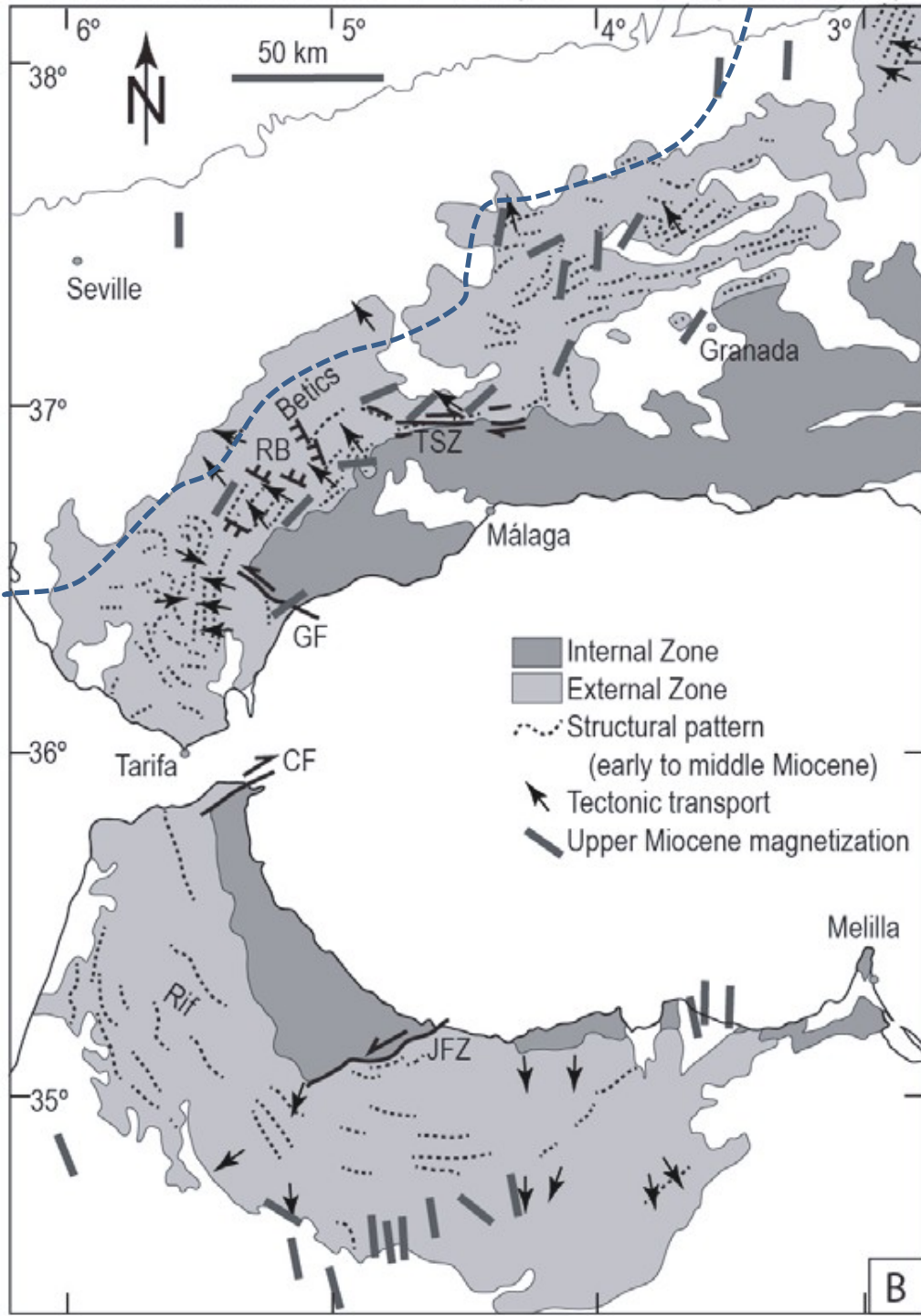
Geological map of the Gibraltar Arc





Previous works:
 Jiménez-Bonilla et al., 2016;
 Crespo-Blanc et al., 2017
 Jiménez-Bonilla et al., 2020





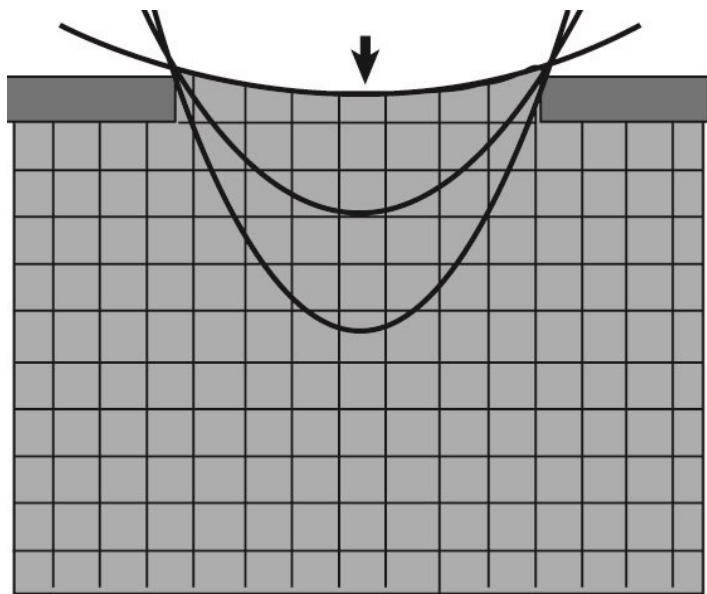
Aims:

