PSStratigraphy and Reservoir Architecture of the Apulian Carbonate Platform - Ionian Basin System (Late Cretaceous, Albania)*

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Abstract

In the Late Cretaceous peri-Adriatic domain, the Apulian carbonate platform was located along the eastern side of the NW-SE-oriented Ionian Basin. Both basinal and platform successions were studied in eight outcrops exposed along three mountain belts that are presently part of the Albanian fold-and-thrust system. The Apulian carbonate platform documents significant *in situ* sediment production and accumulation in intertidal to subtidal environments producing 1415 m of Cenomanian-Maastrichtian carbonates. The uppermost part of the platform succession evidences syn-sedimentary deformation inserted in well-bedded intertidal to shallow-subtidal platform deposits. Mass Transport Deposits (MTDs) demonstrate significant lateral variability accompanied by both brittle and ductile deformation. In the adjacent Ionian Basin, the slope and basinal deposits comprise hemipelagites, calciturbidites, and calcidebrites. In addition, spectacular MTDs were recognized and studied analysing the detachment surfaces, syn-sedimentary faults and folds. Their lateral extent points toward multiple regional destabilization events affecting the Late Cretaceous Apulian Platform margin. The age of the Upper Cretaceous Ionian Basin series is constrained in more detail by bio- and chronostratigraphy.

The Late Cretaceous sedimentary evolution of the Apulian-Ionian system shows three stages: (1) A Cenomanian–Turonian period characterized by stable shallow-water conditions on the platform and the associated deep Ionian Basin with no significant influx from the platform; (2) A Coniacian-Santonian interval typified by a broad development of rudist build-ups on the platform shelf. Toward the end of the Santonian, the sedimentary dynamics in the basin changed abruptly with the onset of a massive influx of platform-derived calciclastics; (3) The Late Campanian-Early Maastrichtian period is marked by a major change in the (re-) sedimentation processes marked by the influx of three massive MTD units that make up ca. 25% of the succession. They contain reworked thick sediment packages of up to 40 m thick.

This study aims to discuss reservoir-scale heterogeneities of the carbonate gravity deposits and the associated hemipelagic basin sequence by mapping out the spatial distribution of the bed-packages that compose the slope-to-basin succession. Ancient carbonate platform-slope-basin

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systems may host important hydrocarbon reservoirs as demonstrated by ongoing industrial surveys that focus on this particular carbonate reservoir in Albania and Greece, and investigations elsewhere. This stresses the need for detailed sedimentological research of carbonate platform-slope-basin systems studying grain-size distributions, depositional morphologies (submarine fans vs. sheet like deposits) as well as petrophysical variations and fracture development.



