

# Microbathymetric mapping of an active submarine fault offshore Mount Etna (SE Italy)



Status Conference Research Vessels 2026  
4 - 6 March 2026, Geomar, Kiel

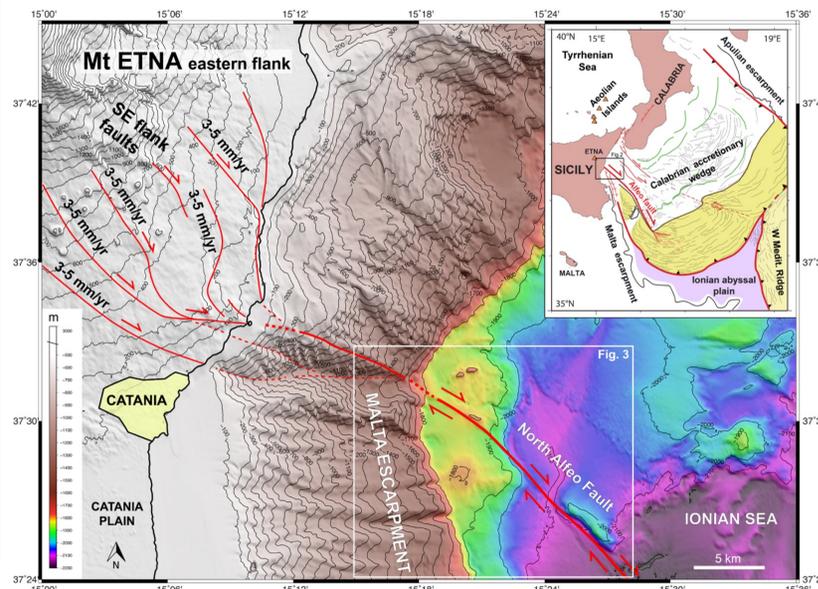
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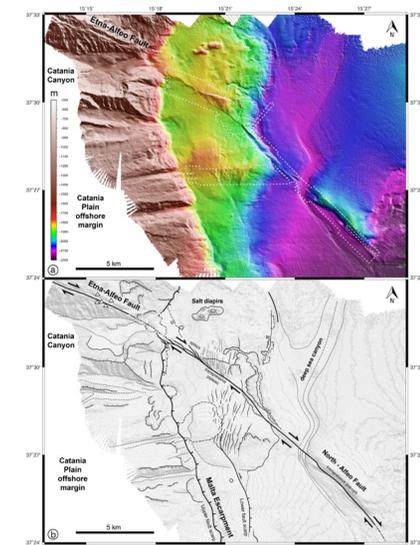
## Abstract / summary

Southern Italy and eastern Sicily have been the site of several destructive historical earthquakes. Here at the junction between 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 southeastern flank of Mount Etna and cutting the western edge of the Calabrian accretionary prism. High resolution bathymetric mapping (1 m grid spacing) conducted by unmanned submersibles along a 15-km-long segment of the North Alfeo Fault 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 implies 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 length of the North Alfeo Fault segment, and sedimentary stratigraphy and chronology indicate that pluri-metric scale deformation has occurred in the past several thousand years, consistent with the generation of magnitude 6 earthquakes.

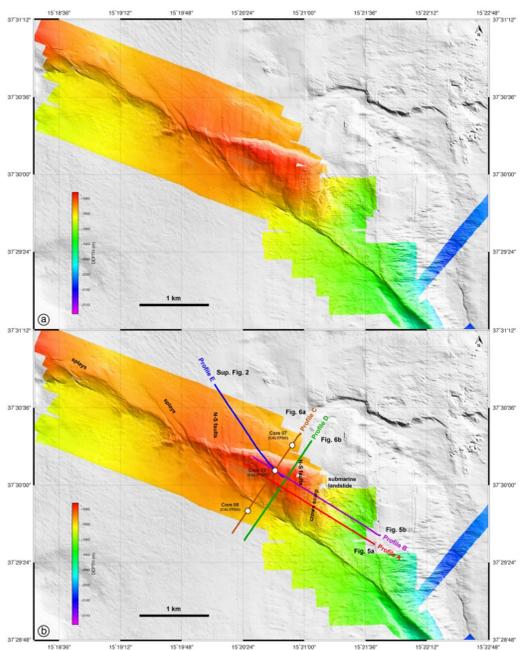
## Regional Setting: East Sicily / Mt. Etna Region



