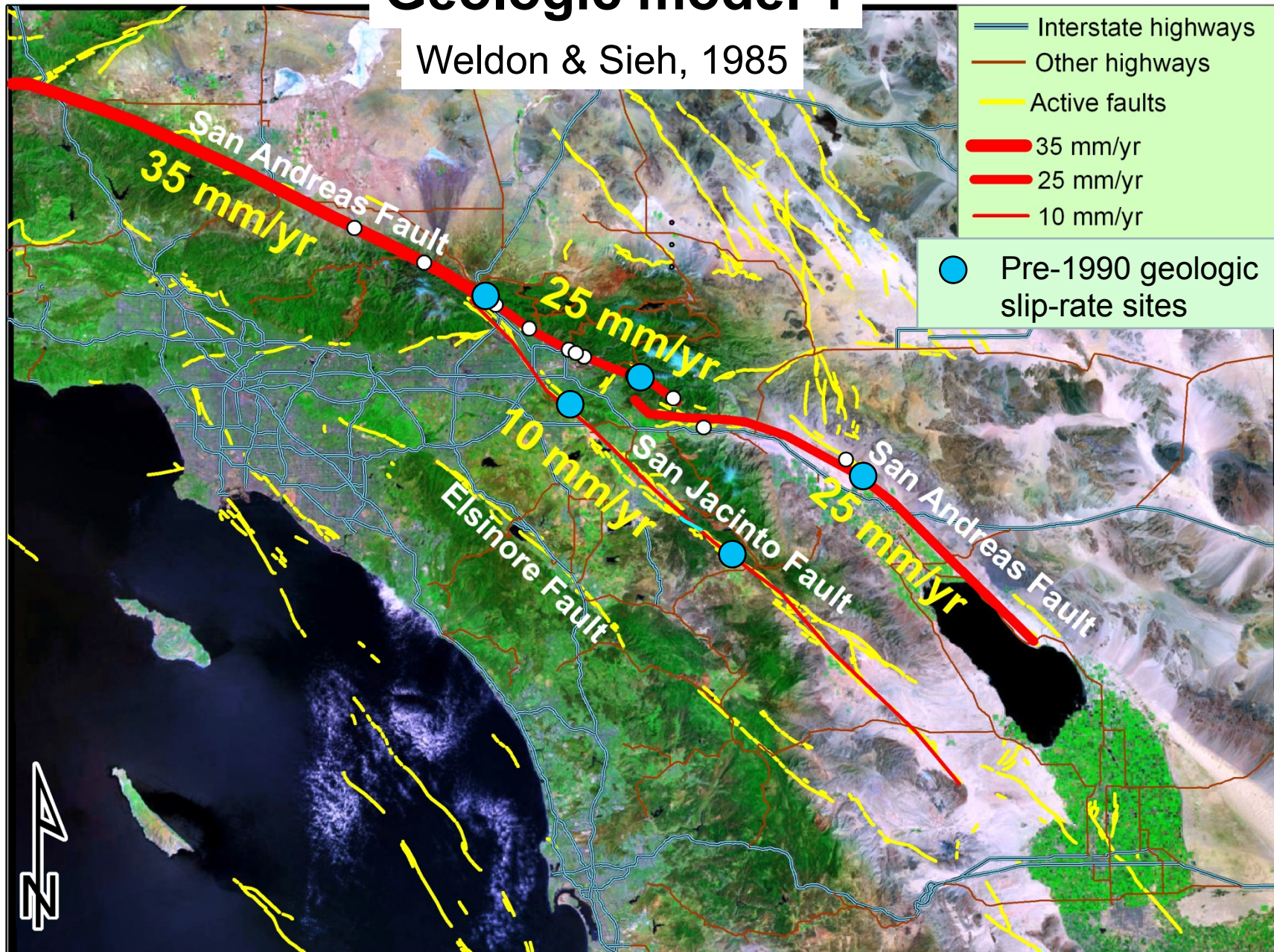


Fault Slip Rates  
Since the Late Pleistocene  
San Geronio Pass and Vicinity

Sally McGill  
CSU San Bernardino

# Geologic model 1

Weldon & Sieh, 1985





## Geologic model 2

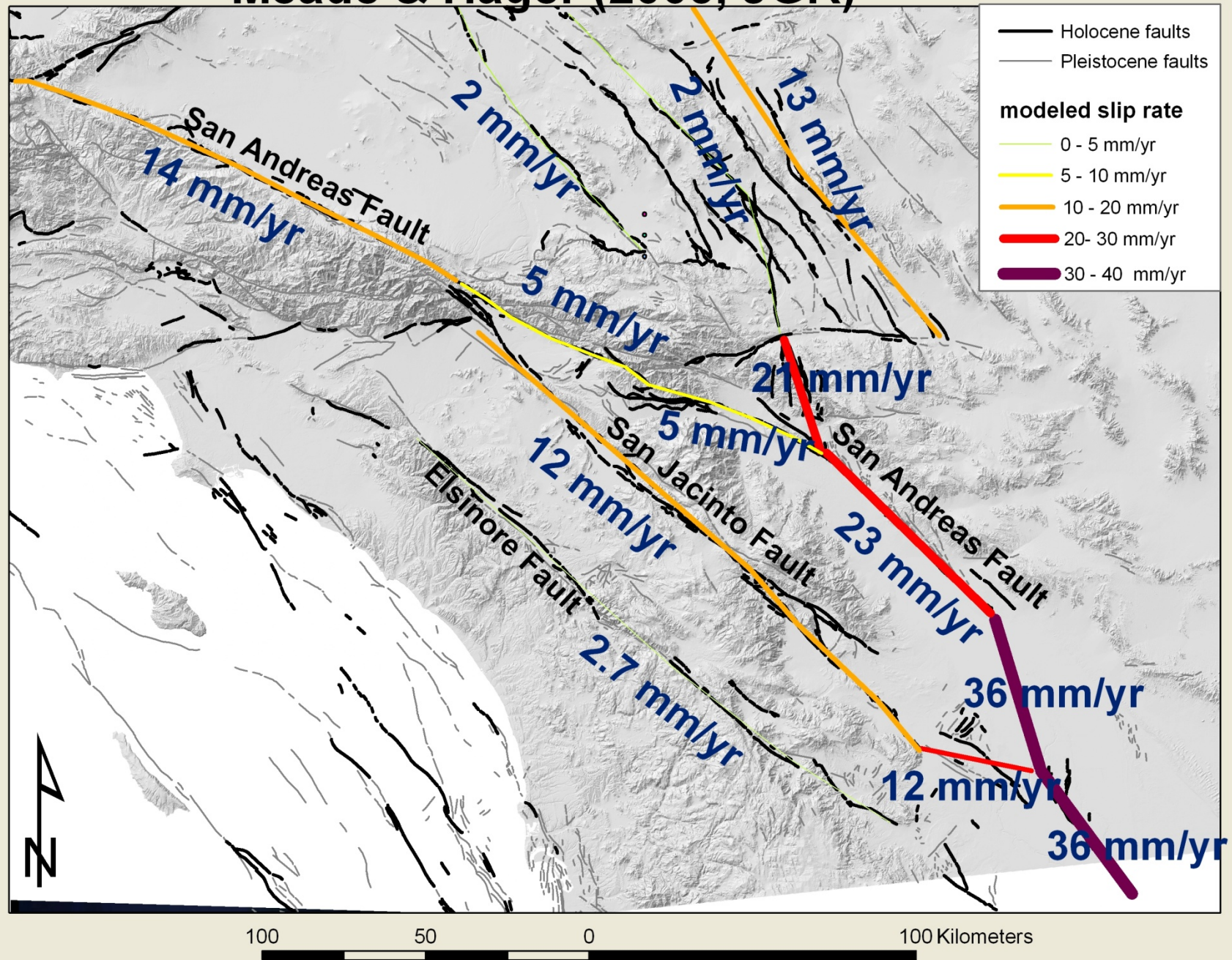
Morton et al., 1986

Morton and Matti, 1993

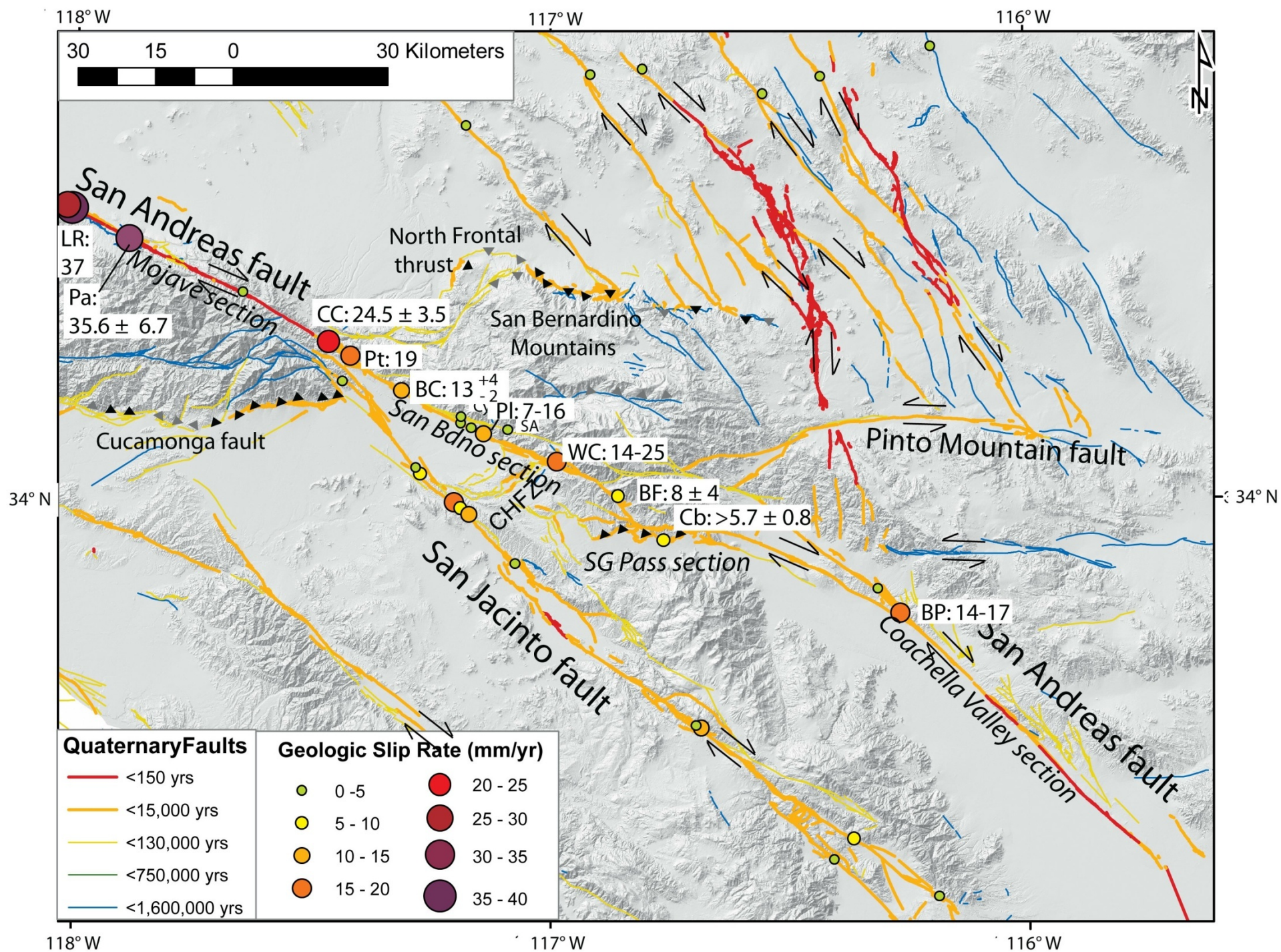




# Meade & Hager (2005, JGR)



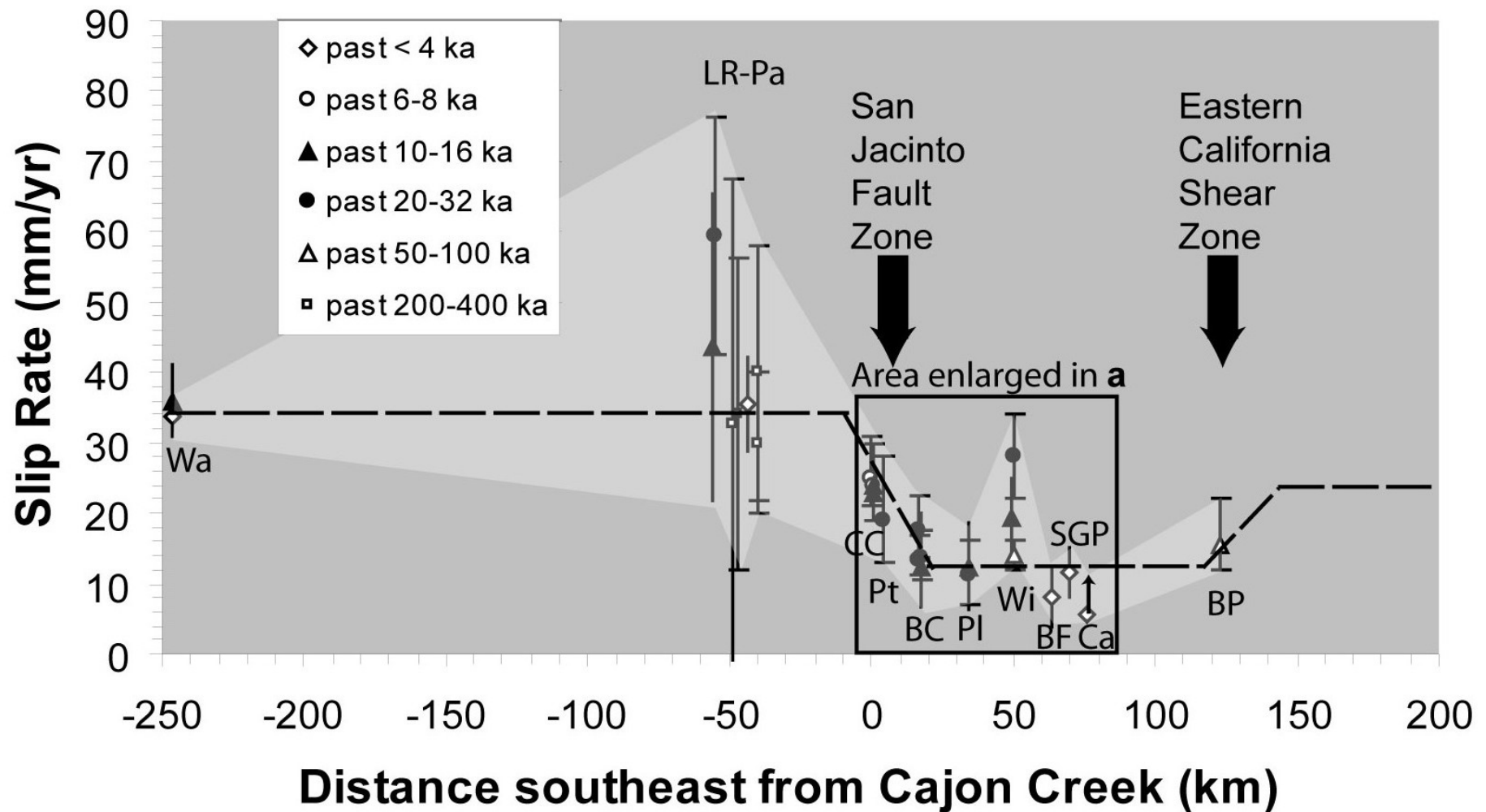




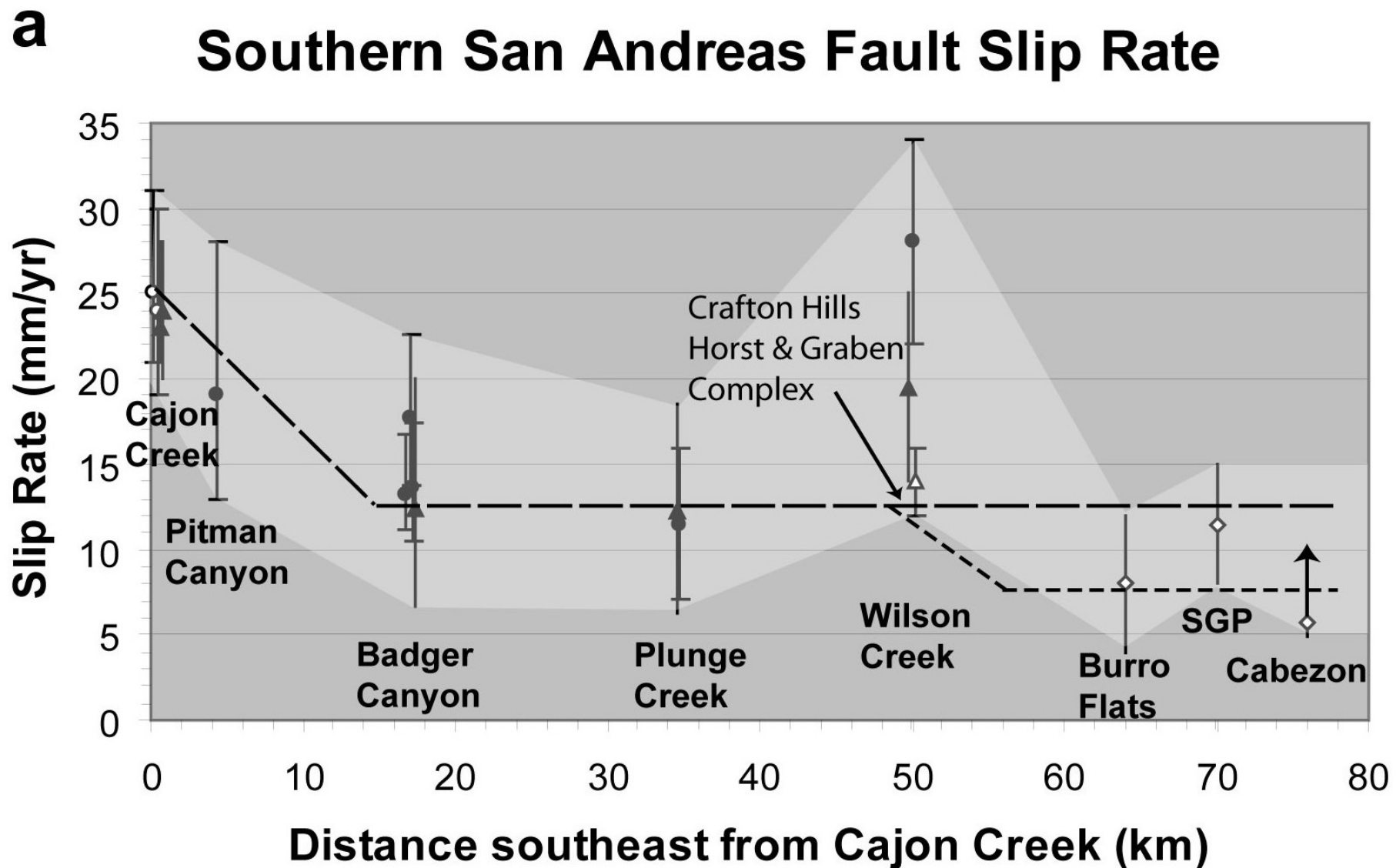