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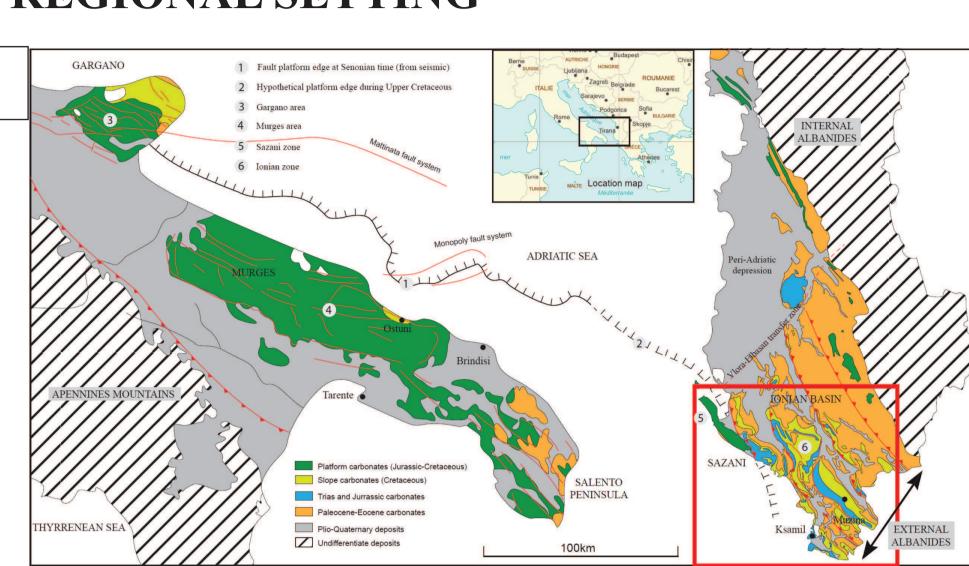
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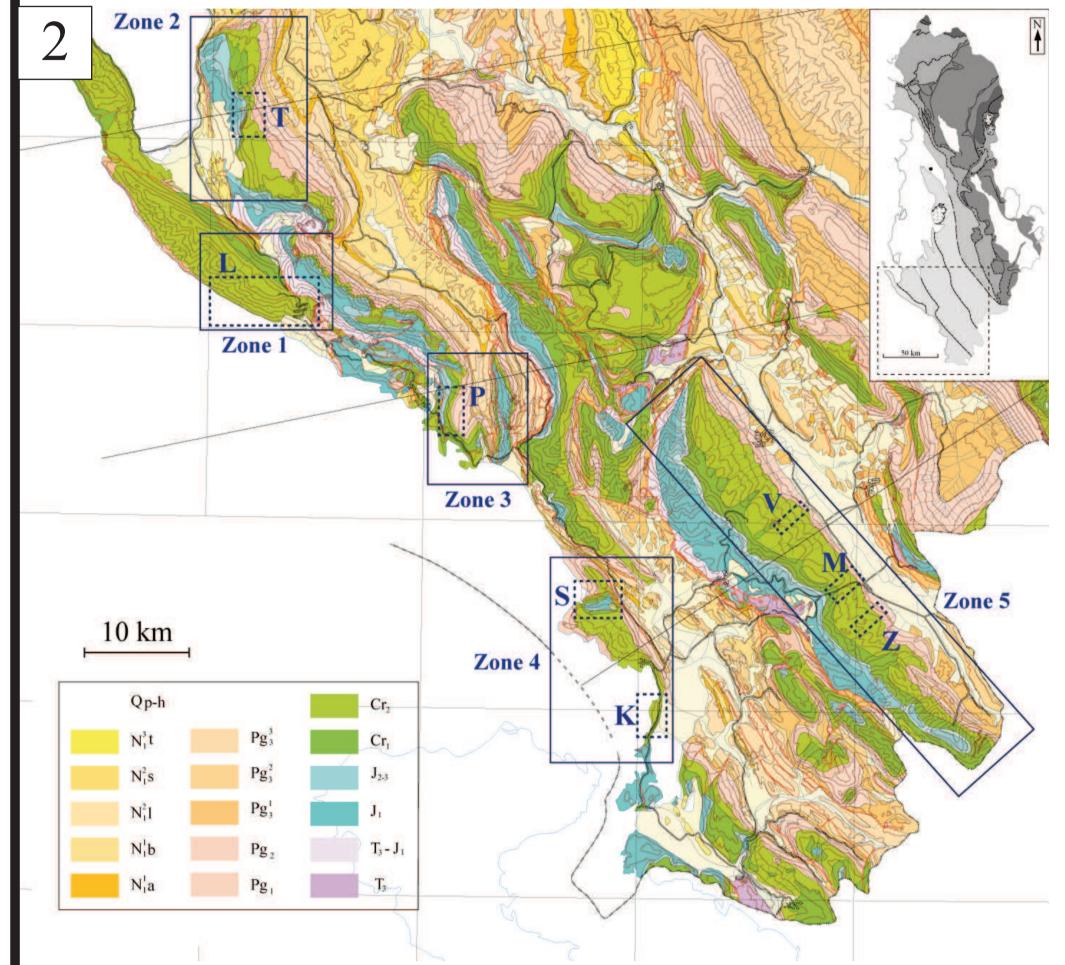
Apulian Carbonate Platform – Ionian Basin

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REGIONAL SETTING

Platform and slope/basin carbonate deposits related to the Apulian margin extensively outcrop in the peri-Adriatic domain, in Italy and Albania (Fig. 1).

