2. Olympic Mountains, Willapa Hills & Oregon Coast Range

E-1

Geology Map

http://geology.wr.usgs.gov/parks/olym/geolmap.html

Pe Ell volcanic rocks near Rock Creek

8. Docking of Olympic Peninsula
(25 to 30 m.y.?)

Eocene sedimentary rocks record coastal and shallow marine-like environment

http://www.geol.umd.edu/~jmerck/geol100/images/32/turbidite.gif

http://www.ess.washington.edu/SEIS/PNS/N/HAZARDS/CASCADIA/turbidite_reco rd.html

Turbidity currents—submarine landslides-left graded beds called turbidites in the ocean basin. Rocks of the Olympic core include many turbidites, indicating their marine origin

http://www.geol.umd.edu/~jmerck/geo100/images/32/turbidite.gif

Straight Creek Fault system active up until about 35 Ma
Major Rock Units

1. Peripheral Rocks
2. Core Rocks

Separated by reverse faults

Peripheral Rocks of the Olympics:
Mostly the Crescent Formation

Age: Mostly Eocene (60-50 Myrs)
Rocks: Pillow Basalts, Some Vesicular Basalts, 15-30 km thick in total
Limestone: w/deep water foraminifera (aka “forams”)

Core Rocks of the Olympics
Age: Eocene-Miocene (40-20 Myrs)
Metamorphosed 14-12 Myrs
Rocks: Sandstones w/graded beds (turbidites!)
Shale
Metamorphism:
East - Low Grade (11 km burial)
West - Not Metamorphic

Crescent Formation
Basalt of the Crescent Formation on Klahhane Ridge above Port Angeles; from http://geology.wr.usgs.gov/parks/olym/olym5.html

Core Rocks
Fig. 4. Thick beds of sandstone in the Valhallas and geologists at work. (from: http://geology.wr.usgs.gov/parks/olym/olym2.html)

Fig. 7. Sandstone beds with thin shale interbeds on Windfall Peak.

Olympic Structures

Note faults place older rock over younger rock
Interpretation: Peripheral Rocks
Terrane (fault bounded)
Hot Spot Island
Basalt Chemistry = Hot Spot & Divergent Zone

Modern Analogy - Iceland
http://www.answers.com/topic/geo graphy-of-iceland
http://www.calstatela.edu/dept/geol ogy/HotSpots.htm

Possible Eocene Reconstruction
Plate Reconstruction: 55 Myrs
Supporting evidence for rock age distribution
Interpretation: Core Rocks
Accretionary Wedge
Trench Sediments
**Olympic Accretionary Wedge**

- **Subduction zone** → Basalt
- **Oceanic lithosphere** → Edge of continent

**Olympic History**
- Western Core rocks accreted first & were buried deepest (explains why they are oldest and most metamorphosed)

**But Why is the North “Wedge” (Olympics) so much larger than the South “Wedge” (Willapa Hills/Oregon Coast Range)?**

1. Shoved in the Corner

   - Insular ST
   - Washington
   - Olympics
   - Coast Range
   - Oregon

2. There is a bend in the Juan de Fuca Plate under the Olympics

   - Cross Section
   - North ----> South

**Evidence for the Bend**

1. **NW Volcanoes**

2. **NW Earthquakes**

   - Quakes occur in the subducting plate
Why is there a Bend at all?
Basin & Range Extention to the South

- Hoh Formation turbidite deposits (closeup looking down on overturned beds at Beach #4)
- Ruby Beach on the Olympic Coast

Tilted turbidite beds of the Miocene Hoh Formation (~20 Ma) at Beach #4 on the Olympic Coast. What are they looking at...??

Can you see the angular unconformity?

An eye-hopping California Gray Whale!
| Sedimentary and mildly metamorphosed sedimentary rocks from the Olympic core can be seen at Ruby Beach |