**b**

## Southern San Andreas Fault Slip Rate









# Discussion Points

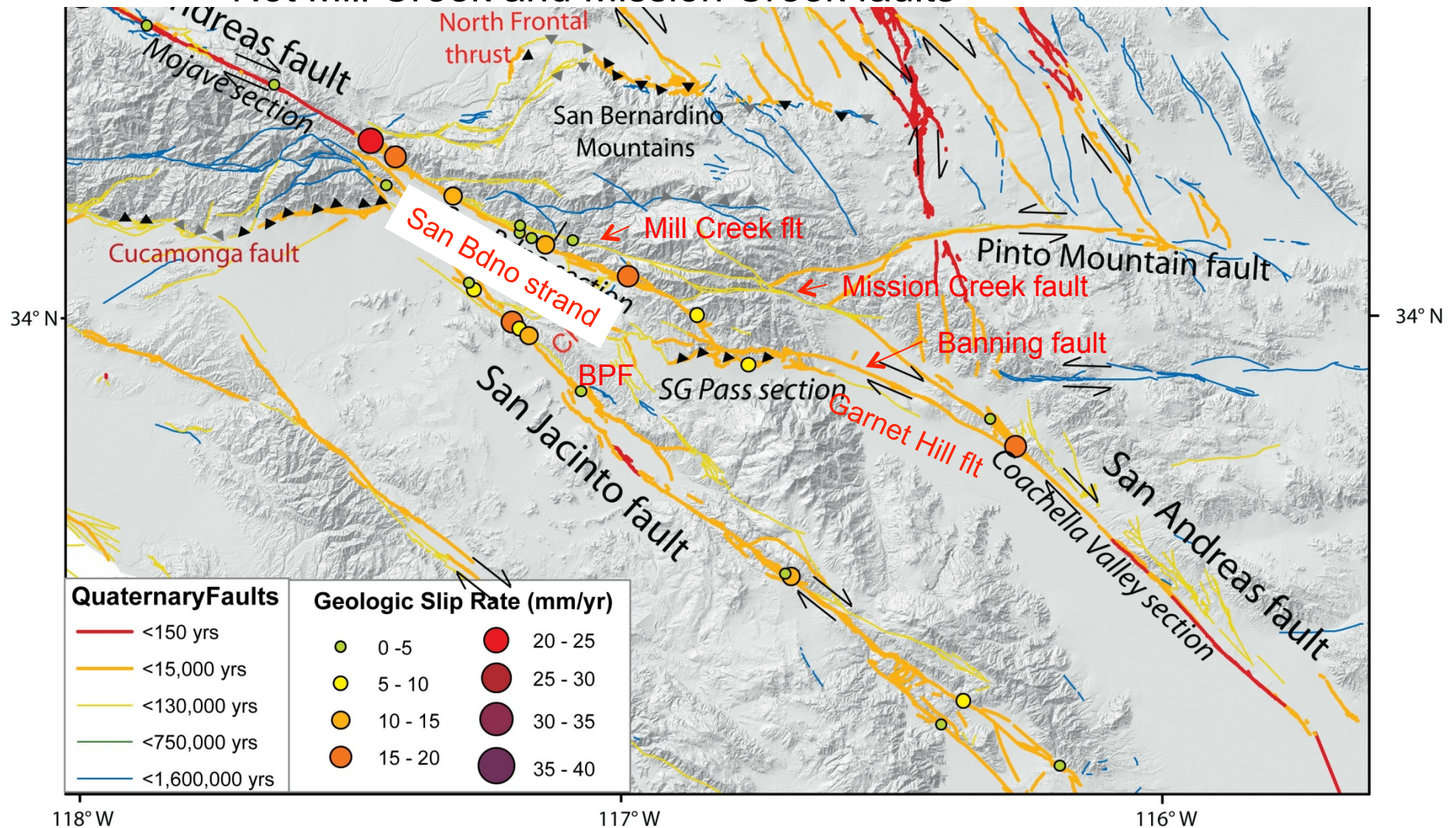
- 1) Comments for modelers
- 2) Spatial distribution of Holocene/Latest Pleistocene slip
- 3) Changing slip rates over time



## 1) Comments for modelers

a) Give priority to Holocene (orange) and historic (red) faults for modeling geodetic data and rupture dynamics

- San Bernardino strand & Banning fault
- Not Mill Creek and Mission Creek faults

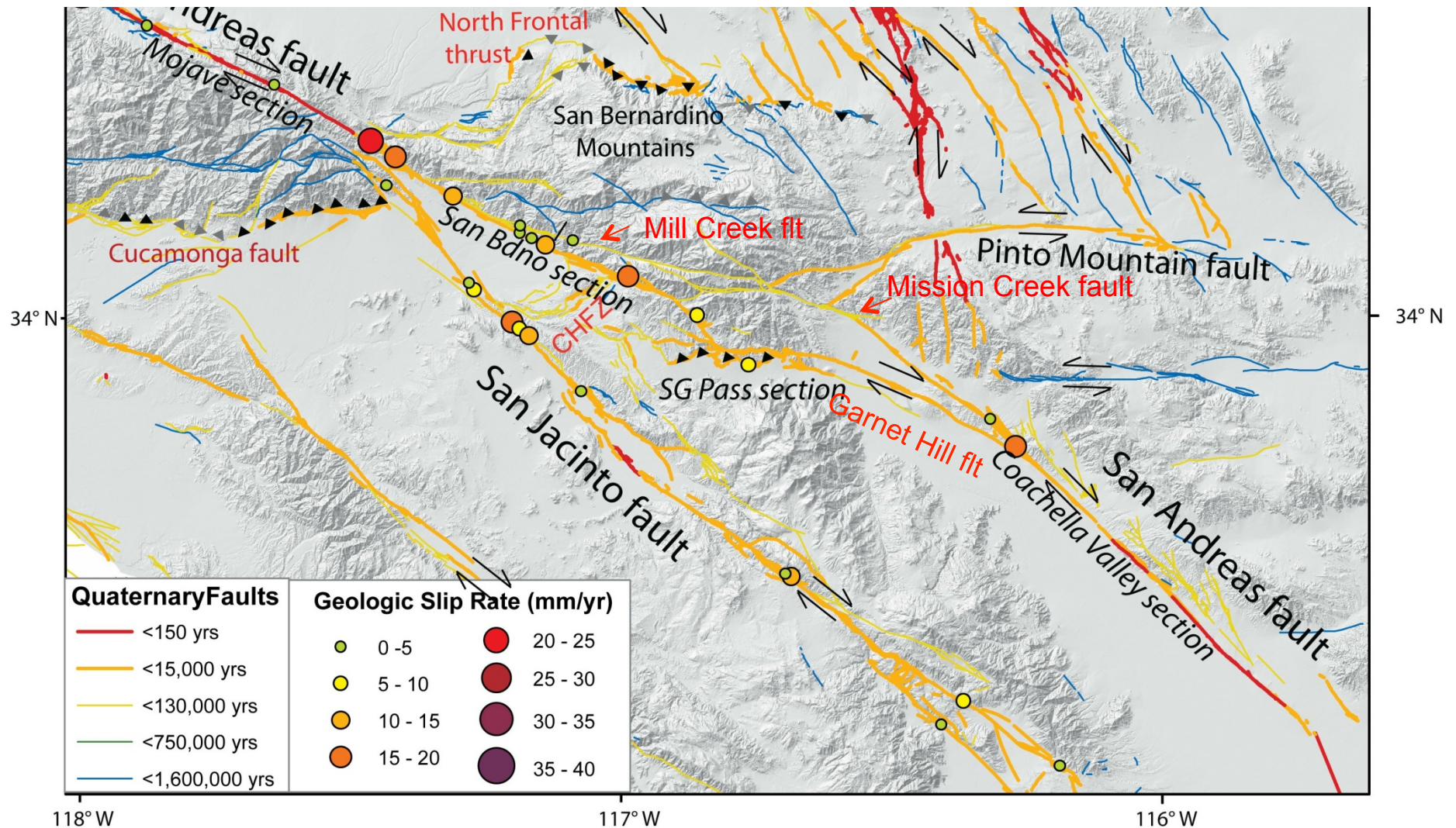




