# THE MONTENEGRO-NORTHERN ALBANIAN CONTINENTAL MARGIN: MORPHOTECTONIC FEATURES IN A SEISMICALLY ACTIVE REGION.

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## Abstract

During four cruises within the ADRICOSM-STAR project high-resolution CHIRP profiles, morphobathymetric data and bottom samples were collected along the seismically active Montenegro and northern Albanian margin. Preliminary analysis of our data suggest that seismogenic structures are marked at the seafloor by morphological features due to deformation of the sediments and possibly to fluid and gas escape.

*Keywords: Adriatic Sea, Continental Margin, Geophysics, Tectonics, Bathymetry*

The Montenegro coastal region is characterized by intense seismicity and by the occurrence of large historical earthquakes, such as the Great Dubrovnik Earthquake (M=7, 6 April 1667), the June 13, 1593 event (M=6.5), with epicenter located close to Kotor, and the June 1, 1905 event, with epicentre near Skadar. The last large earthquake affecting the region is the M=7.1 (15 April 1979) whose epicentre was located fifteen kilometers from the Montenegro coast between Bar and Ulcinj (Fig.1). This last event stressed the importance of studying the Montenegro offshore to localize seismogenic features and trying to understand their behaviour in time. The Montenegro offshore and coastal area has been included in the northern segment of the Ionian-Adriatic coastal earthquake belt ([1]). This area constitutes the eastern boundary of the Adria microplate, a block of continental lithosphere presently colliding with the Dinarides chain since the late Miocene ([2], [3]); it constitutes the most external sector of the chain. Along the Adriatic coast of Montenegro, the 200 km-long plate boundary consists of a WNW trending thrust belt (Fig. 1), cut by NS and rarely ENE oriented strike-slip faults which laterally segment the major thrust front ([1], [2], [4]).

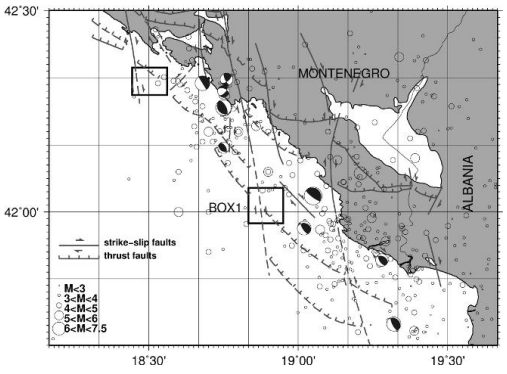


Fig. 1. Structural map of the Montenegro margin ([4] modified). Circles indicate local seismicity and main historical events ([5]). Boxes indicate areas where morphological features possibly related to tectonic deformation were observed

Despite its geological interest and the high seismic hazard, the Montenegro offshore has been poorly investigated in the past, if we exclude extensive multichannel seismic reflection surveys carried out by oil companies, not available to the wider scientific community, and few seismic lines collected during the '90 in the Albania offshore ([3]). During 4 oceanographic cruises, carried out from May 2008 to July 2009 with the Italian CNR research oceanographic ships Urania and Mariagrazia in the frame of ADRICOSM-STAR project (ADRIatic sea integrated COaStal and river basins Management system: Montenegro coaSTal ARea and Bojana river catchment), we collected a set of marine geological and geophysical data offshore Montenegro and northern Albania. Our dataset includes high-resolution seismic reflection profiles and multibeam morphobathymetric data, as well as several sediment samples, gravity cores, grabs, and box corers collected in key areas, selected through interpretation of geophysical data. The sediment accumulation in the coastal area is variable along the margin, probably due to the effect of strong alongshore bottom currents. First results from combined interpretation of seismic profiles and sediment samples suggest that wide areas in the shelf are presently starved, and LGM (Last Glacial Maximum) sedimentary features, such as dunes and sand ridges are present on the seafloor. These features are mostly observed in the bathymetric range 60-120 m and are mainly made of relict coarse sandy material that seems to be cleaned by bottom current reworking.

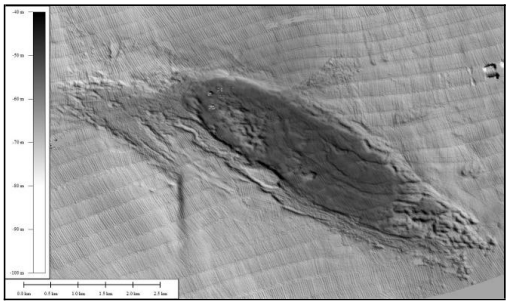

Fig. 2. Morphobathymetric image of compressive deformation along the margin. See figure 1 (box 1) for location

Typical geo-morphological and structural features observed along the margin through integrated analysis of seismic reflection profiles and high resolution bathymetric maps are: 1) hundreds-meter scale bathymetric swells, possibly interpreted as mud volcanoes; 2) elongated, heavily deformed ridges, marking compressive deformation fronts (Fig. 2); 3) rectilinear scarps offsetting the seafloor. All of these features appear aligned with regional tectonic boundaries, described by several authors ([1], [2], [4]) and are thus probably genetically controlled by deep-seated faults. Moreover, a correlation between these features and local seismicity (moderate to large historical earthquakes and recent events) is also observed ([5]). Preliminary analysis of our data suggest that seismogenic structures along the margin, such as thrusts and strike-slip faults, are marked at the seafloor by morphological features due to deformation of the sediments and possibly to fluid and gas escape. This very preliminary results need to be confirmed by further analysis and collection of new data along the margin.

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