Supplementary material

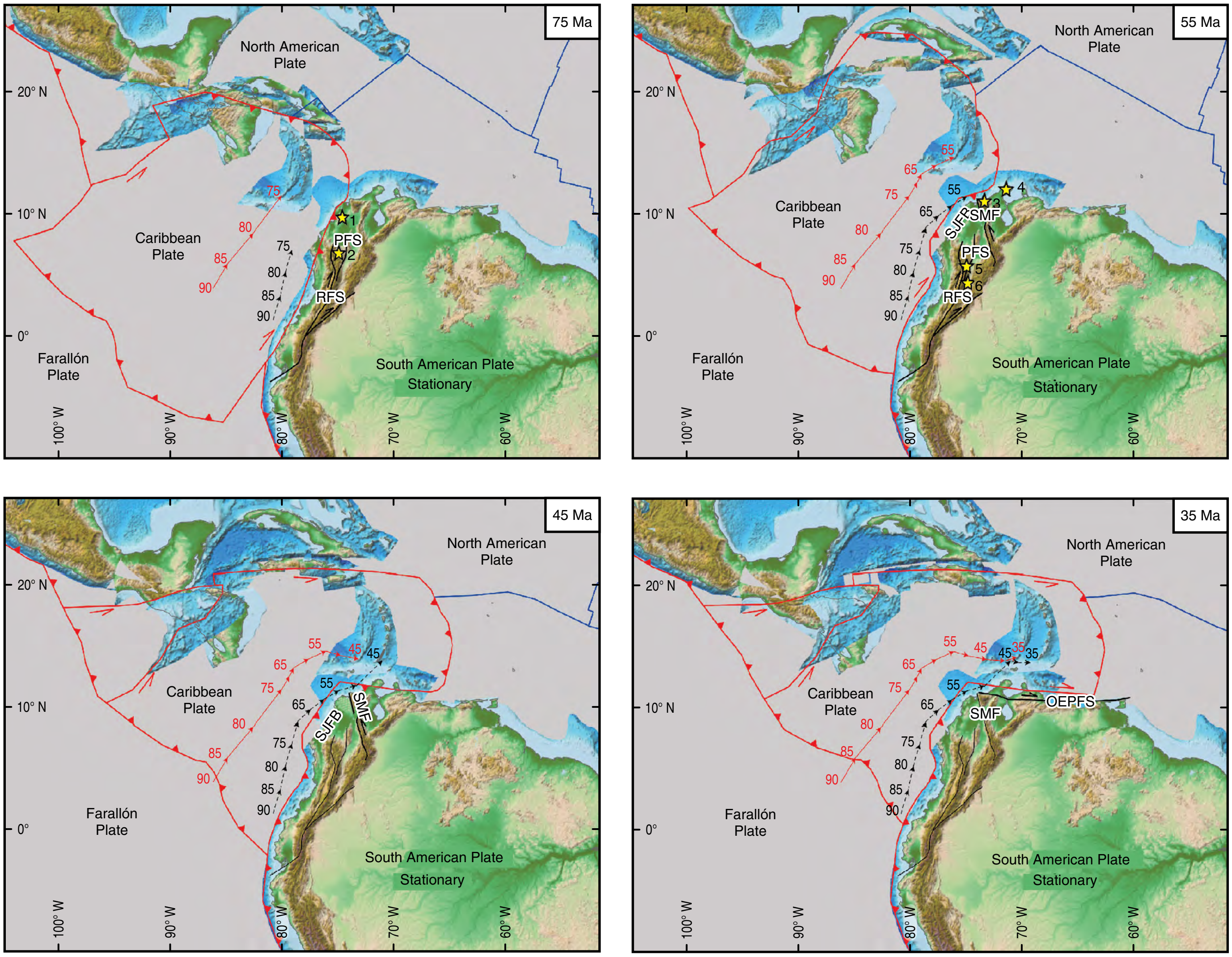
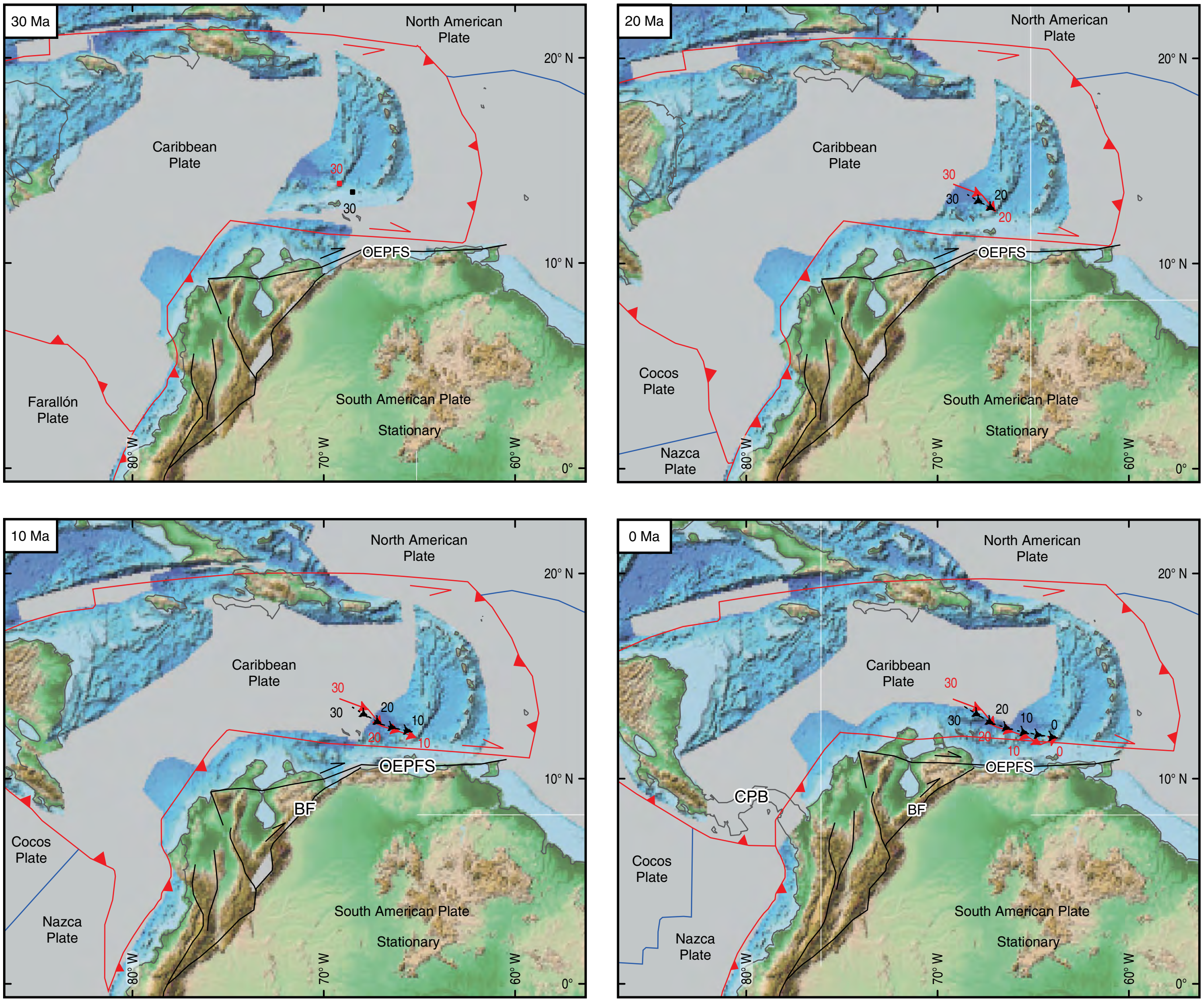