## 1) Comments for modelers

### b) Can dynamic rupture modeling explain features of the Holocene fault pattern?

- Why does Holocene slip in Coachella Valley bifurcate but then die out on northern Mission Creek fault?

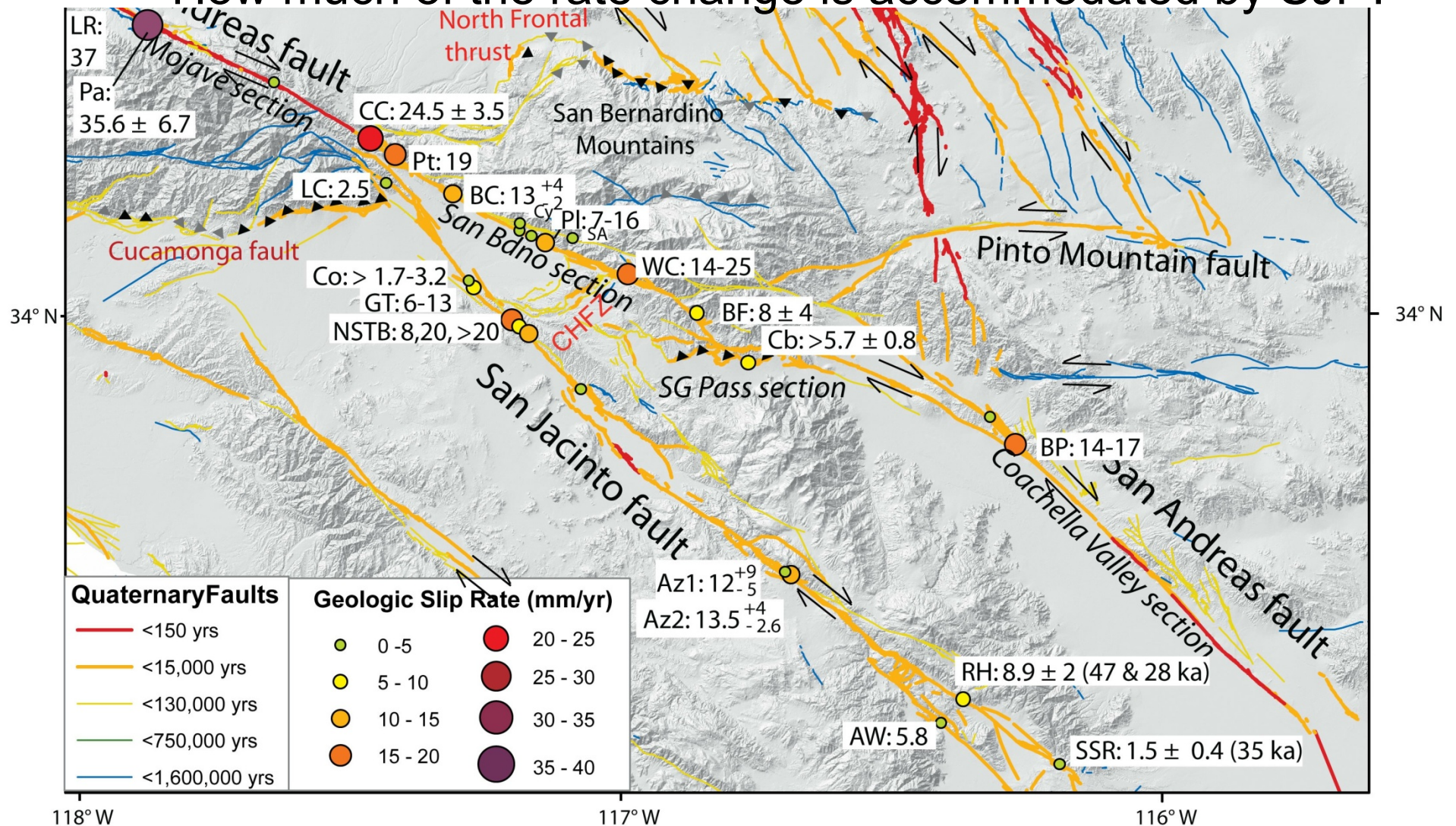




## 2. Which structures have accommodated Holocene/late Pleistocene slip transfer to/from SAF and how much?

a) Biggest transfer occurs near Cajon Pass

- How much of the rate change is accommodated by SJF?