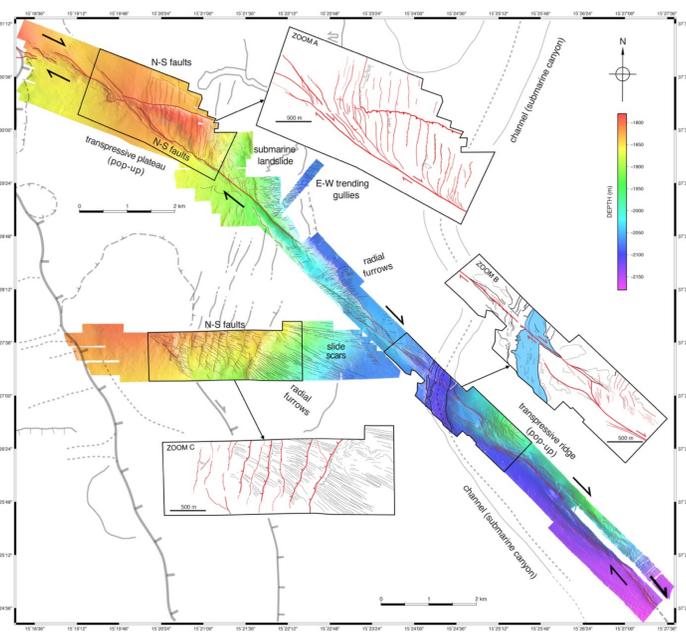
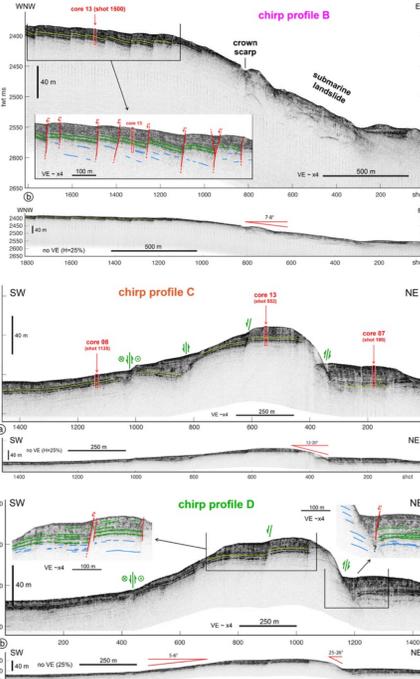
## Bathymetry FOCUS study area



## Micro-bathymetry: triangular plateau, domino faults and splays (1 m grid)

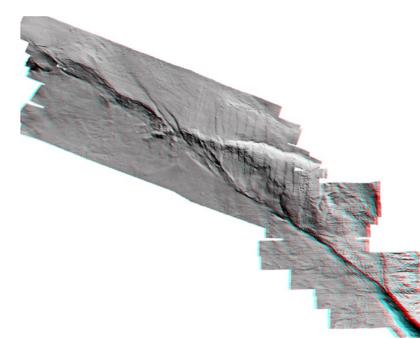


## Chirp (sub-bottom profiles)

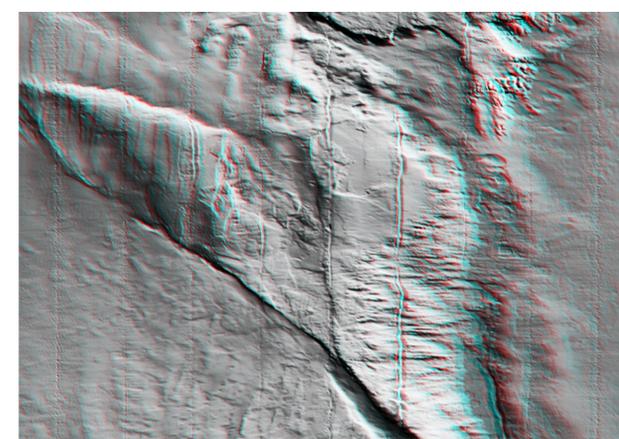


Micro-bathymetry: 15-km-long mapped region (1 m grid), with detailed interpretations (insets)

