Outline

• Ocean basin sedimentation
• Anatomy of a forearc:
  – “Old paradigm”
  – Forearc basins and accretionary wedges
• Accretionary margins:
  – wedges, mélanges
    • Basics
    • Internal structure and models of growth
    • Exhuming high-pressure rocks
• Non-accretionary margins
• Modern subsurface views of accretionary prisms
Ocean basin sedimentation

http://www.ngdc.noaa.gov/mgg/sedthick
Forearc subsidence linked to episodes of accretionary wedge growth in Mesozoic archetype of western California.
Forearc basin and near-trench sedimentation dominated by continently-derived hemipelagic and debris flow deposits.
Just like retroarc fold-thrust belts, accretionary prisms ("forearc fold-thrust belts") are wedge-shaped with a topographic slope (alpha) and a basal dip (beta).

Critical taper wedge by Woudloper, Public Domain
Subduction by Mikenorton, CC BY-SA 3.0
- Often discrete blocks of HP and UHP rocks in a “matrix” of lower grade material

-The internal structure of ancient accretionary prisms (more specifically, mélanges) is more “jumbled” than retroarc fold-thrust belts.
Several ideas for exhuming high pressure rocks in mélanges:

- Subduction channel
  - Cloos 1982

- Buoyant ascent and normal faulting
  - Platt, 1987

- Mass wasting and normal faulting
  - von Huene et al., 2003

Also:

- Lallemand and Guth, 1990

Oblique convergence

Cloos 1982
Buoyant, "diapir"-like rise currently popular model to explain high pressure rocks exhumed at subduction zones; still need better geophysical data to explore deep processes.

Stern et al. 2013

We have great data for this area
High resolution bathymetry coupled with 3D seismic reflection data and boreholes provide detailed views of structures at plate boundary: some structures similar to retroarc fold-thrust belts!
Moore et al., 2009
Core from out-of-sequence “splay” fault indicates frictional heating along fault zone

Yamaguchi et al., 2011; Sakaguchi et al., 2011


