Simplified Geologic Map (USGS & CDMG)

red = granite
yellow = Quat. alluvium
pink = basalt
orange, gray = melange
= accretionary wedge, mix of sea floor and sediments, some once deeply buried
How do we form rocks like those in Coast Ranges and Sierras?

Subduction Zones!

(drawing from Press et al.)
Conclusion: Many of the rocks in CA were formed in a subduction zone

• Sierra granites
• Coast ranges are scraped from seafloor or formed in basins of an ‘accretionary wedge’

Present Tectonics

• Subduction in Pacific NW
• Rifting in Gulf of CA
• San Andreas site of horizontal motion
Mt. St. Helens erupts
Blowing ash was observed across Montana and North Dakota as the cloud below 10,000 feet moved east.

Fast-moving winds between 18,000 and 40,000 feet carried the ash cloud east across the continent in about 3 days. Ash between 30,000 and 40,000 feet circled the globe in 17 days.

MAY 18 ASHFAIL
About 1.2–2.8 inches.

MAY 25 ASHFAIL
About 0.1–2.8 inches
About 0.4–1.2 inches
About 0.1–0.4 inches

Mount St. Helens
Spokane
Missoula
618 Mazama ash 5000 BC
San Andreas Fault
Figure 2. Map of ancient and modern plate boundaries in California.
Will California fall into the sea?

• Southern California is attached to Pacific Plate.
• Relative motion of Pacific Plate to NA is 5 cm/yr.
• SF and LA are 600 km apart

How long will it take to be neighbors?

If we move in M=8 quakes, with 6m per quake, how many quakes will it take?
**Seismicity**

- Mendocino fracture zone (lateral)
- San Andreas (lateral)
- Sierras (uplift)
- Transverse Ranges (compression)
- Salton Trough (extension)
Figure 5. Fence diagram illustrating rupture probabilities for the time period 1994 to 2024 for fault segments associated with type A zones.
Salton Trough
(a pull-apart)

1. Offset develops on San Andreas

2. Extension opens basin

3. Present trough

1. Offset develops on San Andreas
Geologic Map
(USGS & CDMG)

Identify San Andreas,
Salton Trough
Sierras and Owens Valley form due to uplift (doming) and extension