Supplementary Table S1 : Principal characteristics of the earthquakes analyzed and of their causative faults

EARTH-QUAKE name, date, location	Mw	Maximum coseismic surface slip (m)	Surface rupture length (km)	References	Causative Fault	Slip mode	Age of initiation (Ma)	Maxi-mum cumula-tive slip (km)	Length (km)	Slip rate (mm/yr)	Overall maturity	Number of major segments (from literature)	Docu-mented direction of long-term propa-gation	Evidence of propagation (from literature ; in addition to splay networks)	References for propagation evidences
Bogd 1957, Mongolia	8.1	~7	~243	Kurushin et al., 1997 ; Choi et al., 2012	Bogd fault (Gobi Altaï)	SS LL and RE	2-8	?	~430	LT : ~1 C : ~1.2	Interm.	3 (Choi et al., 2012)	East	Secondary thrusts developed at parent fault tip become younger toward the east; degree of connection of fault segments decreases towards the east	Bayasgalan et al., 1999a-b ; Choi et al., 2012
Borah Peak 1983, Idaho (USA)	7.3	~2.7	~34	Crone and Machette 1984 ; Crone et al., 1987	Thousand Springs-Warm Springs fault	N	2-5	~3	~34	LT : ~0.3 C : ~1	Immature	2 (Crone and Haller 1991)	North	Decrease from south to north of cumulative slip, current slip rate, and mountain range elevation	Anders and Schlische, 1994; Densmore et al., 2005; Payne et al., 2008
Borrego Mountain 1968, Californi a (USA)	6.4	~0.4	~33	Clark, 1972	San Jacinto fault (including Coyote Creek and Superstitio n Hills sections)	SS RL	~5	~25	~260	LT : 4-15 C : 12-25	Interm.	3 (Marliyani et al., 2013)	Southeast	Northernmost segments are fully connected in contrast to segments further south; stratigraphic evidence of younger fault displacement in the south.	Lutz et al., 2006 ; Dorsey et al., 2012; Marliyani et al., 2013
ChiChi 1999, Taïwan	7.6	10-11	~90	Chen et al., 2001 ; Dominguez et al., 2003	Chelungpu fault	RE and SS LL	< 1 (Suppe, 1980; Lee et al. 2001)	10-15 (Suppe, 1980; Lee et al. 2001)	~90	LT : 10.5-16 C : 2-10	Interm.	3 (Simoes et al., 2014)	South	Decrease of Quaternary slip rate from nor-thern fault part to southern fault tip; southward propagation of foreland subsidence	Simoes and Avouac, 2006 ; Simoes et al., 2014

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Denali 2002, Alaska (USA)	7.8	~8.9	~300	Haeussler et al., 2004	Denali fault	SS RL	55-70	~400	~2300	LT : 7-12 C : ~10	Mature	?	West and east	Progressive decrease of cumulative offset and slip rate from fault center to western and eastern fault tips	Plafker and Berg, 1994; Lowey, 1998; Matmon et al., 2006; Mériaux et al., 2009
Dixie Valley 1954, Nevada (USA)	6.7	~3.3	~46	Caskey et al., 1996	Dixie Valley fault	N	?	~5	~55	LT : ~0.5 C : ?	Immature	2 (Zhang et al., 1999)	North and south	Progressive de-crease of cumu-lative slip from fault center towards nor-thern and sou-thern fault tips	Wallace and Whitney, 1984
El Asnam 1980, Algeria	7.1	~5 (vertical displaceme nt)	~25	Yielding et al., 1981 ; Philip and Meghraoui, 1983	Oued Fossa fault (splay of the Cheliff fault)	RE (and SS LL)	2-5 (Guiraud 1977 ; Philip and Thomas 1977)	?	~25	LT : ? C : ?	Immature	3 (King and Yielding, 1984)	South-west	Growing folds and geomor-phological evidence of younger fault displacements in southwest	Avouac et al., 1992 ; Boudiaf et al., 1998
El Mayor Cucapah 2010, Baja Californi a (Mexico)	7.2	3.5-4	~120	Fletcher, 2010 ; Teran et al., 2011 ; Wei et al., 2011	Elsinore fault	SS RL	5-10	~15	~400	LT : 3-6 C : ~3	Interm.	?	Southeast	Younger stratigraphic faulted levels in the south; more juvenile secondary faults in the south; decrease of cumulative offset and slip rate from north to south	Weber 1977 ; Morton and Miller, 1987 ; Hull and Nicholson, 1992 ; Dorsey et al., 2012 and references therein
Erzincan 1939, Turkey	7.8	~7.5	~335	Barka 1996	North Anatolian fault	SS RL	11-13	> 85	~1400	LT : ~18 C : ~22	Mature	5 (Barka and Kadinsky-Cade 1988 ; Barka et al., 2002)	West	Dated offsets become younger westwards	Armijo et al., 1996, 1999; Schindler et al., 1998; Hubert-Ferrari et al 2002, 2003; Sengör, 1979, Sengör et al., 2005; Bohnhoff et al., 2016