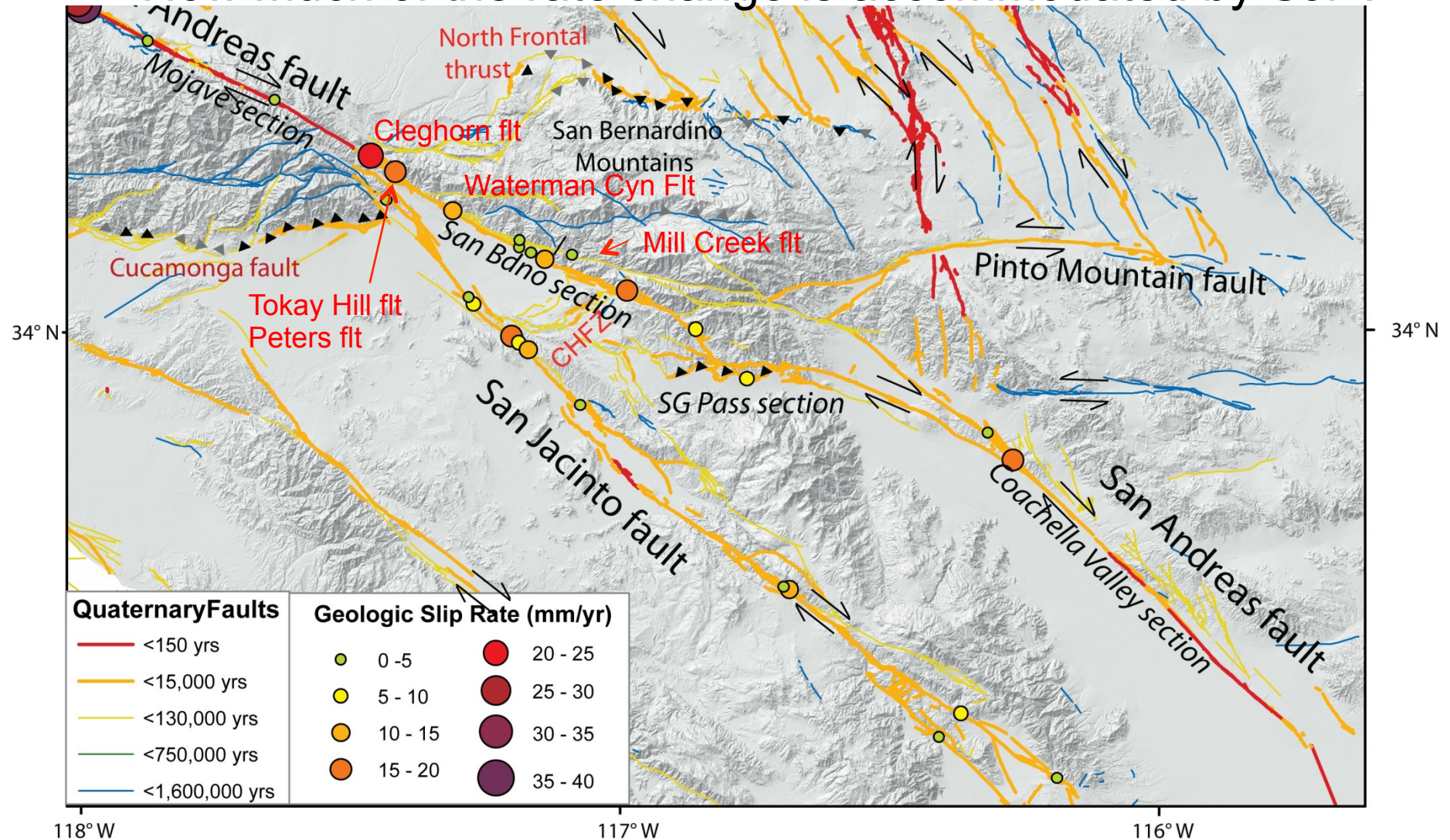




2. Which structures have accommodated Holocene/late Pleistocene slip transfer to/from SAF and how much?

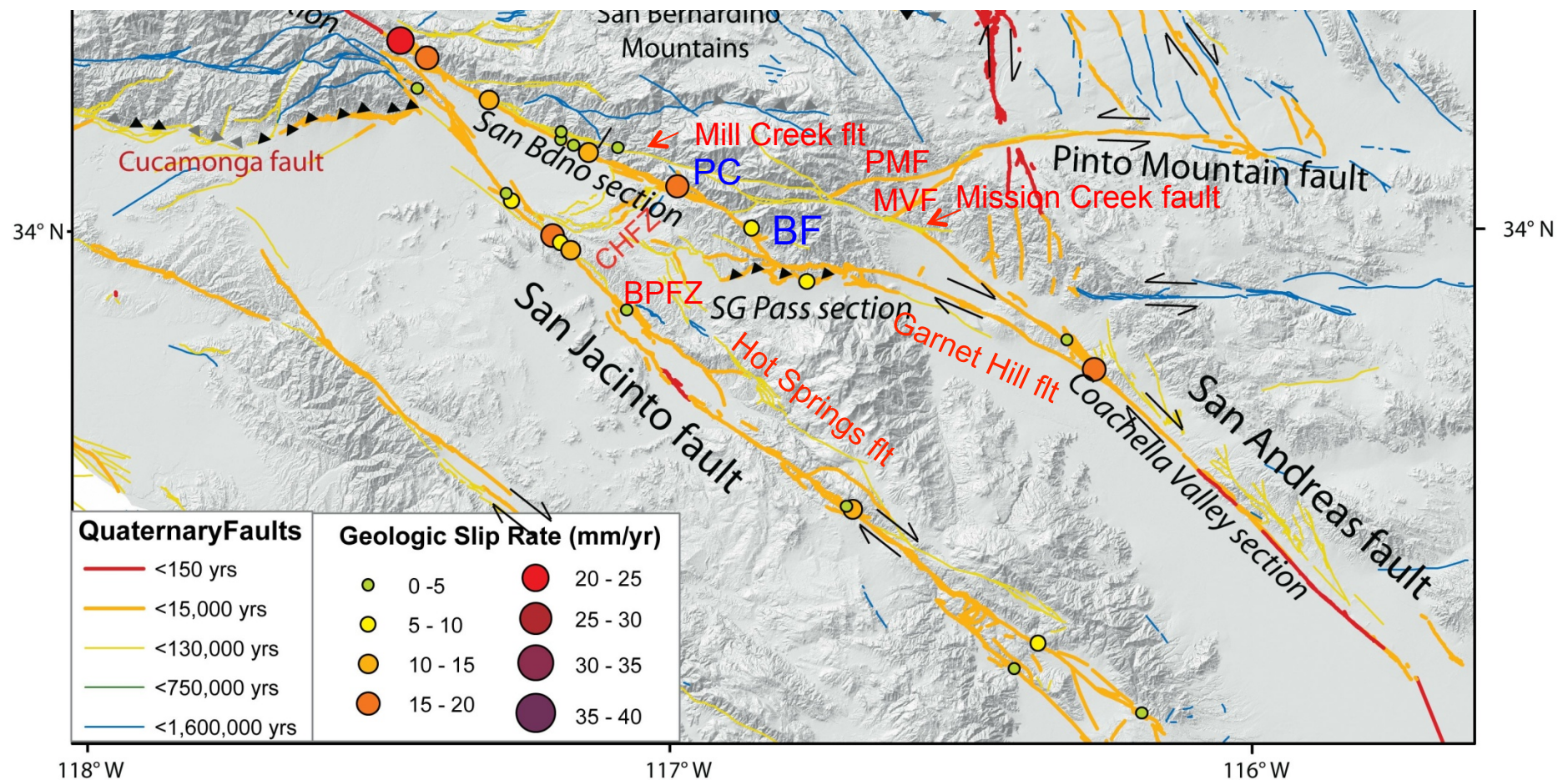
a) Biggest transfer occurs near Cajon Pass