Study the effects of the geometry of the ductile layer such as the presence of pinch-outs, ductile layer variations of thickness, diapirs to:

- Characterize the geometry and kinematics of structures
- Examine the influence on the structural style
- Compare with natural cases

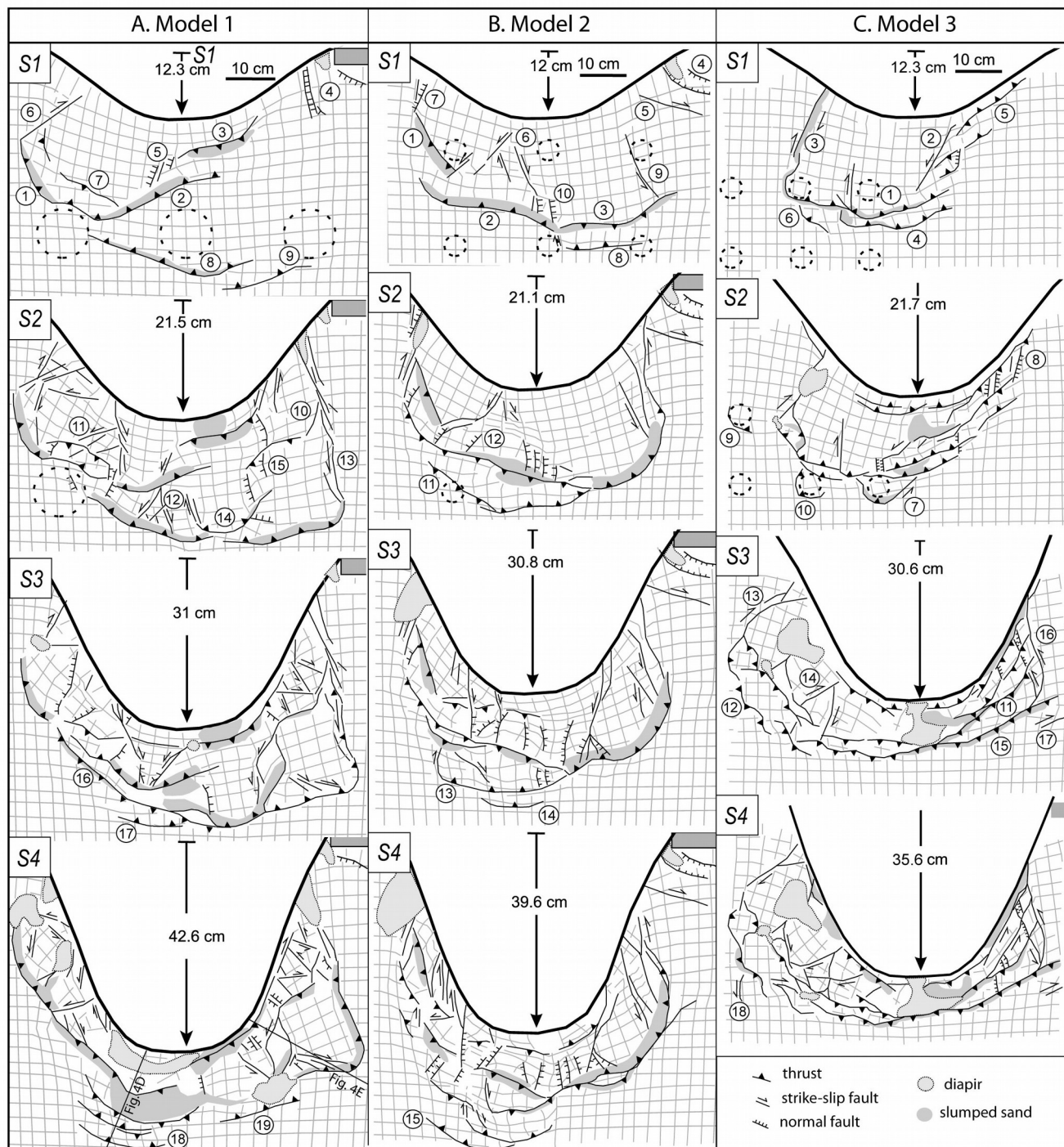
2. MODEL SETUP

PARAMETERS	Nature (N)	Model (M)	Scale factor (N/M)
Length [m]	1×10^3	5×10^{-3}	2×10^5
Density δ_b [kg·m ⁻³]	2400	1770	1.36
Density δ_v [kg·m ⁻³]	2200	980	2.35
Density contrst δ_b/δ_v	1.04	1.81	--
Viscosity η [Pa·s]	1.7×10^{18} to 19	0.5×10^5	3.4×10^{13} to 14
Convergence velocity v [m·s ⁻¹]	2.9×10^{-10} to 7.3×10^{-10} (0.9 to 2.3 cm/year)	2.03×10^{-6} (0.73cm h ⁻¹)	1.43×10^{-4} to 3.59×10^{-4}