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Fairview Peak 1954, Nevada (USA)	7.2	~5.2	~46	Caskey et al., 1996	Faiview Peak fault	N (and SS RL)	?	?	~46	LT : ~0.2 C : 2	Immature	3 (Zhang et al., 1999)	North	- Architecture of tip splay networks - ongoing connection with Dixie Valley fault	This study along with mapping from USGS website
Fort Tejon 1857, California (USA)	7.9	6-9	~330	Sieh, 1978 ; Zielke et al., 2012	San Andreas fault	SS RL	24-29	~600	~1300	LT : 20-35 C : 4-25 (depending on location along fault)	Mature	4 (Aviles et al., 1987)	South (see text and Doc. S1 for details on complex history of Northern San Andreas)	- Initiation in northern part around 24-29 Ma, and lengthening towards the south from ~12 Ma, with development of San Jacinto and Elsinore splays in last ~5 Ma; - Maximum cumulative slip of ~600 km in northern part, decreasing down to ~300 km in southern part; - Fault trace becomes more segmented from north to south; - splay fault network widens and intensifies southwards; - Durmid southernmost fault segment formed ~30 ka ago	Nicholson et al., 1994; Atwater and Stock, 1998; Liu et al., 2010 Suppe, 1970; Crowell, 1979; Aviles et al., 1987 Aviles et al., 1987; Ando et al., 2009 Bilham and Williams, 1985
Fuyun 1931, China	7.9	9-14.8	~165	Lin and Lin 1998 ; Jianbang et al., 1984 ; Klinger et al., 2011	Fuyun fault	SS RL	2-8 (Vassallo et al., 2007)	~20 (Etchebes 2011)	~450	LT : ? C << 5	Interm.	?	North (recent) South (over the long-term)	- Long-term : architecture of tip splay network, well developped along the fault and widening southward	This study along with mapping from Tapponnier and Molnar 1979

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														- Recent : the perpendicular Barkol Tagh range in the south has obviously stopped the southward propagation; Subtle tip splay faults in the north.	
Hebgen Lake 1959, Montana (USA)	7.5	~5.5	~25	Witkind et al., 1962; Myers and Hamilton, 1964; Witkind, 1964; Zhang et al., 1999	Hebgen fault	N	0.6-2 (Scott et al., 1985; Christian sen, 1986)	?	~45	LT : 0.8-2.5 (Doser et al., 1985) C : ?	Immature	?	East	Architecture of tip splay network	This study along with mapping from USGS website
Hector Mine 1999, Californi a (USA)	7.1	~6.4	~50	Jonsson et al., 2002	Lavic lake-Pisgah-Bullion-Mesquite fault	SS RL	<10	6-14 to 20	~90	LT : ~1 C : 2 ?	Immature	3 (Treiman et al., 2002)	North	Cumulative slip is maximum in southern half of the fault zone, and decreases northward	Dibblee, 1961; Garfunkel, 1974; Dokka, 1983; Dokka and Travis,,1990a ; Jachens et al., 2002
Imperial Valley 1940, Californi a (USA)	7	~6	~58	Sharp, 1982	Imperial fault	SS RL	~2 ?	?	~60	LT : 15-20 C : 5-9 (shallow creep) to 25-35	Interm. ?	?	Northwes t	- Architecture of tip splay network - Northern section of the Imperial fault is young (3ka).	Larsen and Reilinger, 1991
Imperial Valley 1979, Californi a (USA)	6.5	~0.6	~31	Sharp et al., 1982	Imperial fault	SS RL	~2 ?	?	~60	LT : 15-20 C : : 5-9 (shallow creep) to 25-35	Interm. ?	?	Northwes t	- Architecture of tip splay network - Northern section of the Imperial fault is young (3ka).	Larsen and Reilinger, 1991

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Izmit 1999, Turkey	7.4-7.6	~5	~100	Michel and Avouac, 2002 ; Barka et al., 2002	Northern branch of North Anatolian fault	SS RL	~2-5	Debated between 4-70	~500	LT : ~16 C : ~17	Interm.	?	West	Dated offsets become younger westwards	Barka 1992; Armijo et al., 1999; Hubert-Ferrari et al 2003; Sengör et al., 2005; Bohnhoff et al., 2016
Kunlun 2001, China	7.8	~8.3	~450	Lasserre et al., 2005 ; Klinger et al., 2006 ; Xu et al., 2006	Kunlun fault	SS LL	10-34	85-120	~1500	LT : ~12 C : ~11	Mature	6 (Van der Woerd et al., 2002)	West and East	Largest cumulative offset ~100 km east from fault center; current transfer from Kunlun to Manyi and Altyn Tagh faults; most recent westward lengthening dated at ~3 Ma Progressive decrease of slip rate from fault center to eastern fault tip; abrupt slip rate decrease in easternmost part of fault; Sedimentation onset in splay fault-controlled basins suspected to young eastwards	Gaudemer et al., 1989; Van der Woerd et al., 2002; Jolivet et al., 2003; Fu and Awata, 2007 Meyer et al., 1998; Kirby et al., 2007 Harkins et al., 2010
Landers 1992, California (USA)	7.3	~6.6	~67	Sieh et al., 1993	Emerson-Camp Rock-Johnson Valley-Homestead Valley fault	SS RL	<10	4-4.6	~95	LT : ~0.7 C : 2?	Immature	3 distinct faults (Wald and Heaton 1994)	South	Progressive decrease of cumulative slip from northern fault system part to southern fault tip;	Jachens et al., 2002