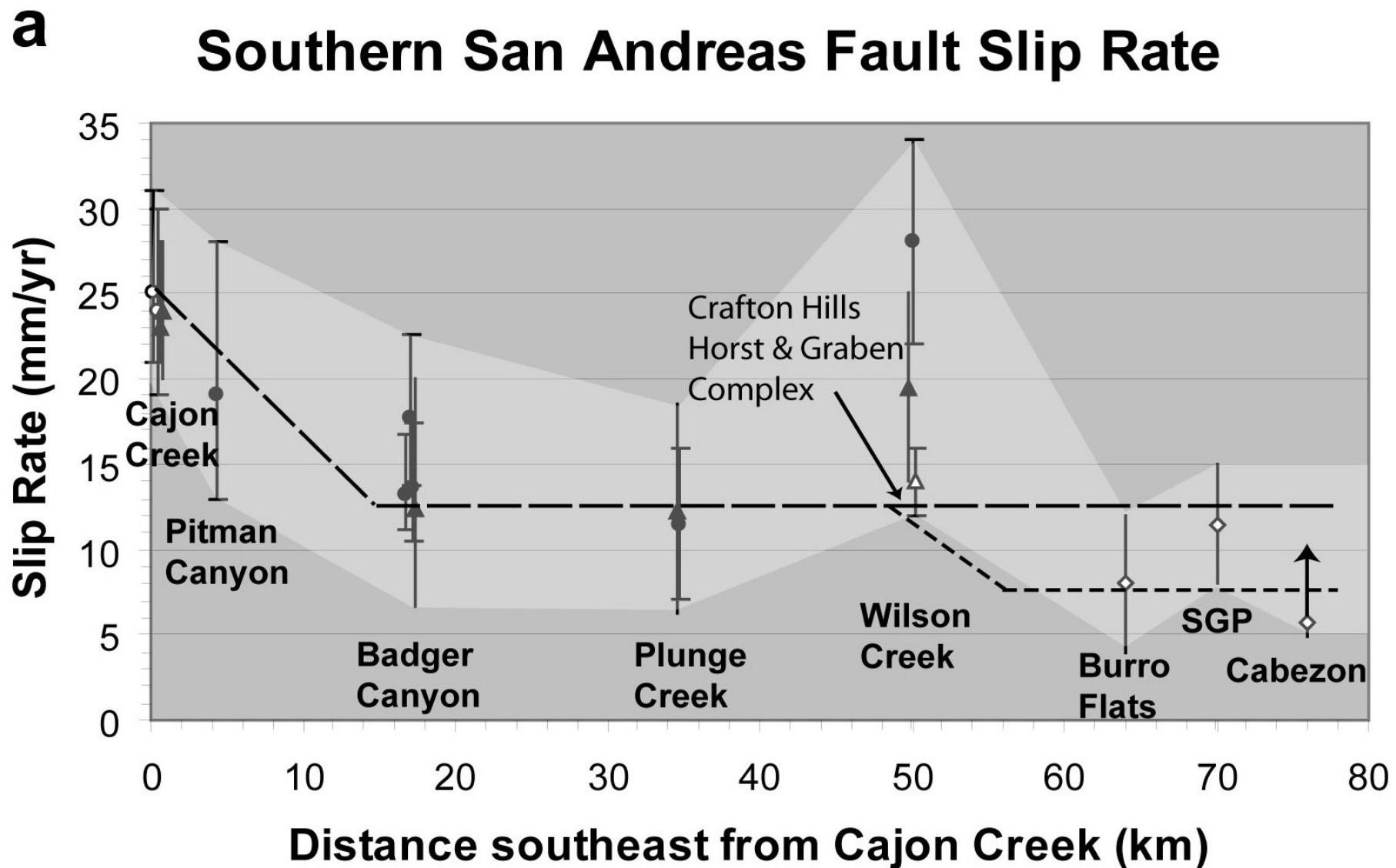
- How much of the rate change is accommodated by SJF?



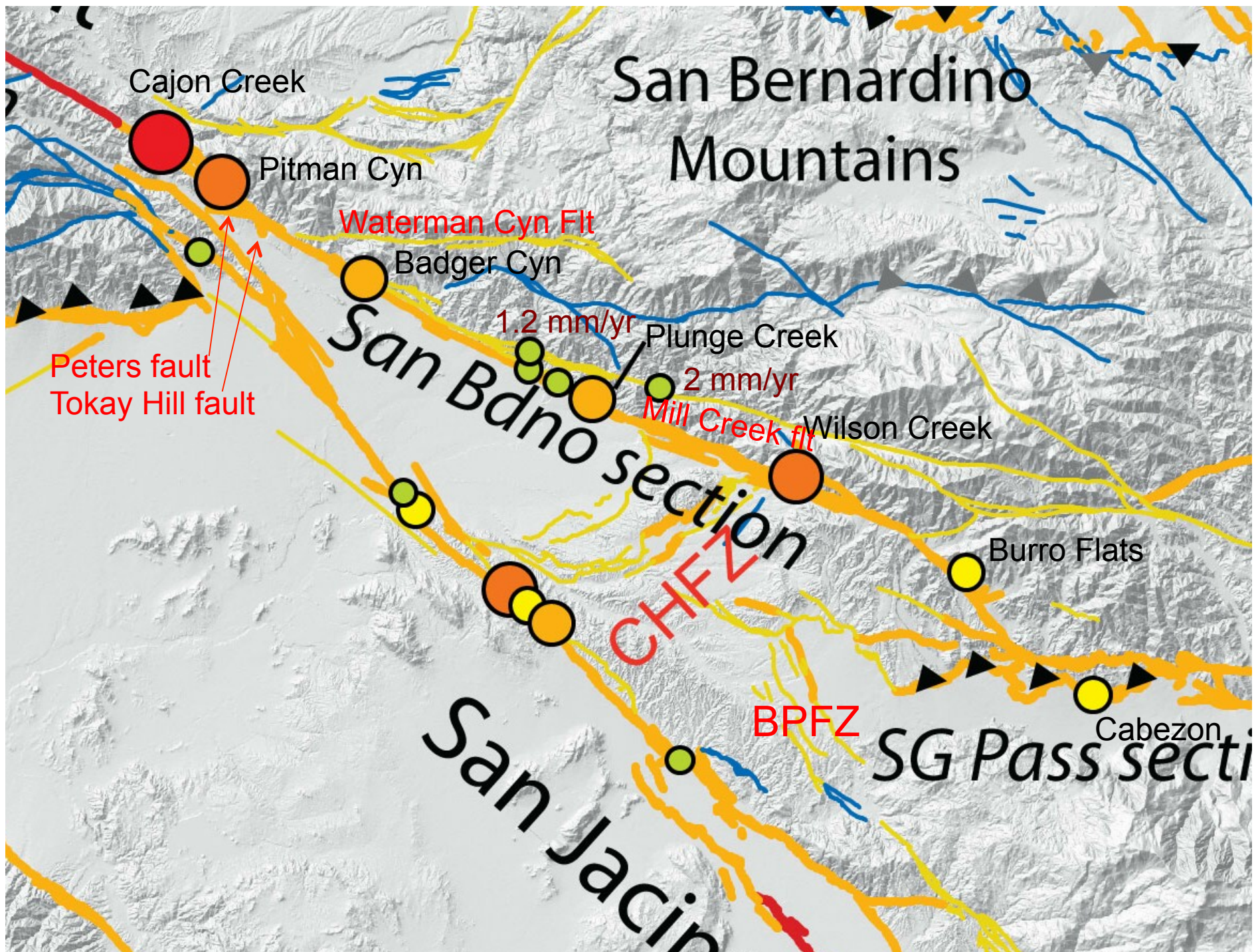


2. Which structures have accommodated Holocene/late Pleistocene slip transfer to/from SAF and how much?
- b) Does the apparent drop in SAF slip rate between Plunge Creek and Burro Flats require additional slip transfer to the SJF (e.g., via Beaumont Plains fault zone?) or can it be explained by other, more local, strands of the SAF?





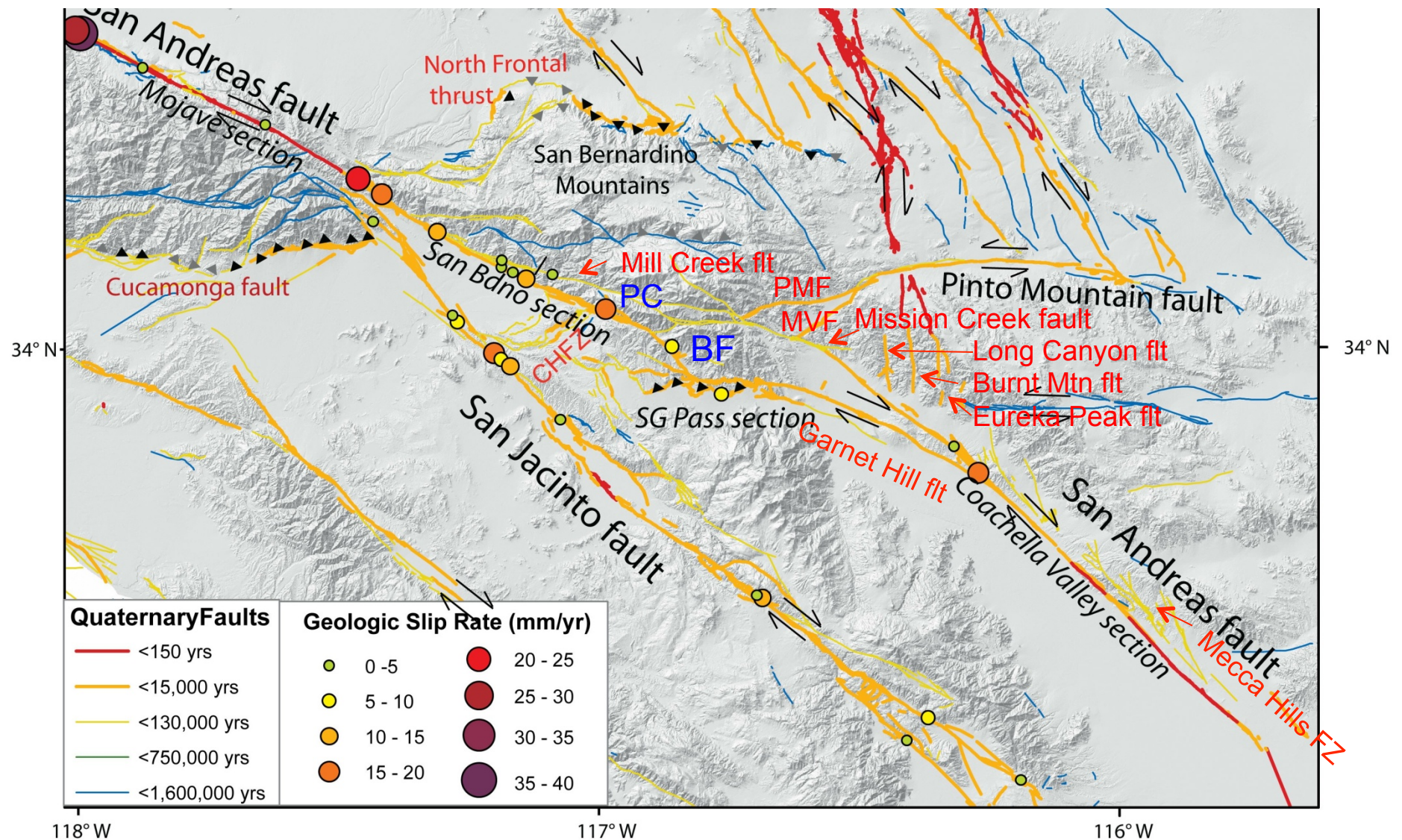






2. Which structures have accommodated Holocene/late Pleistocene slip transfer to/from SAF and how much?

c) Where does ECSZ slip feed into SAF?