Figure 1. Paleo–tectonic reconstructions at 75, 55, 45, and 35 Ma, illustrating the displacement of the Caribbean Plate relative to fixed South America and the major change in convergence obliquity, which occurred between 55 and 45 Ma. The displacement vectors of the Caribbean Plate relative to South America are shown in red arrows according to the model of Matthews et al. (2016, GPlates database) and in black dashed arrows according to Boschman et al. (2014). The plate boundaries (spreading ridges in blue, subduction and transform zones in red) are from Matthews et al. (2016). The main fault zones of NW South America are labelled and drawn in thick black lines when active. Yellow stars indicate active magmatic arcs in our studied area: 1–Bonga and Cicuco Plutons, 2–Antioquian Batholith, 3–Santa Marta Batholith and related plutons, 4–Parashi Pluton, 5–Sonsón Batholith, 6–El Bosque Batholith. The northwestward motion of allochthonous oceanic terranes (up to ca. 1080 km between 90 and 65 Ma in Boschman et al., 2014), accreted to western Colombia along major suture zones such as the right–lateral RFS in Late Cretaceous to Paleogene times, is not shown here. From Mora et al. (2017b). (PFS) Palestina Fault System; (RFS) Romeral Fault System; (SJFB) San Jacinto fold belt; (SMF) Santa Marta Fault; (OEPFS) Oca–El Pilar Fault System.