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					system									- Emerson fault older than its southern Homestead splay	Zachariasen and Sieh, 1995
Manyi 1997, China	7.5	~7	~165	Peltzer et al., 1999	Manyi fault	SS LL	?	?	~275	LT : ? C : ~5	Interm. ?	?	East and West	- Architecture of tip splay networks	This study along with mapping from Taylor and Yin, 2009 (in Bell et al., 2011)
Mudurnu 1967, Turkey	7.0	~2	~75	Barka, 1996	North Anatolian fault	SS RL	11-13	> 85	~1400	LT : ~18 C : ~22	Mature	5 (Barka and Kadinsky-Cade 1988 Barka et al., 2002)	West	Dated offsets become younger westwards	See ref. in Erzincan case
Muzaffarabad 2005, Kashmir (Pakistan)	7.6	~7 (vertical displacement)	65-70	Avouac et al., 2006 ; Kaneda et al., 2008	Balakot-Bagh fault	RE	<1	~0.12 ?	~90	LT : ~3 C : ~10 ?	Immature ?	2-3 (Kaneda et al., 2008)	Southeast	-Intersection with the MBT prevents propagation to the northwest. -Ongoing connection with the Riassi thrust fault to the southeast	Kaneda et al., 2008 ; Hussain et al, 2009
Pleasant Valley 1915, Nevada (USA)	7	~6	~45 (without China Moutain section ; see Table 2)	Jones 1915 ; Wallace, 1984 ; dePolo et al., 1991 ; Zhang et al., 1999	Pleasant Valley fault	N	?	~2 (Vertical cumulative throw)	~70	LT : ~0.2 C :?	Immature	4 (De Polo et al., 1991 ; Ferrill et al., 1999 ;Zhang et al., 1999)	North and South	-Oldest part of fault is its central Pearce section; -cumulative slip decreases from fault Pearce center down to northern and southern fault tips; -geomorpho-logical evidence of bilateral propagation	Ferrill et al., 1999 Anders and Schlische, 1994 Jackson and Leeder, 1994

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San Francisco 1906, California (USA)	7.7	~8.6	~475	Lawson 1908 ; Thatcher et al., 1997	San Andreas fault	SS RL	24-29	~600	~1300	LT : 20-35 C : 4-25 (depending on location along the fault)	Mature	4 (Aviles et al., 1987)	South (see text and Doc. S1 for details on complex history of Northern San Andreas)	- Initiation in northern part around ~24 Ma, and lengthening towards the south from ~12 Ma, with development of San Jacinto and Elsinore splays in last ~5 Ma; - Maximum cumulative slip of ~600 km in northern part, decreasing down to ~300 km in southern part; - Fault trace becomes more segmented from north to south; - splay fault network widens and intensifies southwards; - Durmid southernmost fault segment formed ~30 ka ago	Nicholson et al., 1994; Atwater and Stock, 1998; Liu et al., 2010 Suppe, 1970; Crowell, 1979; Aviles et al., 1987 Aviles et al., 1987; Ando et al., 2009 Bilham and Williams, 1985
Sichuan 2008, China	7.9	10-12	~280	Liu-Zeng et al., 2009 ; Lin et al., 2009, 2012 ; Zhang et al., 2010	Longmen Shan fault zone	RE (and SS RL)	5-12	~20	~480 (380 for Beichuan fault only)	LT : ~1.5 C : 1-2 LT : ~1 C : ?	Interm.	3 (Jin et al., 2010)	Northeast	Decrease from south to north of total throw.	Zhang et al., 2011; Burchfiel et al., 2008
Superstition Hills 1989, California (USA)	6.6	~0.5	~27	Sharp et al., 1989	San Jacinto fault (including Coyote Creek and Superstitio	SS RL	~5	~25	~260	LT : 4-15 C : 12-25	Interm.	3 (Marliyani et al., 2013)	Southeast	Northernmost segments are fully connected in contrast to segments further south;	Lutz et al., 2006 ; Dorsey et al., 2012; Marliyani et al., 2013

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					n Hills sections)									stratigraphic evidence of younger fault displacement in the south.	
Yushu 2010, China	7.1	1.8-3	~75	Li et al., 2012	Garze-Yushu fault	SS LL	~13	~80	~450	LT : ~12 C : ~20	Interm.	2-3 (Li et al., 2012)	North-west	Western part of fault younger than farther east; westward decrease of cumulative lateral slip	Wang et al., 2008

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