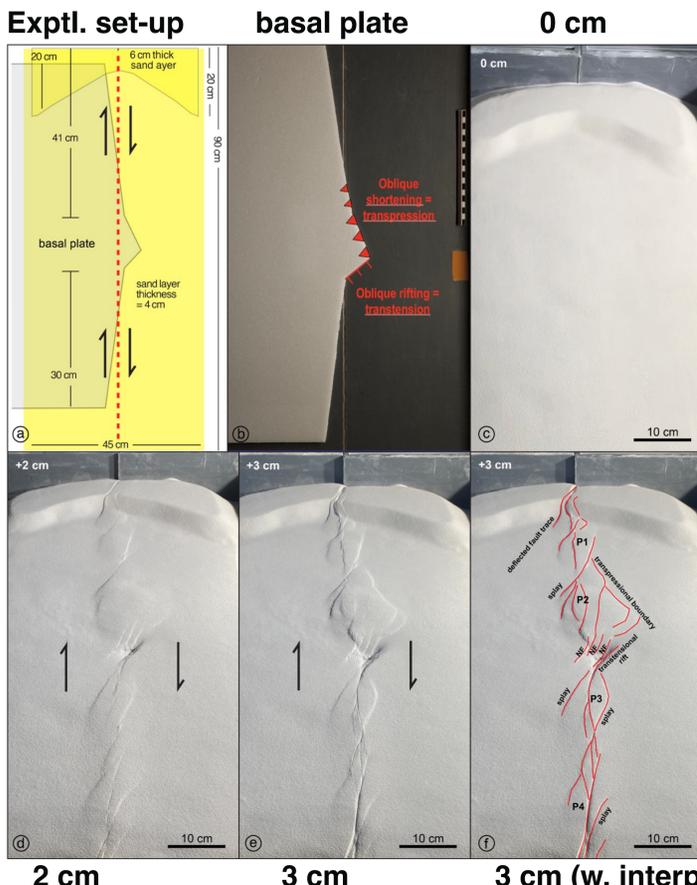
## Anaglyph (1m grid): zoom on triangular plateau, domino faults, splays



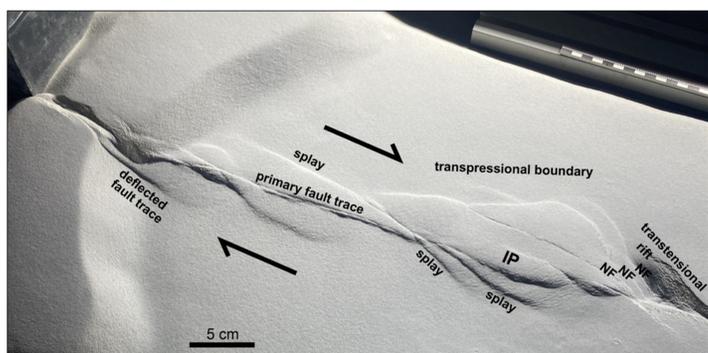
## Anaglyph (5m grid): triangular plateau, submarine landslide and gullies



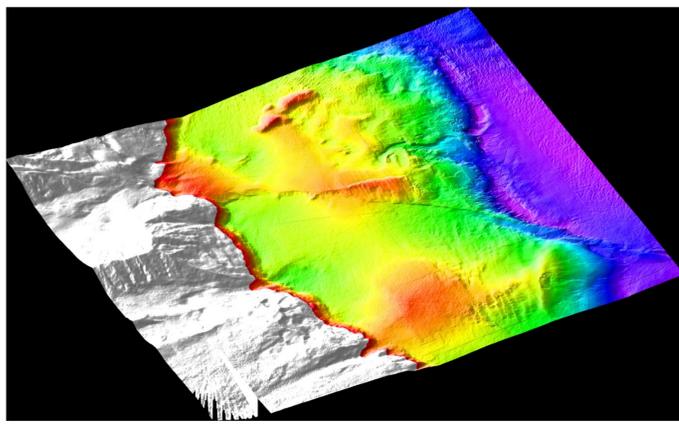
## Analog modeling (Univ. Montpellier laboratory) dextral strike-slip, with triangular asperity



## Analog model (3 cm final stage) oblique view



## 3-D view of micro-bathymetry + ship multi-beam



## 3-D sketch / interpretation