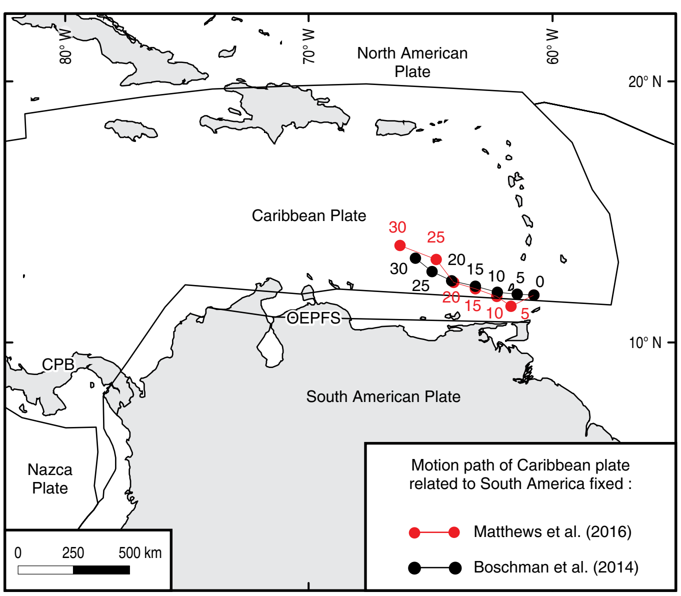


Figure 2. Paleo–tectonic reconstructions at 30, 20, 10, and 0 Ma, illustrating the displacement of the Caribbean Plate relative to fixed South America. The displacement vectors of the Caribbean Plate relative to South America are shown in red arrows according to the model of Matthews et al. (2016, GPlates database) and in black dashed arrows according to Boschman et al. (2014). The plate boundaries (spreading ridges in blue, subduction and transform zones in red) and continent polygons are from Matthews et al. (2016). The main fault zones of NW South America are labelled and drawn in thick black lines when active. This reconstruction incorporates the "escape" of the northern Andes block in both models. The overall displacement of the Caribbean Plate relative to a stationary South American Plate since Oligocene times is relatively stable and does not show major changes neither in convergence velocity nor in obliquity. From Mora et al. (2018). (OEPFS) Oca–El Pilar Fault System; (BF) Boconó Fault; (CPB) Chocó–Panamá Block.

Table 1. Main characteristics of the studied Upper Cretaceous to Eocene tectono–stratigraphic sequences in the San Jacinto fold belt (SJFB).

Sequence	Lithostratigraphic unit	Planktonic foram zones (Berggren et al., 1995; Blow, 1969)	Age	Thickness and other characteristics	Facies and depositional environments
4	San Jacinto	P.15 to P.20	late Eocene to early Oligocene	Highly variable facies and thicknesses, average thickness of 342 m but drilled ca. 1000 m in the Saman stratigraphic well.	Exhibits clastic (San Jacinto) and calcareous (Toluviejo) facies
unconformity		absence of P.14 to P.16	late Eocene		
3	Chengue	P.10 to P.14	middle to late Eocene	Highly variable facies and thicknesses; original syn–depositional fabric comprises ESE–WNW and NNE–SSW–trending extensional faults; onlaps the basement to the ESE; thicknesses range from 150 m in paleohighs to >1000 m in low areas.	Exhibits clastic syn–tectonic deposits (Maco, Pendales), and local with development of carbonates in possible paleohighs (Arroyo de Piedra).
unconformity		absence of P.9 to P.10	early to middle Eocene		
2	San Cayetano	P.3 to P.9	late Paleocene to early Eocene	Original fabric comprises ESE–WNW and NNE–SSW–trending extensional faults; thicknesses of >2000 m in wells in the north and ca. 1600 m in stratigraphic sections.	General fining–upward trend, but notorious lateral facies variations; interpreted depositional environments range from turbidites in the north and south, to fan deltas in the central part of the fold belt.
unconformity		absence of P.0 to P.2	early Paleocene		
1	Cansona		Coniacian to Maastrichtian	Original syn–depositional fabric affected by west–verging deformation of the San Jacinto fold belt; thickness uncertain but would be ca. 762 m in the most complete stratigraphic section (Cacao).	Shows a general coarsening and shallowing–upward pattern, deep marine environments interpreted; seismic expression is not clear, though locally presents high amplitude, parallel and continuous reflectors.

Source: From Mora et al. (2017b).

Table 2. Main characteristics of the studied Oligocene to Quaternary tectono–stratigraphic sequences in the Lower Magdalena Valley (LMV).

