MODELING GPS DATA ALONG THE SOUTHERN SAN ANDREAS FAULT

2012 SCEC San Gorgonio Pass Workshop
Joshua Spinler and Rick Bennett, University of Arizona
Sally McGill, Cal-State San Bernardino
• Modeling GPS data from two regional campaign GPS networks
  • JOIGN - Joshua Tree Integrative GPS Network
    • *See Spinler et al., 2010, JGR, for further information*
    • SBM - San Bernardino Mountains GPS Network
• Current distribution of GPS stations in the San Gorgonio Pass region
• Where do we go from here?
JOIGN GPS VELOCITY FIELD

- Network: 36 Campaign GPS sites and 46 Continuous GPS sites
- JOIGN data collected tri-annually between fall 2005 and fall 2008
- SBM data spans 2002-2008, 2-6 observations at each of the 9 sites, roughly annually
- CGPS data spans 1994-2009.5

From Spinler et al., 2010 JGR
CRUSTAL BLOCK MODELING

- Selection Criteria for Crustal Blocks:
  - Mapped faults
  - Mapped Gravity anomalies
  - Observed Seismicity

Gravity data from Langenheim et al., 2007
PREFERRED FAULT MODEL
FAULT SLIP RATE ESTIMATES

ECSZ: 14-18 ± 0.3
5-8 ± 0.3
6-10 ± 0.4
11-13 ± 0.3
9.4 ± 0.4
16-18 ± 0.3
22-23 ± 0.3

Fault Slip Rate (mm/yr)
SBM GPS VELOCITY FIELD

- 35 total campaign sites with at least 2 observations spanning at least 2 years
- Data spans 1993-2011
  - Most data collected in 2 periods: 2002-2005 (NW transect) and 2008-2011 (SBM and SE transect)
1D FAULT MODELING
SAN BERNARDINO TRANSECT

Models with SAF = 0 to 18 mm/yr make very similar predictions.

McGill, Spinler, Bennett, in progress
• Need more campaign sites to better resolve slip distribution within the San Gorgonio Pass region
  • Mission Creek vs. Banning strands
  • Banning vs. Garnet Hill faults

• Investigate transfer of strain between the San Andreas and San Jacinto faults in the Crafton Hills/San Timoteo Badlands region

• More observations are needed to apply campaign datasets to studies of vertical deformation
Currently only 2 sites between Banning and Mission Creek strands of the San Andreas fault in SGP region
- MOGO has 4 observations between 2008-2011

Four campaign sites located near Garnet Hills/Banning fault zones
- Sites TOM2 and EDOM have multiple observations between 1993-2000
- Site GARN only has observations in 1993
DISCUSSION POINTS

• Need more campaign sites to better resolve slip distribution within the San Gorgonio Pass region
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  • Banning vs. Garnet Hill faults

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• More observations are needed to apply campaign datasets to studies of vertical deformation
Currently have 2+ years of data from sites in the SBM network

- Data primarily spans 2002-2005 and 2008-2011

- Site **0818** has 17 observations between 1993-2000

- Site **CRAF** hasn’t been observed since 1993
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VERTICAL VELOCITY