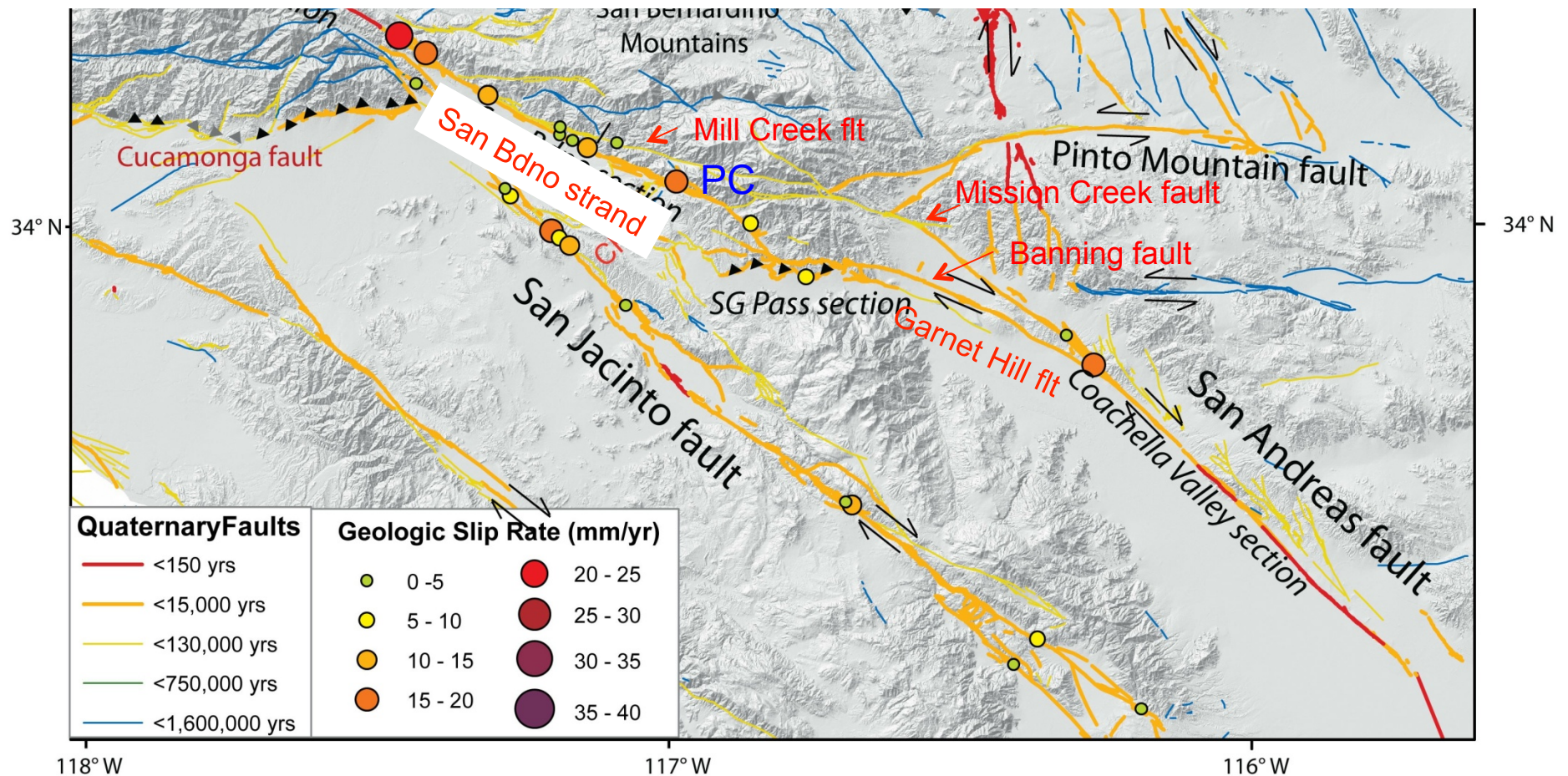




### 3. How have slip rates varied over time?

a) Slip rates **have changed** during the history of the fault:

- SSAF **lifetime average** slip rate = **28 mm/yr**
  - (140 km total offset on 4 strands / 5 Ma)
- Slip rate for **past ~ 35 ka** = **8 – 18 mm/yr**
  - (7-16 mm/yr on SB strand + 1-2 mm/yr on Mill Creek strand)

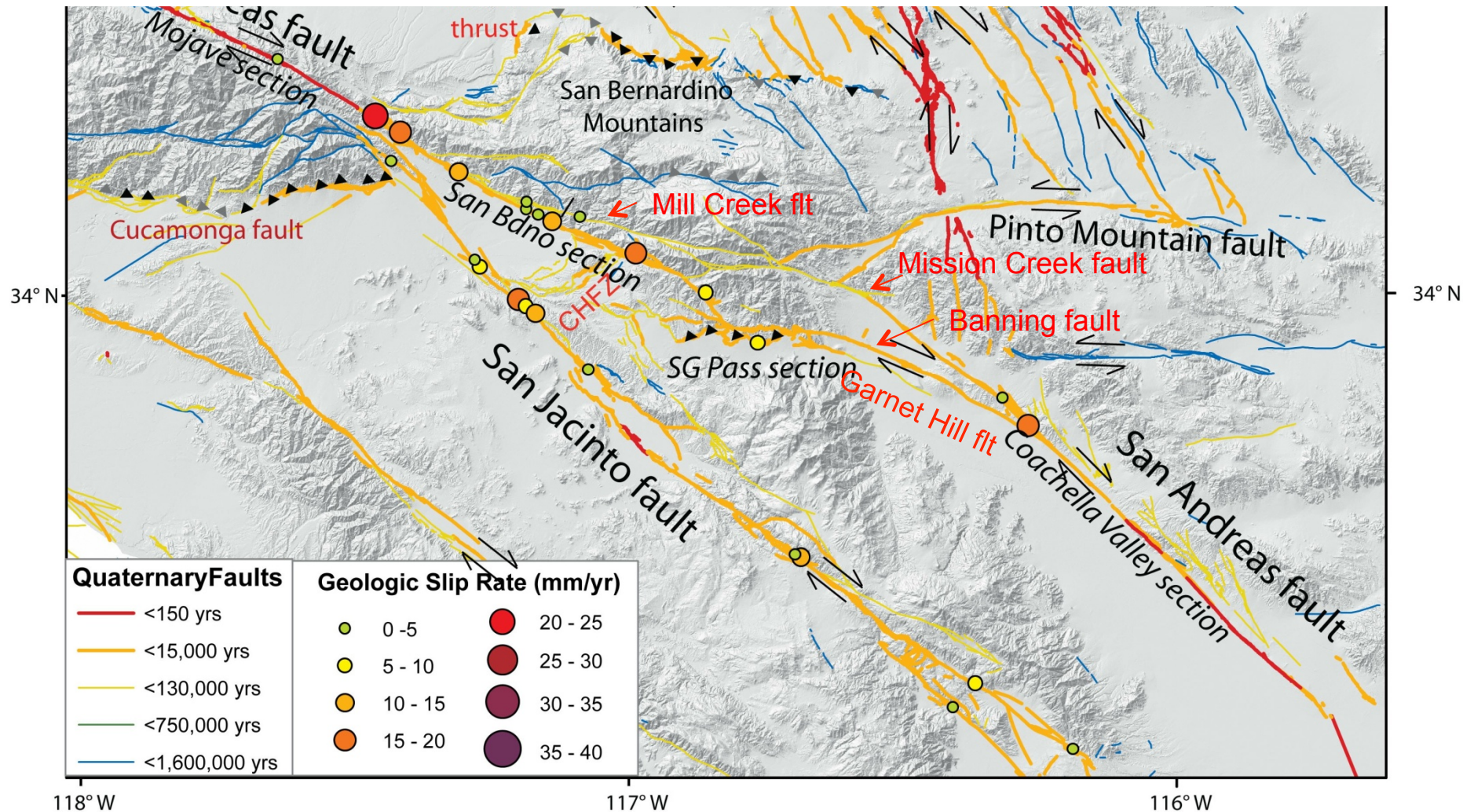




### 3. How have slip rates varied over time?

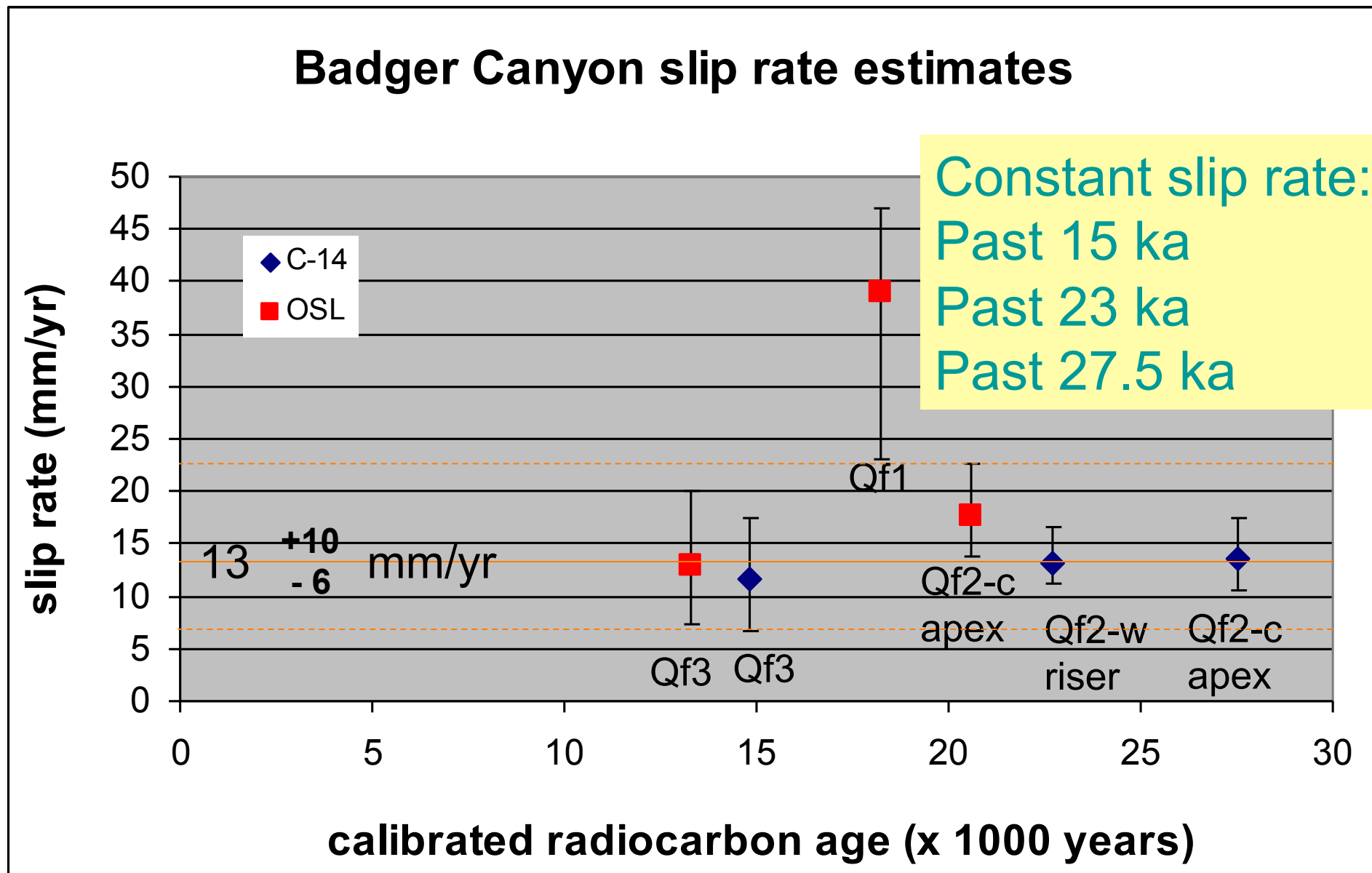
b) Did SAF stop when Mission Creek strand was abandoned and SJF initiated ~ 1.1-1.5 Ma?

