THE HISTORY OF SEISMIC AND ASEISMIC SLIP AT THE CENTRAL ECUADOR SUBDUCTION ZONE

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Wegener, 19th General Assembly, September 11 2018, Grenoble, France
THE SEISMIC SEQUENCE
AT THE ECUADOR-COLOMBIA SUBDUCTION ZONE SINCE 1906


All large earthquakes of the sequence have been recorded by seismometers

Nocquet et al., (2017). See also Chlieh et al. (2014) and Gombert et al. (2018) for alternative interseismic coupling models
THE PEDERNALES APRIL 16 2016 ECUADOR EARTHQUAKE (Mw 7.8)

Beauval et al.,
BSSA, 2017
NEAR FIELD HIGH RATE GPS & ACCELETOGRAMS
present-day kinematics of the Mediterranean: a comprehensive overview of GPS results

**Coseismic Static Displacement from GPS & InSAR**

**A**
ALOS-2 descending (wrapped) interferogram
L-band (24.55 cm)
2016/04/01-2016/04/29

**B**
Sentinel-1 descending tracks (unwrapped) interferogram
C-banded (5.55 cm) 2016/04/12-2016/04/24
NEAR FIELD HIGH RATE GPS & ACCELEROMETERS (FILTERED)

Nocquet et al., Nat. Geosc., 2017
Pedernales 2016 April 16 Mw 7.8 earthquake

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slip m
Present-day kinematics of the Mediterranean: a comprehensive overview of GPS results

SLIP DISTRIBUTION & INTERSEISMIC COUPLING
Present-day kinematics of the Mediterranean: a comprehensive overview of GPS results.

POST-EARTQUAKE GPS TIME SERIES

Mw 7.8 mainshock

Mw 6.3 aftershock

Mw 6.7 & 6.9 aftershocks
Present-day kinematics of the Mediterranean: a comprehensive overview of GPS results

POST-EARTHQUAKE GPS TIME SERIES
TIME DEPENDENT SLIP INVERSION OVER 30 DAYS

Aseismic slip (mm)

-2°
-1°
0°
1°

50 mm

day1

-82° -81° -80° -79°
Onset of a Slow Slip Event
**EARLY AFTERSLIP & AFTERSHOCKS**

Seismic/aseismic budget for 1 month:

Total postseismic moment Mw 7.4

30% of the co-seismic moment released

Seismicity accounts for ~10 % of the postseismic deformation

Spatial and temporal correlation  aftershocks/aseismic slip

Aftershocks primarily driven by afterslip

Rolandone et al., Sci. Advances, 2018
TWO UNUSUAL CHARACTERISTICS OF AFTERSLIP AFTER THE PEDERNALES EARTHQUAKE

Pisco Mw 8.0 EQ (Perfettini et al. 2010)
Maule Mw 8.8 EQ (Lin et al., 2013)

Rolandone et al., Sci. Advances, 2018
SSE north of the Pedernales rupture

Slip kinematic inversion every 3 days and micro-seismicity

November 2013 – January 2014

Vaca et al., Tectonophysics, 2018
Global geodetic moment: $M_w \sim 6.3$
SEISMIC SWARMS AND REPEATING EARTHQUAKES AT THE SOUTHERN SHALLOW PATCH

Rolandone et al., Sci. Advances, 2018
A DEEP SSE

SSEs, seismic swarms & repeating earthquakes

Rolandone et al., Sci. Advances, 2018
SSE & (early) afterslip likely obey the same friction law

Spatial & temporal organization of slip modes
Although some of patches appear to be locked during a few years, some of them release stress aseismically while others are seismic

The Ecuador case suggests:
A better anticipation for the location of future large ruptures can be gained by documenting precisely and jointly Interseismic locking and episodic transient slips

Rolandone et al., Sci. Advances, 2018