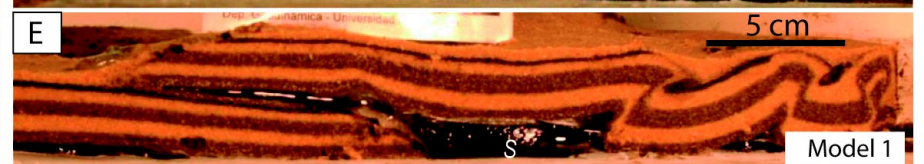
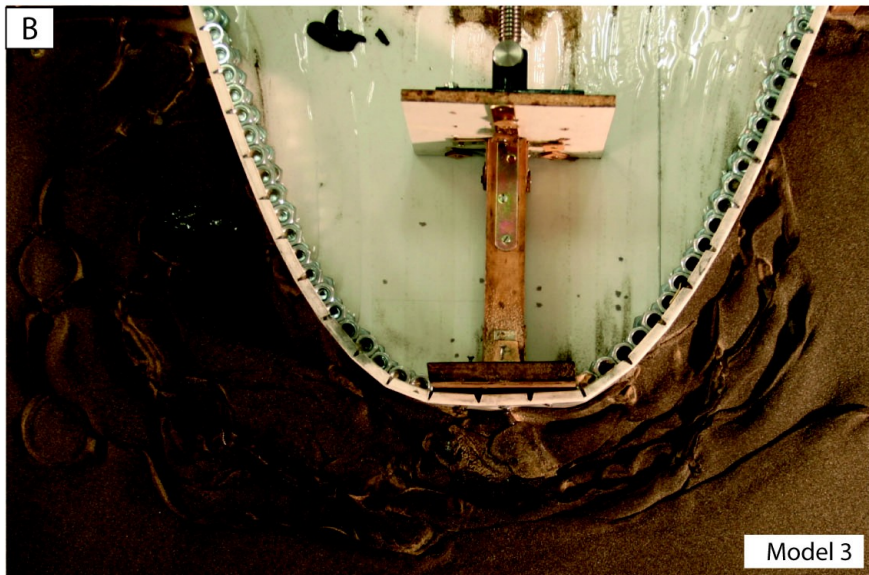


RESULTS:

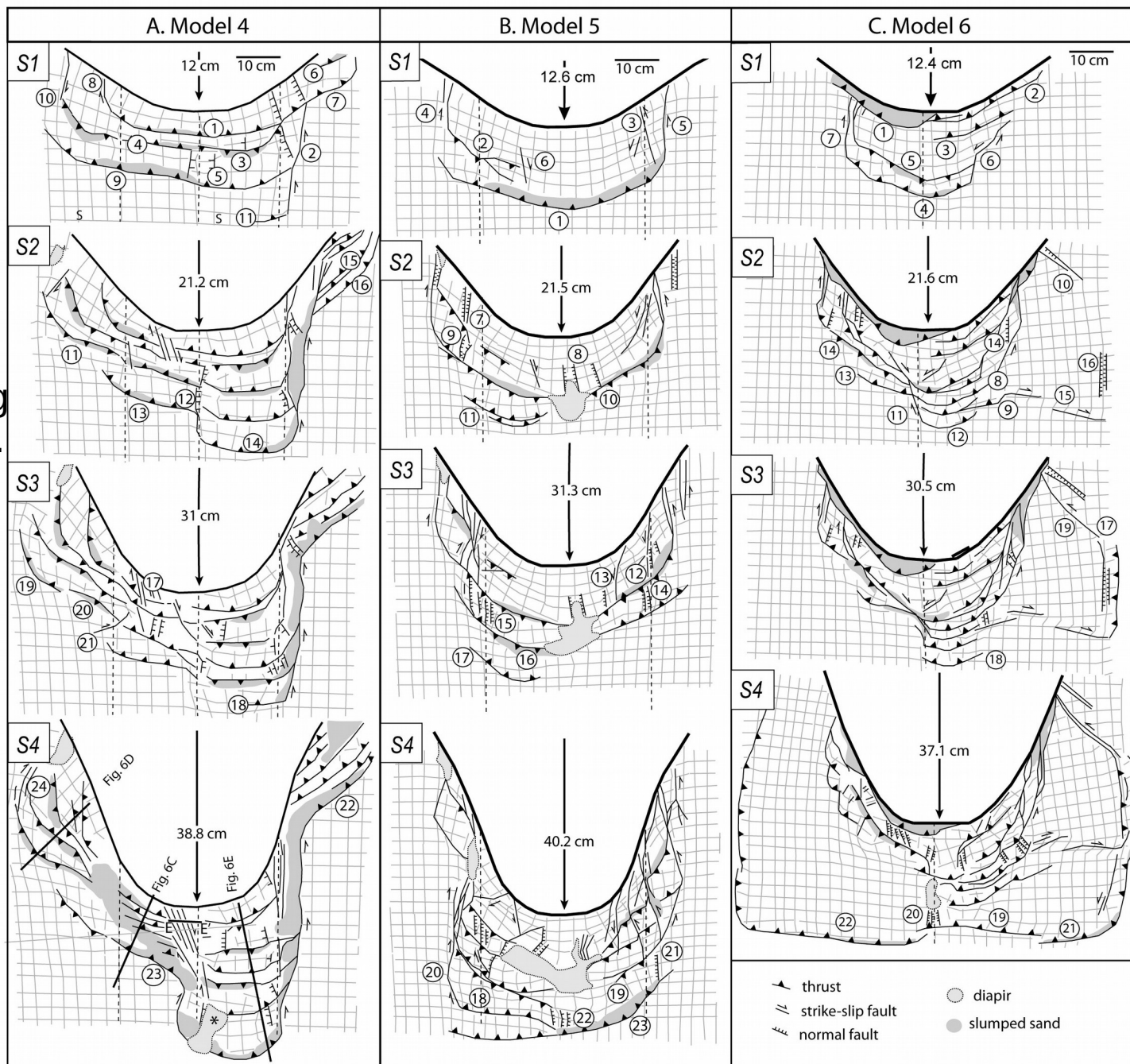
Analogue Models With diapirs

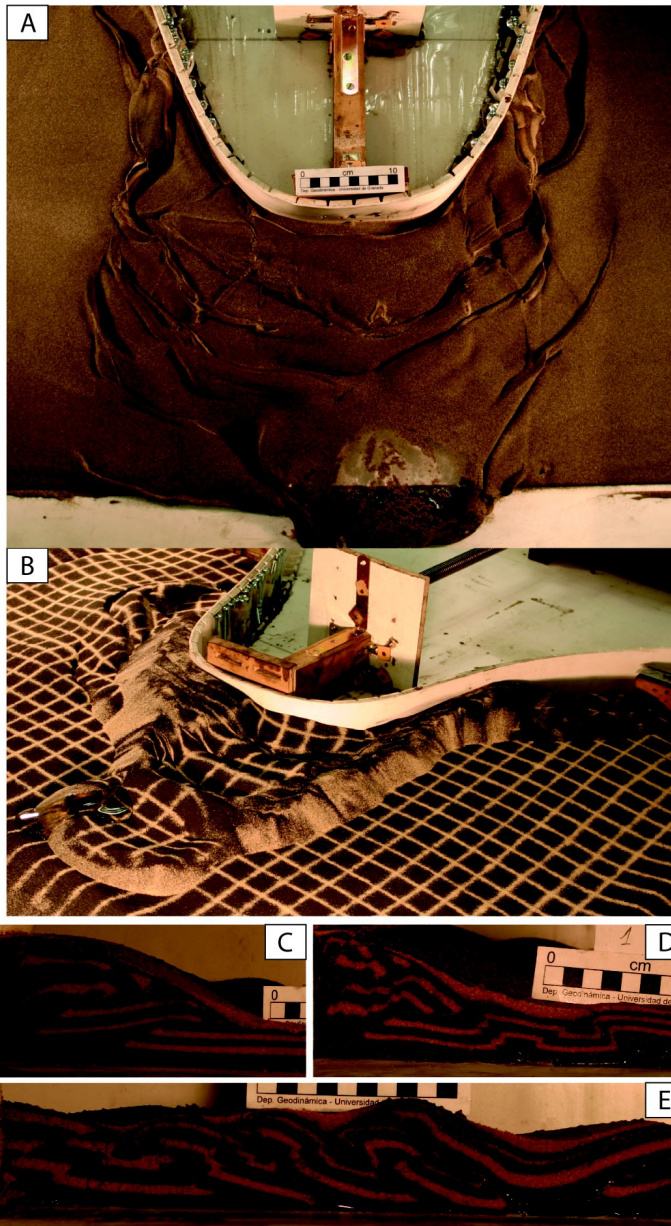


- (a) Picture in plan view of a model with diapirs.
- (b) Silicone topography of a model with diapirs.
- (c) Normal faults generated in models with diapirs.
- (D) Cross-section in the apex part of a model with diapirs.
- (E) Cross-section in the lateral part of a model with diapirs.

