QUATERNARY TECTONISM IN A COLLISION ZONE: THE CALAWAH FAULT

by

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with contributions from
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TECTORIC EVOLUTION OF WESTERN NORTH AMERICA REQUIRES
~ 110 KM OF CONTRACTION IN PACIFIC NORTHWEST

Modified from Wilson, McCrory, & Stanley, 2005, Tectonics
FORE-ARC CONTRACTION PARTIALLY ACCOMMODATED IN QUINAULT AREA

MODERN PLATE AND FORE-ARC BLOCK MOTION

Kinematic vectors relative to fixed North America
[from McCrory, 2000, Tectonics; D. Wilson, 1998, unpubl. data]

EFFORTS TO BETTER RESOLVE MODERN CONTRACTION INCLUDE:
(1) CAMPAIGN GPS OBSERVATIONS
AND (2) RE-LEVELING ACROSS GRAYS HARBOR FAULT ZONE USING EXISTING BENCHMARKS
AND (3) ESTABLISHING NEW LEVELING BENCHMARKS IN COLLABORATION WITH CVO AND THE SPATIAL REFERENCE CENTER OF WASHINGTON
IS REMAINING FORE-ARC CONTRACTION ACCOMMODATED IN MAKAH AREA?

Queried geologic vectors from McCrory et al., 2002, USGS PP-1661-A
VERTICAL MOTION WITHIN FORE-ARC SUGGESTS MAKAH AREA HAS A RELATIVELY HIGH UPLIFT RATE

HORIZONTAL ROTATIONAL MOTION SUGGESTS CCW OR SINISTRAL ROTATION

Vertical geodetic observations from R. Weldon, 2005, *unpubl. data*; Horizontal rotations from F. Pollitz, 2006, *unpubl. data*
UPLIFT/
SUBSIDENCE
CONTOURS
SUGGEST
COMPLEXITY
BEYOND
SIMPLE PLATE
INTERFACE
LOCKING

Geodetic contours modified from
Savage, Lisowski, and Prescott, 1991, JGR
GEOPHYSICAL DATA COVERAGE IN STUDY AREA
COMPLEX SET OF NW-SE TRENDING FAULTS & FOLDS MAPPED ADJACENT TO FORE-ARC BLOCK BOUNDARY

Onshore structures modified from Tabor & Cady, 1978; Snavely et al., 1993; Dragovich et al., 2002
CALAWAH FAULT MARKED ON SEA FLOOR BY SCARP THAT SEPARATES SMOOTH SEA FLOOR FROM ROUGH SEA FLOOR

Multi-beam image from S. Intelmann, 2004, *unpubl. data*
CALAWAH FAULT MARKED BY CHANGE IN ACOUSTIC CHARACTER
STREAM MORPHOLGY AND GEOMORPHOLOGY ADJACENT TO CALAWAH FAULT SHOW STRUCTURAL CONTROL
PHOTO OF GOWER SITE SHOWING
OVERGROWTH OF EXPOSURE
DOCUMENTING LATE QUATERNARY
ACTIVITY ON CALAWAH FAULT
CALAWAH FAULT EXPOSED IN STREAM BANK OF HOKO RIVER
CALAWAH FAULT EXPOSED IN STREAM BANK NEAR PARADISE LAKE AND ALONG LOGGED HILL SLOPE (?)
PHOTO OF CALAWAH FAULT EXPOSED ALONG STREAM NEAR PARADISE LAKE
PHOTO OF POSSIBLE CALAWAH FAULT SCARPS CROSSING LOGGED SLOPE
THESE QUERIED FAULT SCARPS WILL BE INVESTIGATED THIS SUMMER
PHOTO OF GOWER’S CALAWAH FAULT CROSSING EAST OF PREVIOUS PHOTOS
BOUNDARY CREEK FAULT DISRUPTS FLOOR OF CRESCENT LAKE
LAKE CRESCENT SEISMIC LINE 15 (SLEDGEHAMMER TO SARATOGA)

P. Snavely, 1984, *unpubl. data*
SUMMARY

1. GEODETIC MODELS SUGGEST ~3.5 MM/Y CONTRACTION IN COASTAL WASHINGTON MAY BE CONCENTRATED IN MAKAH AREA

2. GEOLOGIC OBSERVATIONS SUGGEST THAT CONTRACTION IN MAKAH AREA IS ACCOMMODATED BY BOTH LEFT-LATERAL, STRIKE-SLIP FAULTING AND THRUST FAULTING

3. IF CORRECT -- THE CAPE FLATTERY AREA IS ‘ESCAPING’ SEAWARD AS THE COAST RANGE BLOCK TRANSLATES NORTHWARD TOWARD VANCOUVER ISLAND

4. FURTHER GEOLOGIC FIELD WORK IS NEEDED IN MAKAH AREA TO ESTABLISH RECENCY OF FAULTING AND SLIP RATE

5. FURTHER GEODETIC FIELD WORK IS NEEDED IN QUINAU LT AREA TO ESTABLISH MODERN CONTRACTION RATE