# Fine-scale structure and kinematics of an active submarine strike-slip fault from micro-bathymetric mapping and analog modeling: The North Alfeo Fault offshore Catania (East Sicily)

Marc-André Gutscher*†[1], Stéphane Dominguez[2], Nathalie Babonneau[1], Arnaud Gaillot[3], and Giovanni Barreca[4]

[1]Geo-Ocean – Institut français de Recherche pour l'Exploitation de la Mer, Institut National des Sciences de l'Univers, Université de Brest, Centre National de la Recherche Scientifique – France
[2]CNRS – CNRS : UMR5243, UM2 , Géosciences Montpellier, France, Montpellier, France – France
[3]Geo-Ocean – Université de Bretagne Sud, Institut français de Recherche pour l'Exploitation de la Mer, Université de Brest, Centre National de la Recherche Scientifique – France
[4]Università degli studi di Catania = University of Catania – Italie

**Résumé**

Southern Italy and Eastern Sicily have been the site of several destructive historical earthquakes. Here at the junction of the western edge of the Calabrian subduction zone and the Malta Escarpment several strike-slip faults have been mapped, which may be the surface expression of the lateral slab tear fault and are candidate sources for some of these earthquakes. The North Alfeo Fault is the northern portion of a 140-km-long fault system extending from the SE flank of Mount Etna and cutting the western edge of the Calabrian accretionary prism. Ultra-high resolution bathymetric mapping (1 m grid spacing) was performed along a 15-km-long segment of the North Alfeo Fault and reveals alternating transpressive pop-ups and lozenge shaped transtensional basins. A pronounced triangular plateau occurs where the fault-trace bends by 15○ and is cross-cut by N-S trending domino fault blocks. Analog modeling performed using granular materials above a dextral strike-slip boundary reproduces the large-scale features of the North Alfeo Fault, including imbricated, transpressive pop-ups, lozenge shaped basins, and secondary splays oriented 20 - 25○ (clockwise rotation) from the primary fault trace. The clockwise splay rotation requires dextral kinematics and is consistent with known earthquake focal mechanisms showing dextral strike-slip for fault planes oriented generally NW-SE. The fresh surface morphology, the dimensions of the North Alfeo fault and the sedimentary stratigraphy and chronology indicate metric scale deformation occurred in the past several thousand years consistent with generation of magnitude 6 earthquakes.

**Mots-Clés:** analog modeling, seafloor morphology, microbathymetry, strikeslip faults, Sicily, Ionian Sea, subduction, tear fault

*Intervenant
†Auteur correspondant: gutscher@univ-brest.fr