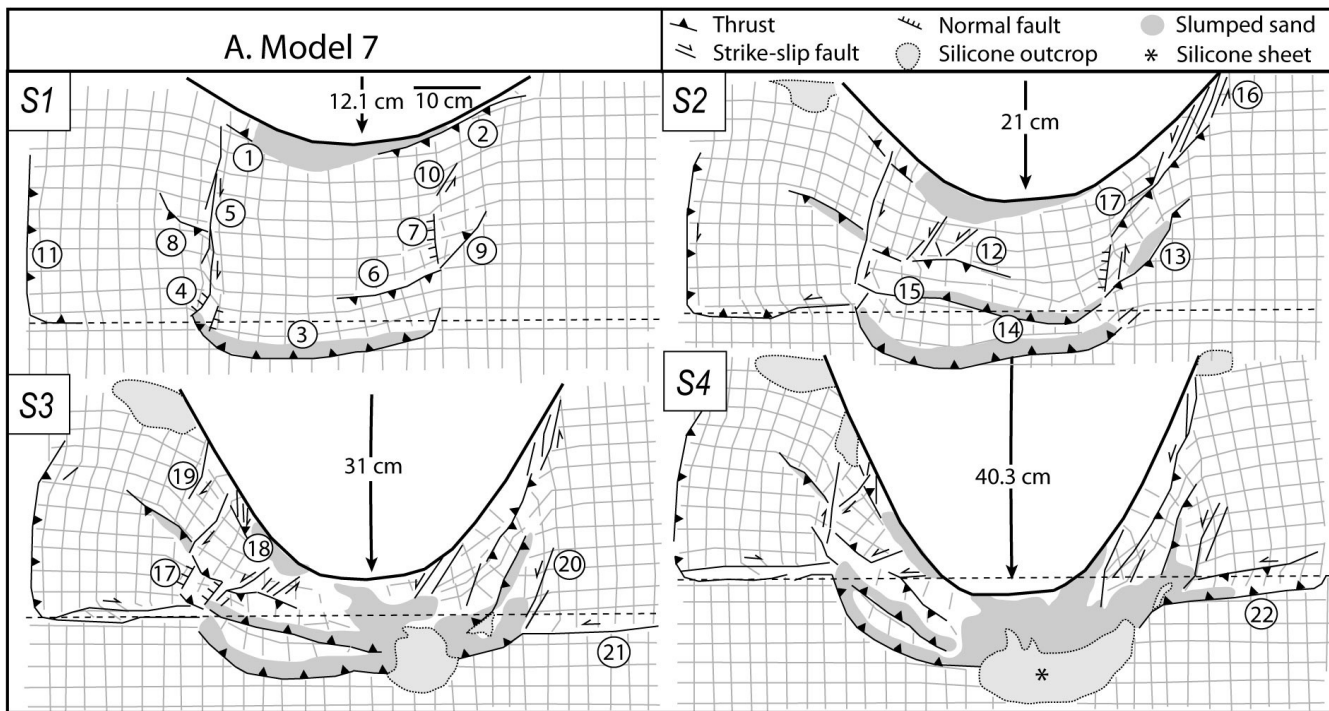


Models with
Variations of
The underlying
Silicone sheet.