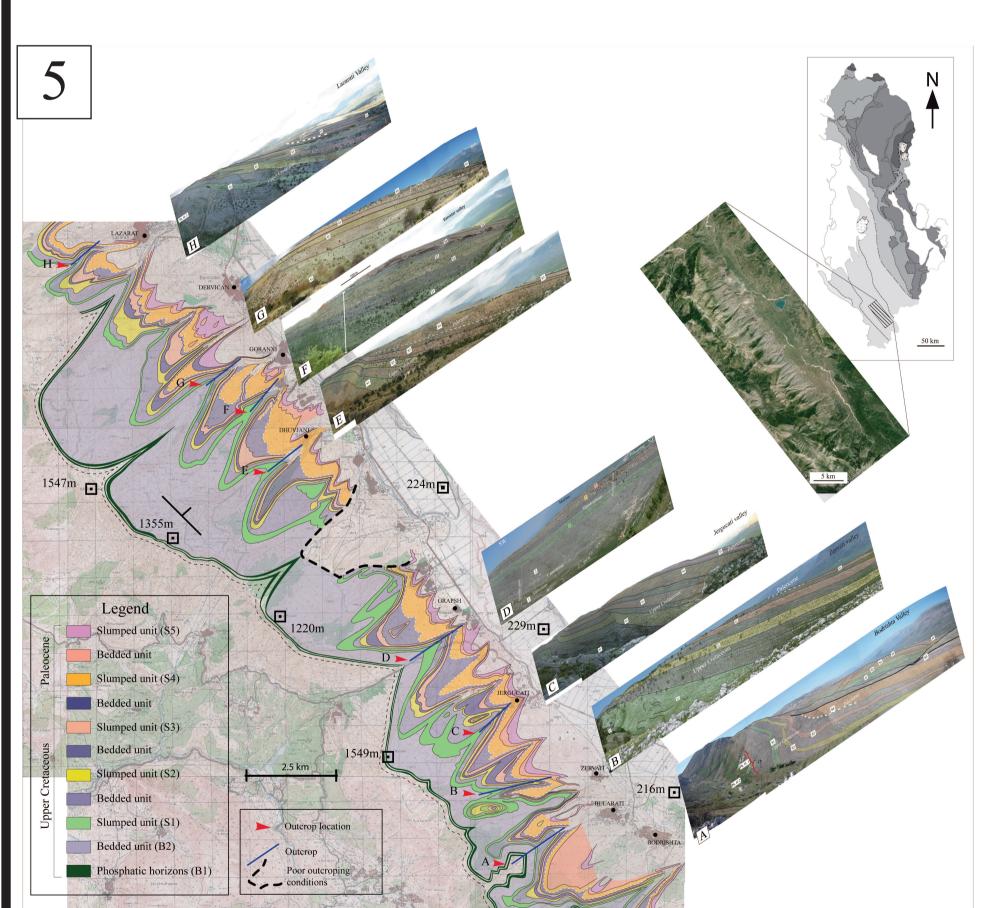




The Sazani zone (Zone 1 in Fig. 2) exposes the Cretaceous platform succession while the slope and basinal carbonate deposits outcrop in the adjacent Ionian Basin (Zones 2 to 5, Fig. 2).

Eight outcrops were studied on the Albanian fold-and-thrust belt in Llogara (L), Tragjas (T), Piluri (P), Saranda (S), Ksamil (K), Zervati (Z), Muzina (M) and Vanister (V, see Fig. 2).