- SJF appears to have slipped rapidly at first (~ 20 mm/yr) and then to have slowed to ~ 12 mm/yr later in the Pleistocene

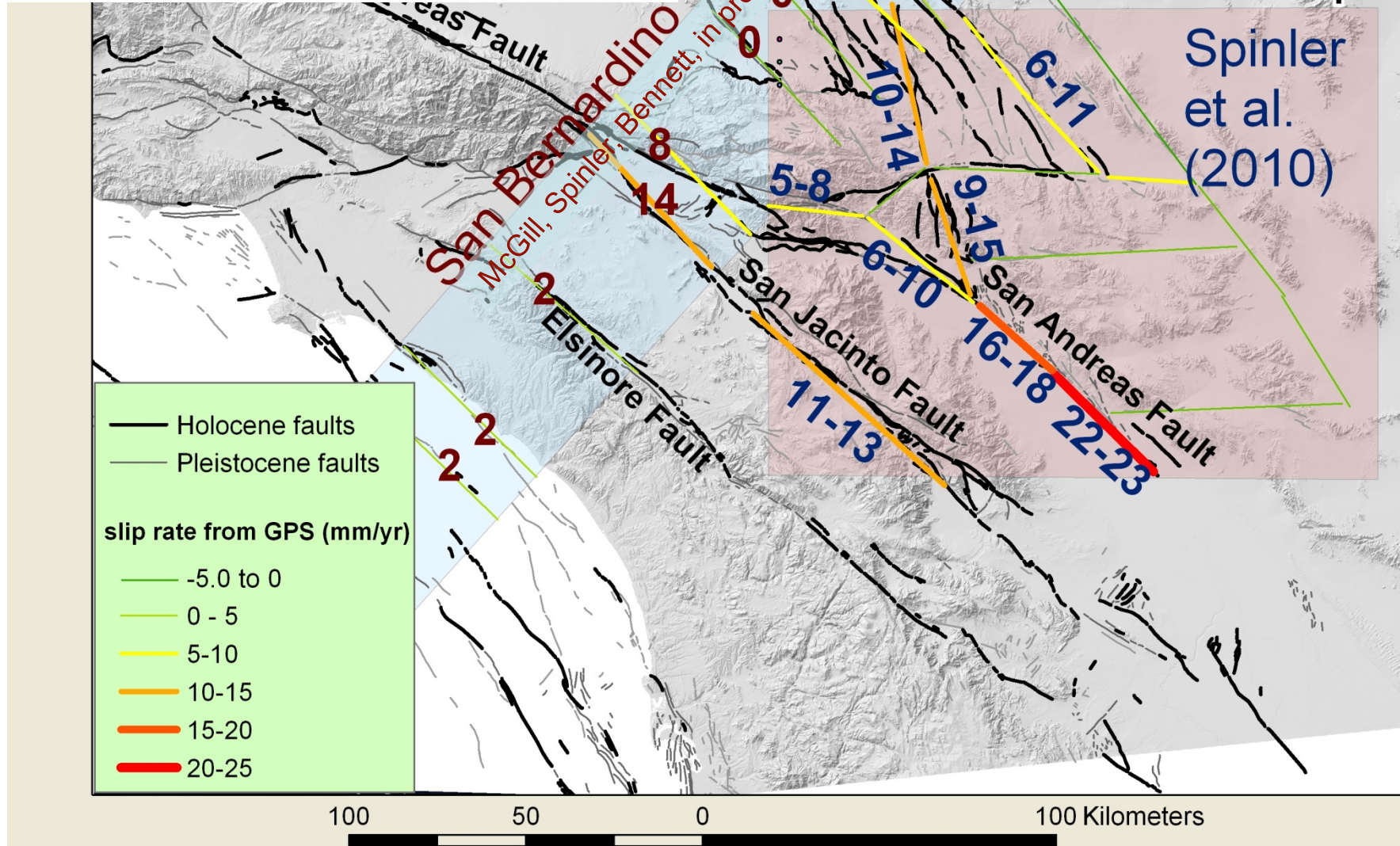




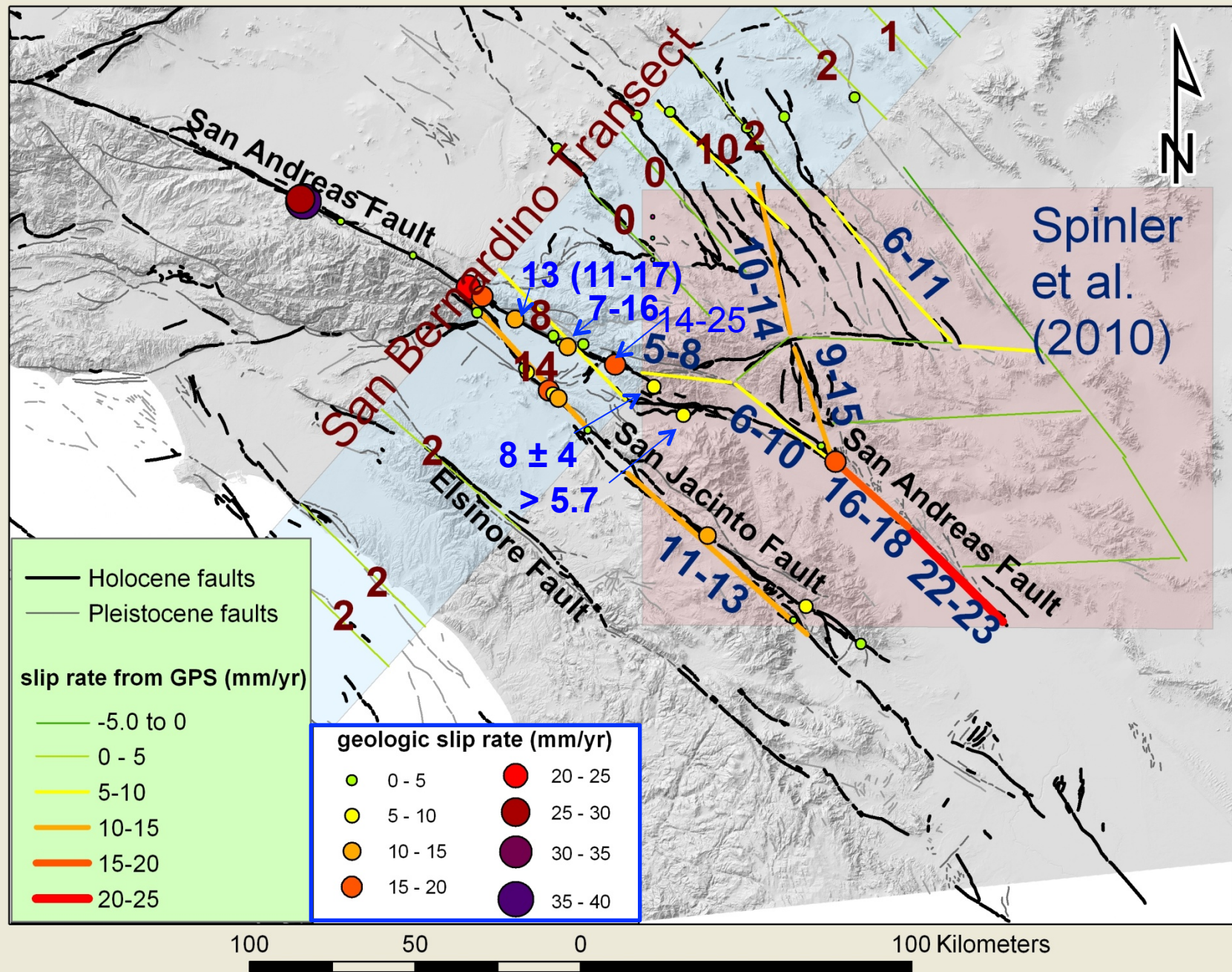
### 3c) No evidence for change in slip rate over the past ~ 28 ka