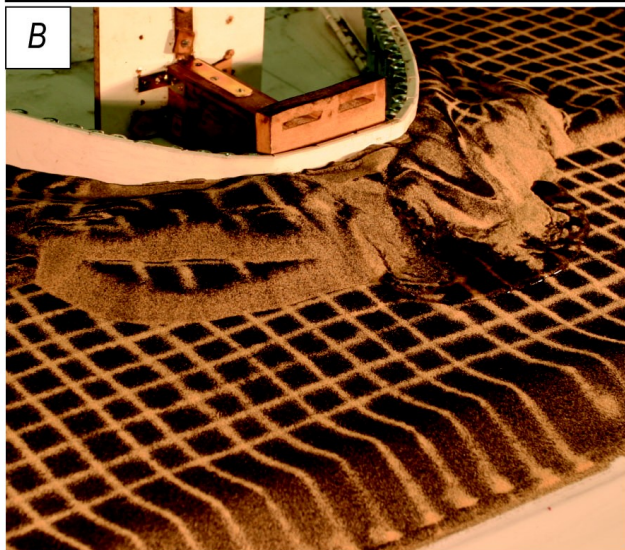


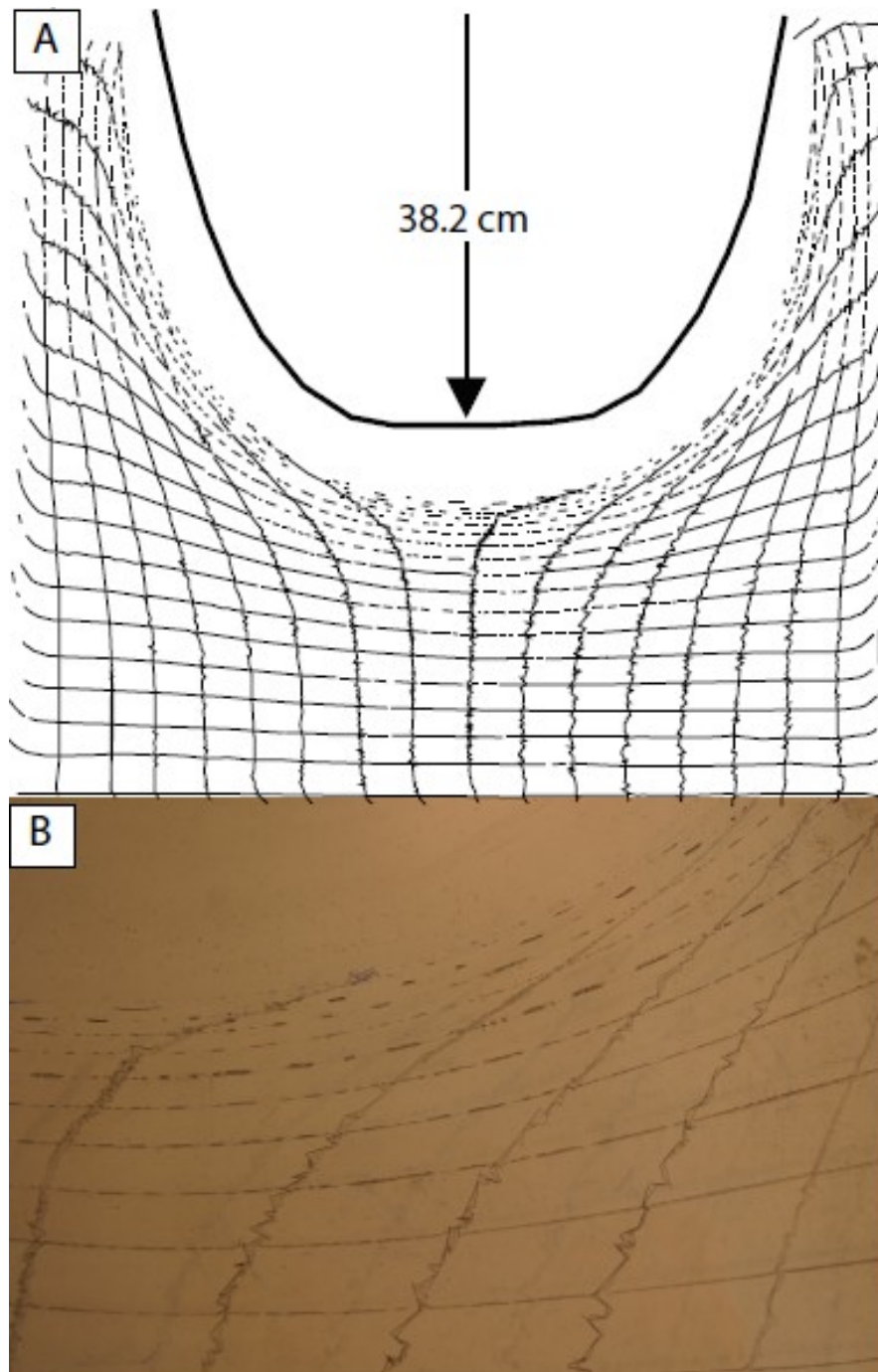


(a) Silicone topography of Model 4.
 (b) Oblique picture of Model 5
 (c) Cross-sections made in Model 5



Model with a silicone pinch-out perpendicular to the apex movement.
 (b) oblique picture and (c) silicone topography.

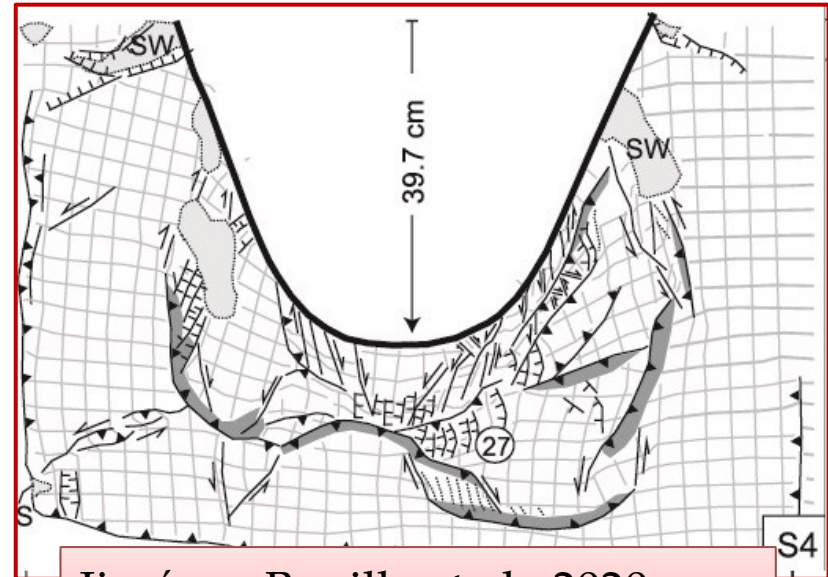
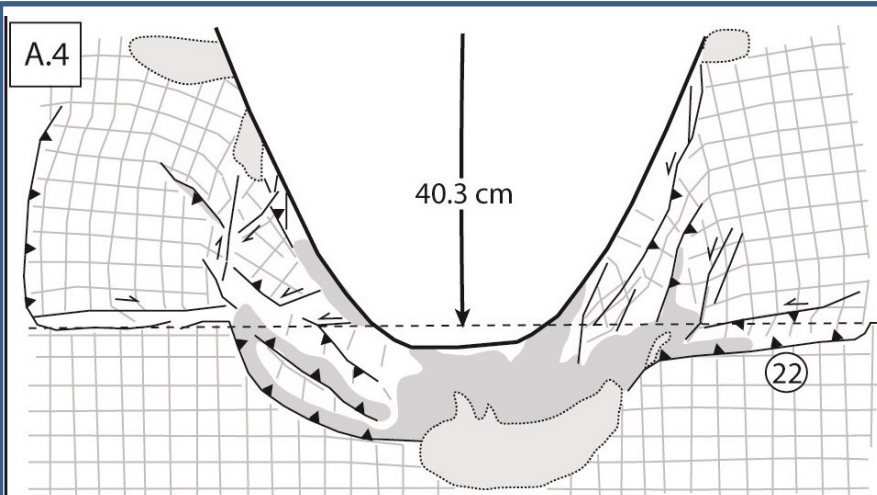




