North American Perspectives I: Cordillera (Mesozoic – Cenozoic)

Processes in Structural Geology & Tectonics
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We Discuss …

North American Perspectives I: Cordillera (Mesozoic – Cenozoic).

- Mesozoic-Today convergent margin setting.
- The concept of far-traveled (super)terranes and their accretion.
  - Paleomagnetism primer.
- Variably exhumed arc and foreland FTB (Sevier).
- Early Cenozoic transition to basement-cored uplift (Laramide).
- Middle Cenozoic and younger continental extension (Basin-and-Range)
- Late Cenozoic subduction of ridge (San Andreas Transform) in conterminous US-N Mexico segment.
Geologic Timescale (GSA, v.4, 2012)
North America - Time and Terrane

http://tapestry.usgs.gov/
Mesozoic-Cenozoic Paleogeography

PaleoMap, Chris Scotese

Zahirovic et al., 2015
Global Mesozoic-Cenozoic Orogen

Dickinson, AREPS, 2004
North American Cordillera

Hildebrand, 2009; 2013
FYI: Lithoprobe Crustal Cross-Section (West)

Cascadia
Active subduction zone

Magmatic arc
Coast Mtns

Thrust-and-fold belt
Rocky Mtns

Sedimentary basin overlying deformed Archean crust
Southern Alberta
Lethbridge

Earthquake zone
Accreted terranes thrust over cratonic crust

Interpretation

Reflection fabric
Cascadia Margin and Wedge

Subduction complex:
- accreted sediments, Late Eocene to present

Structural lid:
- sedimentary cover units of the Crescent terrane
- early Eocene oceanic crust of the Crescent terrane

Continental framework:
- terranes accreted in the Cretaceous
- outline of Cascade magmatic arc, Late Eocene to present

Mount Olympus and Mount Tom from the High Divide, Olympic National Park
©Shane Farnor/NI  

Western N America ©PSG&T
Mesozoic Magmatic Arcs
Cordilleran (suspect or exotic) Terranes
Optional: Paleomagnetism (in 2 minutes)

**Paleo-inclination**: distance from pole: \( \tan(I) = 2 \cotan(L) \)

**Paleo-declination**: rotation relative to (averaged) pole

*Note*: reversal indeterminacy
US and Canadian Foreland Rockies
US Rocky Mountains

Glacier Park’s Chief Mountain: PreC limestone on Kr sandstone
Canadian Rocky Mountains

Lewis Thrust at Gould Dome: Miss. Rundle Fm on U Cr Belly River Fm
Laramide-style Deformation: Basement Uplifts (Eocene)
From Contraction to Extension (SW US)

Landsat mosaic of B&R in Nevada and Death Valley, southern Sierra Nevada, and Great Valley (San Joaquin) in California.
Continental Extension (Miocene-today)

- Half-graben complex
- Tilted hanging-wall blocks
- Exposure of mylonite
- Mylonitized granite

MCC: idealized cross section

Whipple Mnts, CA
Continental Transform: San Andreas Fault

Atwater, UCSB
Today’s Strike-Slip Margin: motion vectors (GPS)
North American Plate Motion
North America - Time and Terrane

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