Geophysical Research Abstracts, Vol. 7, 03407, 2005
SRef-ID: 1607-7962/gra/EGU05-A-03407

Structural style and strain localization in ancient accretionary and out-of-sequence thrusts: evidences from the Kodiak Island, Alaska, U.S.A.

Meneghini F. (1), Rowe C.D. (2), Moore J.C. (2), McKiernan A.W. (3)

(1) University of Pisa, Italy, (2) University of California at Santa Cruz, California, U.S.A., (3) Penn State University, Pennsylvania, U.S.A. (meneghini@dst.unipi.it / Phone: 0039 050 221 58 49

Accretionary thrusts and out-of-sequence thrusts (OSTs) splaying from the decollement contribute to accretionary prism building and represent two good examples of lithospheric shear zones. More over, the decollement thrusts are sites where the most destructive earthquakes and tsunamis occur, and a significant role in releasing seismic energy has also been attributed to OSTs.

In the Kodiak accretionary complex of Alaska, representing the ancient analogue of the Aleutian margin, well exposed examples of both subduction and OS thrusts occur. Both thrusts were primarily active between 59 and 65 Ma.

The structural analysis of both examples has revealed a different deformation style, although in both cases different grades of strain localization are recognized.

In the Paleocene Ghost Rock Fm, a map-scale mélange primarily comprised of turbiditic argillites, variably continuous massive sandstones and rare greenstones, two approximately 15m thick bands of highly sheared cataclasites have been mapped. The cataclasites, sub-parallel to the melange fabric, represent episodes of localized shear in the melange during subduction thrusting at about 13 Km of depth. Extreme strain localization into the cataclastic thrust zones is testified by development of ultrafine fault rocks, occurring as tens of cm thick planar to irregular beds. They show ductile flow which intrude and deform the cataclasite, and can be described as ultracataclasites and/or pseudotachylites.

The Uganik Thrust (UT) juxtaposes the early-mid Cretaceous Uyak Complex over the

latest Cretaceous Kodiak Fm, represented by its tectonized upper boundary, known as Waterfall Bay Melange (WBM). The WBM is interpreted as formed by flattening and shearing of the coherent turbiditic Kodiak Fm during underthrusting along the decollement. The steep geometry of the UT and the overprinting relationship to the melange, allow the interpretation of the UT as an OST. UT core deforms through Riedel fractures separating domains where sandstone blocks are elongated parallel to an S-foliation into the argillite. Several narrow cataclastic zones within the footwall accommodate significant shear. These shear zones crosscut the previous melange fabric and contain evidence of fluid flow, in the form of abundant quartz precipitates along the shear fabrics.

Both thrust examples include strain localization features (pseudotachylites and quartz-infused shear zones) consistent with stick-slip behavior. Thus, although a different structural style, ancient OSTs, in addition to the decollement thrust, may show structural evidences of elastic strain accommodation, testifying their contribution in generating large earthquakes along plate boundaries.