Sequence	Lithostratigraphic and operational names	Planktonic foram zones (Berggren et al., 1995; Blow, 1969)	Age	Structural and thickness maps	Description	Kinematics	Subsidence and sedimentation in LMV
10	Corpa (Sincelejo,Betulia, Popa)	PL3 to PL6?	late Pliocene to early Pleistocene	Two main packages preserved in the southern LMV, the lower one is a SSW–NNE–trending elliptic depocenter and the upper one is a round depocenter on top of the San Jorge graben; total thickness close to 3 km.	In the southern LMV, corresponds to fluvio–deltaic, low–angle clinoforms prograding from S to N (paleo–Cauca deposits); in the NW SJFB, carbonates are preserved (Popa Formation).	After Corpa deposition, NNW–SSE and SW–NE–trending extensional faults in Plato are inverted and older units are intensely eroded; onlap of the upper Corpa to the W indicates onset of recent uplift of the San Jacinto fold belt (ca. 1.7 Ma?).	Non–fault related subsidence, much higher subsidence in San Jorge; high sedimentation rates (ca. 500 m/my); uplift and inversion in Plato.
unconformity			middle Pliocene				
9	Tubará (Cerrito, Zambrano)	N.17 (M.14) to PL2	late Miocene to early Pliocene	Overfilled the Plato depocenter and was highly eroded, first in the south and later in the north, where preserved thicknesses are >2 km (Plato).	Sigmoidal, shelf margin clinoforms represent increased progradation to the NNW, of continental to shallow marine deposits of the proto–Magdalena River in the north (Plato).	After Tubará deposition, NW–SE and SW–NE–trending extensional faults in San Jorge are inverted and older units are partially eroded.	Non–fault related subsidence, higher in Plato until depocenter is overfilled; low sedimentation rates (<250 m/my, due to partial erosion).
unconformity		absence of N.15 to N.16 (M.8 to M.9)	middle to late Miocene				
7 and 8	Middle–Upper Porquero (Mandatu, Hibacharo, Perdices, Jesús del Monte)	N.12 to N.16 (M.9–M.13)	middle to late Miocene	Highly variable thickness due to variable preservation/erosion	Mostly fine–grained, thick deposits preserved mainly in depocenters.	Less fault control, Algarrobo strike–slip fault and El Difícil fault active; local paleo–highs in San Jacinto (NW–SE contraction).	Subsidence with minor fault control, higher subsidence in Plato; low sedimentation rates (due to partial erosion).
unconformity		absence of N.11 to N.12 (M.8 to M.9)	middle Miocene				
6	Upper Ciénaga de Oro and Lower Porquero (Alférez)	N.7 to N.11 (M.4–M.8)	early to middle Miocene	More widespread deposition focused also in topographic lows; average thickness is 400–600 m (1200–2000 ft).	Lower thin part is transgressive and onlaps the basement to the SE, while thicker upper part is progradational; low areas were filled with clastic marine deposits while paleohighs were covered by carbonates.	Active WNW–ESE–trending (Mojana, Sucre, Apure South) and SW–NE–trending (Pivijay, Pijiño, El Difícil South) extensional faults.	Fault–controlled subsidence which tends to decrease with time; much higher sedimentation rates (60 to >300 m/my).

Table 2. Main characteristics of the studied Oligocene to Quaternary tectono–stratigraphic sequences in the Lower Magdalena Valley (LMV). (*Continued*)

Sequence	Lithostratigraphic and operational names	Planktonic foram zones (Berggren et al., 1995; Blow, 1969)	Age	Structural and thickness maps	Description	Kinematics	Subsidence and sedimentation in LMV
unconformity		absence of N.4 to N.6 (M.1 to M.3)	early Miocene				
5	Lower Ciénaga de Oro (Carmen)	P.20 to N.6 (M.3)	early Oligocene to early Miocene	Gradually filled paleo–topographic basement lows from WNW to ESE; found at >3.5 km in San Jorge graben and at >5 km in Plato; thickest in the W towards the SJFB where >1.5 km are preserved in local depocenters.	Lower part shows an onlap pattern to the SE; interpreted as a retrogradational, transgressive package with a fining and deepening upwards pattern; transition from basal sandy, shallow marine facies to muddy, deeper marine facies. Upper muddy part has been mostly eroded .	Active WNW–ESE–trending (Mojana, Sucre, Apure South) and SW–NE–trending (Pivijay, Pijiño, El Difícil South) extensional faults.	Fault–controlled subsidence, low sedimentation rates (<60 m/my) but would be higher due to erosion of upper part of the sequence.

Source: From Mora et al. (2018).