Geophysical Research Abstracts
Vol. 18, EGU2016-9048, 2016
EGU General Assembly 2016

Zipper and freeway shear zone junctions

Cees Passchier (1) and John Platt (2)

(1) Johannes Gutenberg University, Department of Earth Sciences, Becherweg 21, 55099 Mainz, Germany (cpasschi@uni-mainz.de), (2) Department of Earth Sciences, University of Southern California, Los Angeles, California, 90089-0742, USA

Ductile shear zones are usually presented as isolated planar high-strain domains in a less deformed wall rock, characterised by shear sense indicators such as characteristic deflected foliation traces. Many shear zones, however, form branched systems and if movement on such branches is contemporaneous, the resulting geometry can be complicated and lead to unusual fabric geometries in the wall rock. For Y-shaped shear zone junctions with three simultaneously operating branches, and with slip directions at a high angle to the branch line, eight basic types of shear zone triple junctions are possible, divided into three groups. The simplest type, called freeway junctions, have similar shear sense on all three branches. If shear sense is different on the three branches, this can lead to space problems. Some of these junctions have shear zone branches that join to form a single branch, named zipper junctions, or a single shear zone which splits to form two, known as wedge junctions. Closing zipper junctions are most unusual, since they form a non-active high-strain zone with opposite deflection of foliations. Shear zipper and shear wedge junctions have two shear zones with similar shear sense, and one with the opposite sense. All categories of shear zone junctions show characteristic flow patterns in the shear zone and its wall rock.
Shear zone junctions with slip directions normal to the branch line can easily be studied, since ideal sections of shear sense indicators lie in the plane normal to the shear zone branches and the branch line. Expanding the model to allow slip oblique and parallel to the branch line in a full 3D setting gives rise to a large number of geometries in three main groups. Slip directions can be parallel on all branches but oblique to the branch line: two slip directions can be parallel and a third oblique, or all three branches can have slip in different directions. Such more complex shear zone junctions cannot be studied to advantage in a single section. Field examples of several types of metre - 100m scale shear zone junctions are given from Cadaques and Rosas, Spain and from the Vestfold Hills, Antarctica. Zipper and freeway shear zone junctions have also been recognised for continental scale shear zones systems. Examples are given from the Arabian Nubian shield. Recognition of the correct type of shear zone junction can help to interpret the commonly complex geology is such settings.