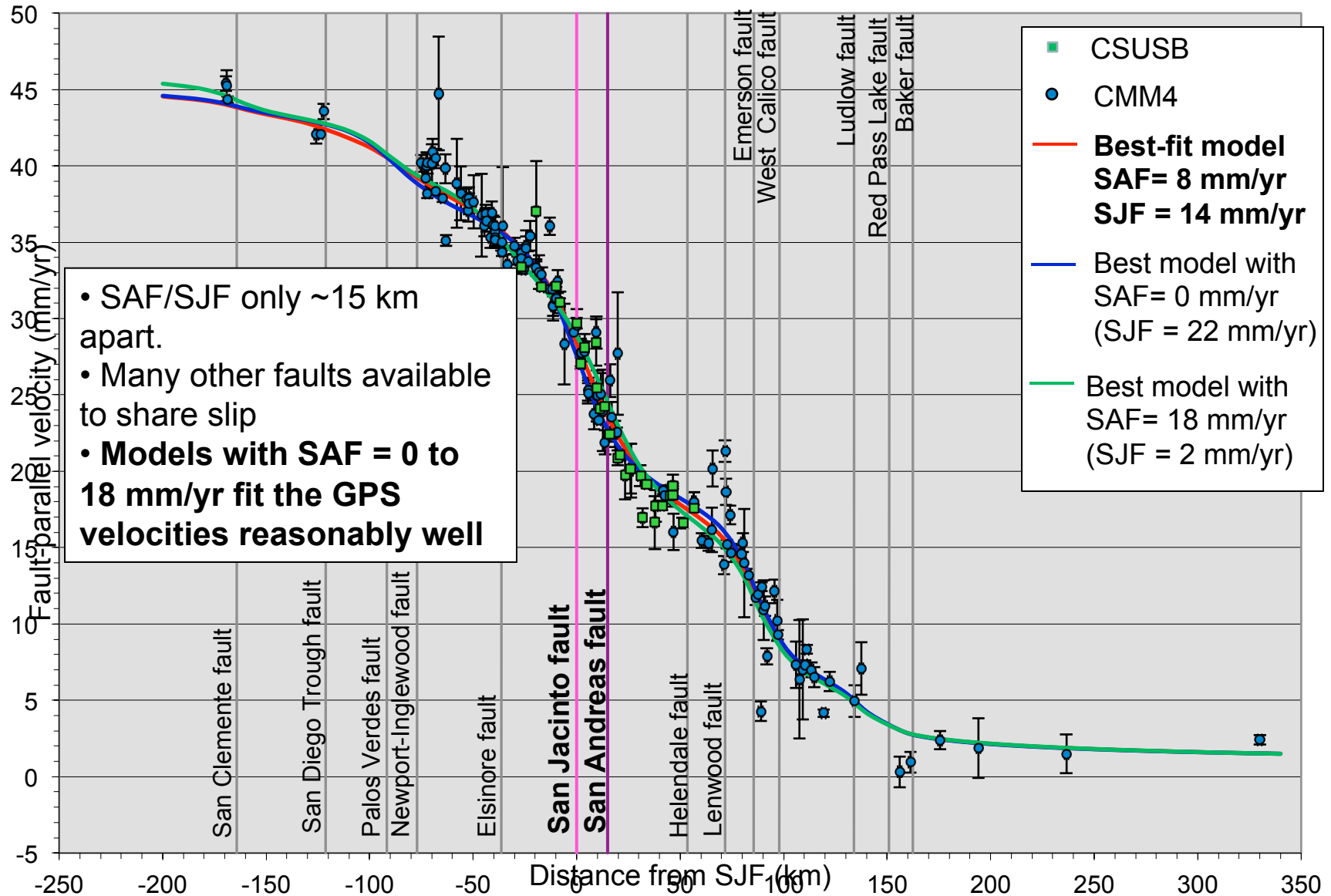
3d) Is the present-day rate of elastic loading equal to the Holocene/late Pleistocene rate of strain release?







# San Bernardino Transect

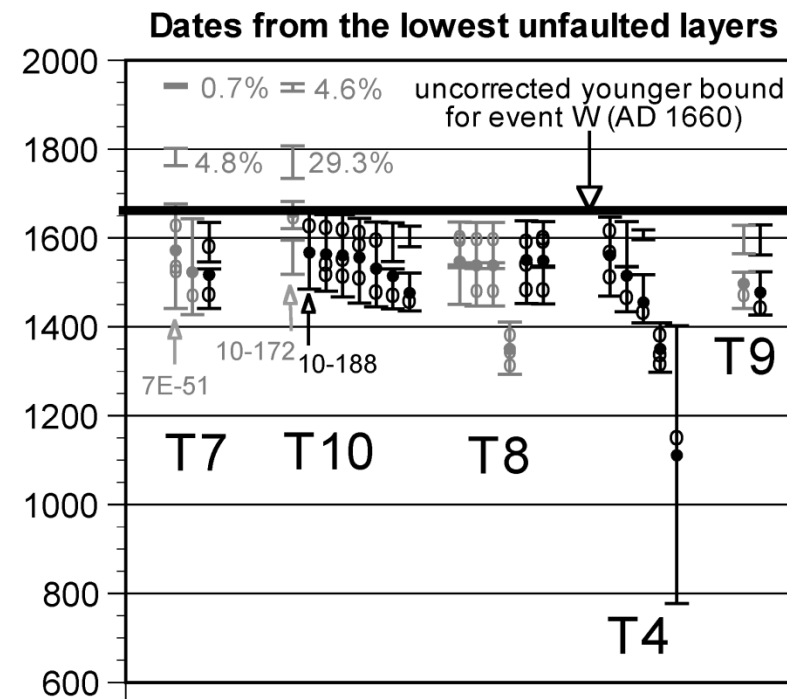
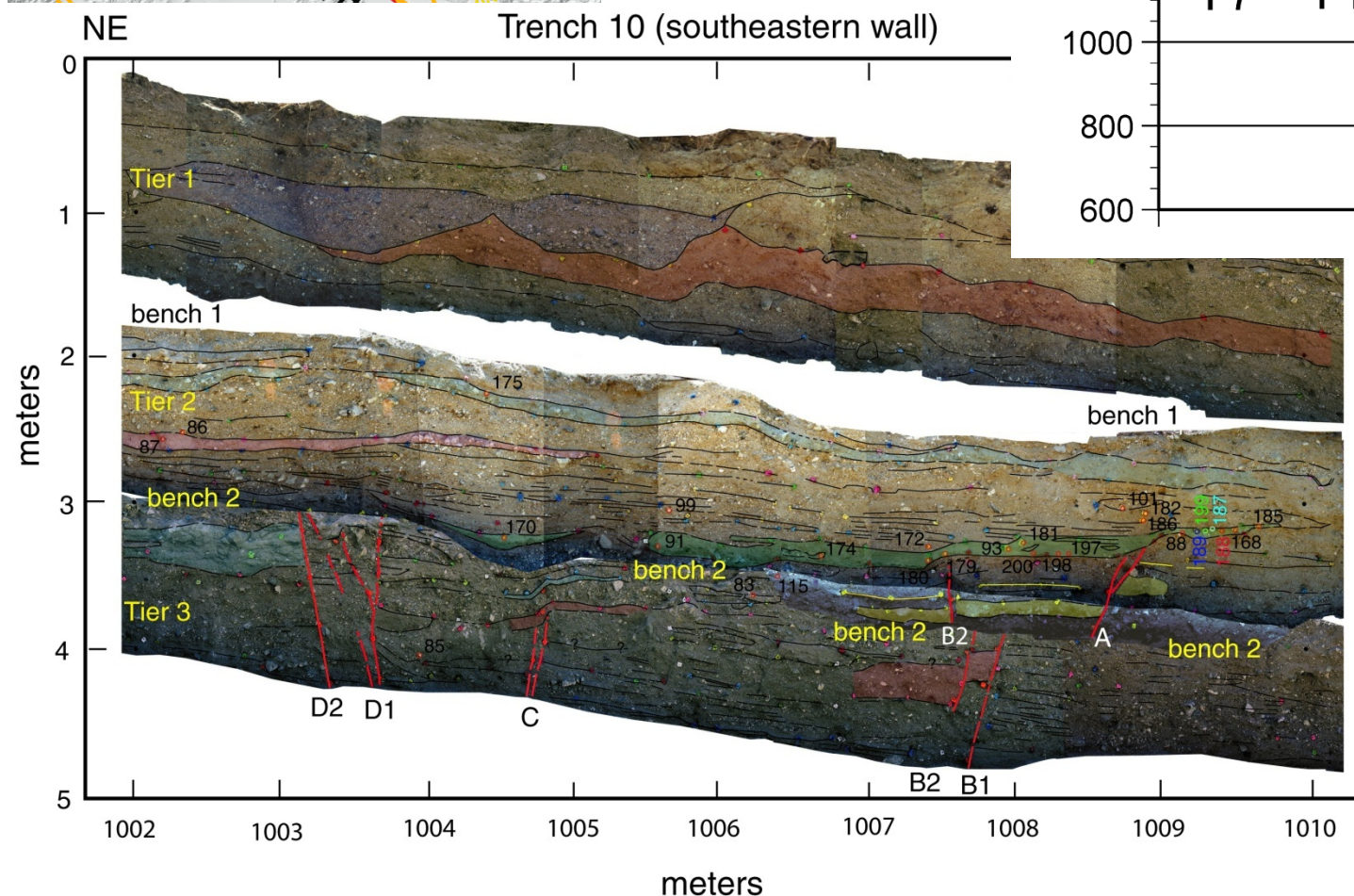
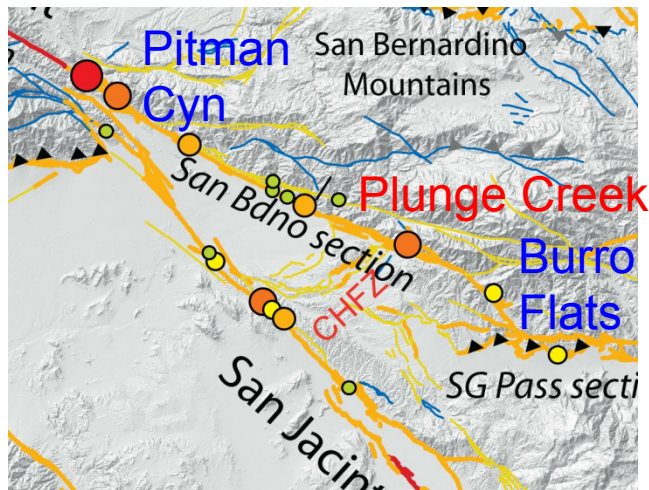




# Discussion Points

- 1) Comments for modelers
  - a) Give priority to Holocene faults
  - b) Can dynamic rupture modeling explain patterns of Holocene faulting?
- 2) Spatial distribution of Holocene/Latest Pleistocene slip
  - a) Cajon Pass: role of SJF vs. other faults
  - b) San Gorgonio Pass: role of SJF vs. other faults
  - c) How does ECSZ slip connect to SAF?
- 3) Temporal variations in slip rate?
  - a,b) over 100' s ka—yes
  - c,d) over past 30 ka to present— not required





1812 surface rupture not expressed at Plunge Creek and weaker than other events at Burro Flats