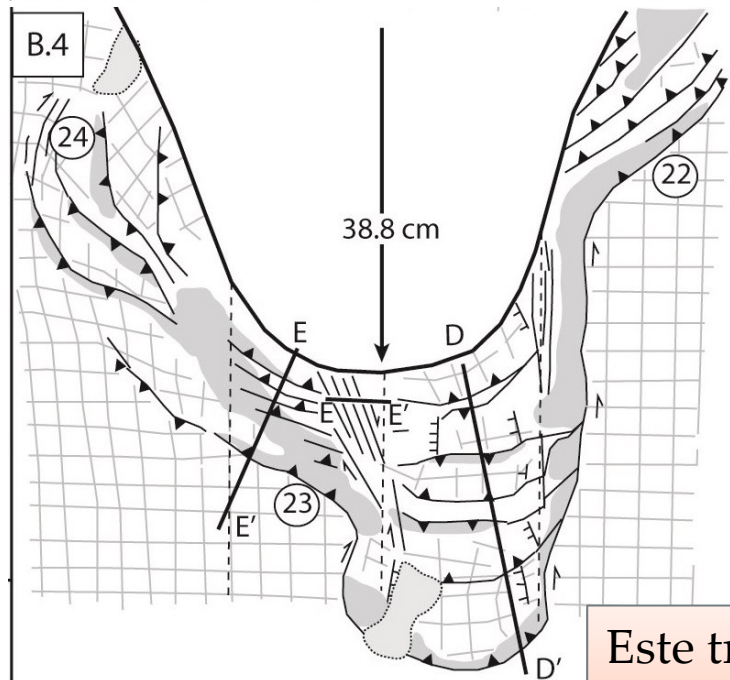
Model made up of
only silicone

4. DISCUSSION

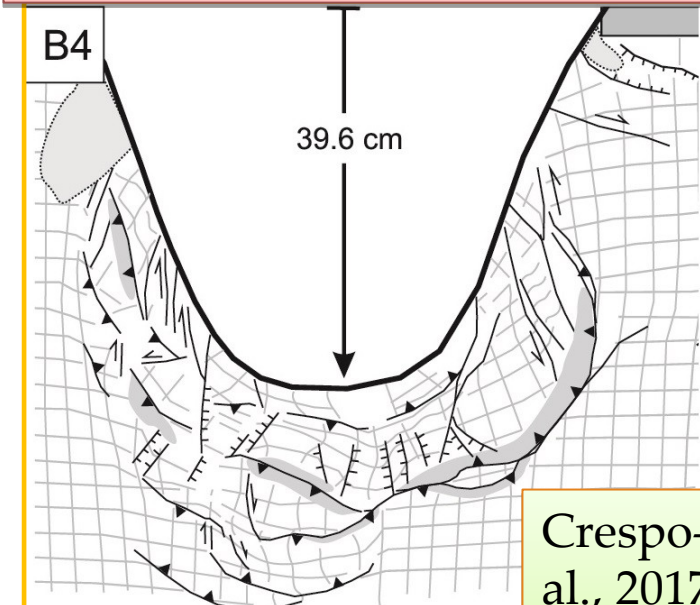
2. Similar Strain partitioning



Jiménez-Bonilla et al., 2020

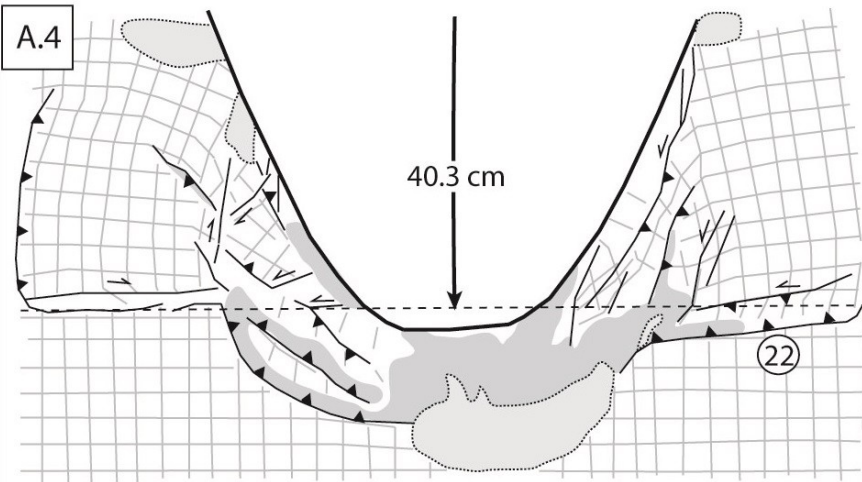


Este trabajo



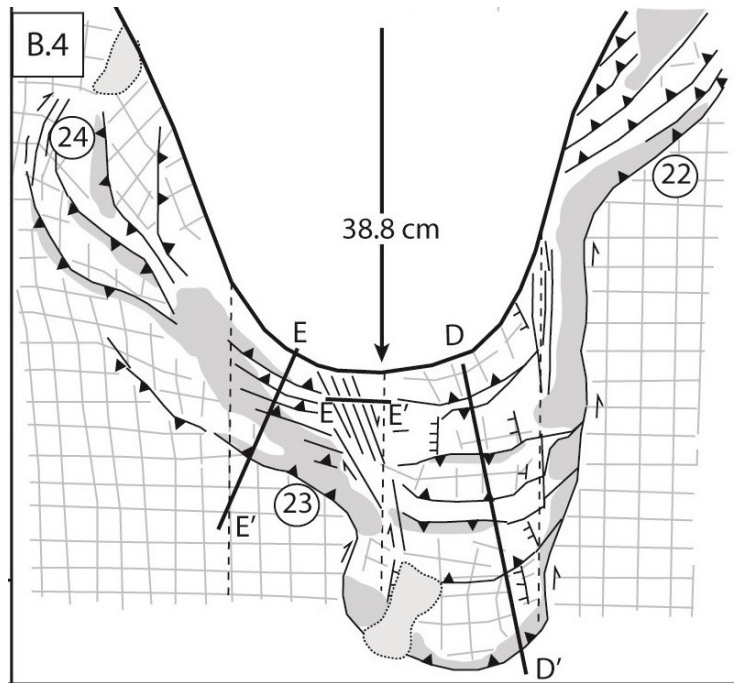
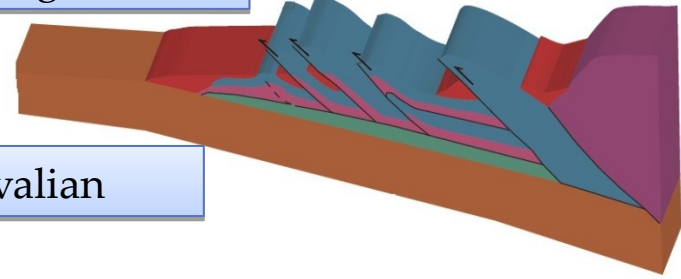
Crespo-Blanc et al., 2017

2. Compare with the natural case: the Gibraltar Arc

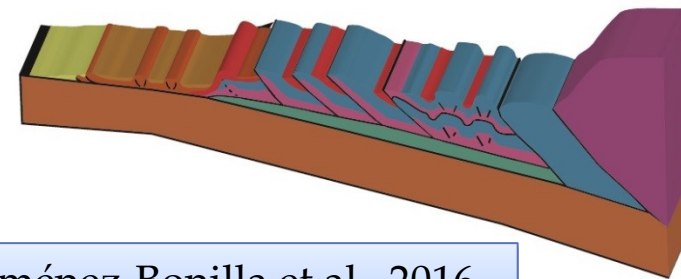
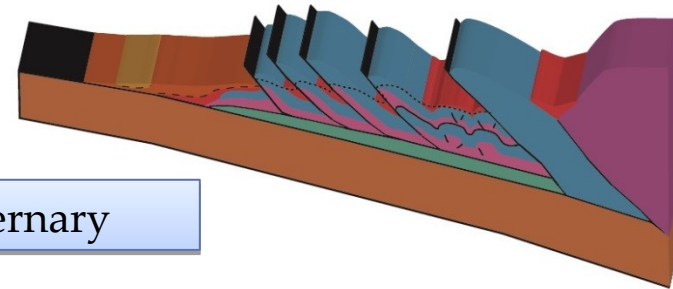


Aquitanian-Burdigalian

Languian-Serravalian



Tortonian-Quaternary



Jiménez-Bonilla et al., 2016



Thank you very much