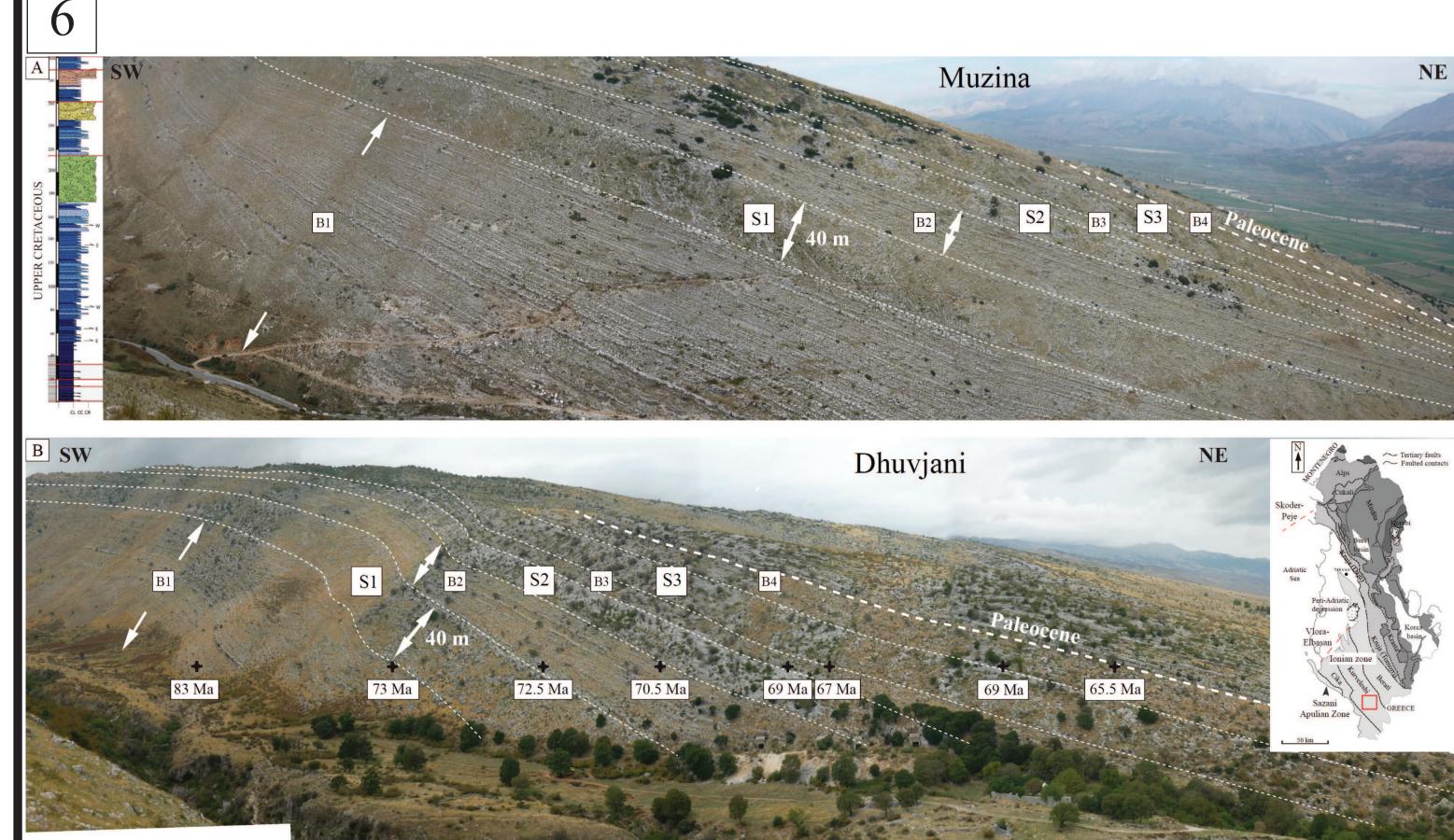
BASIN / SLOPE OUTCROP



The Mali Gjere Moutain belt nicely exposes large-scale out-crops in successive SW-NE oriented valleys (Fig. 5).

This carbonate-exclusive stack is made up of hemipelagites, density-flow deposits and Mass-Transport Deposits also identified as Slumps.

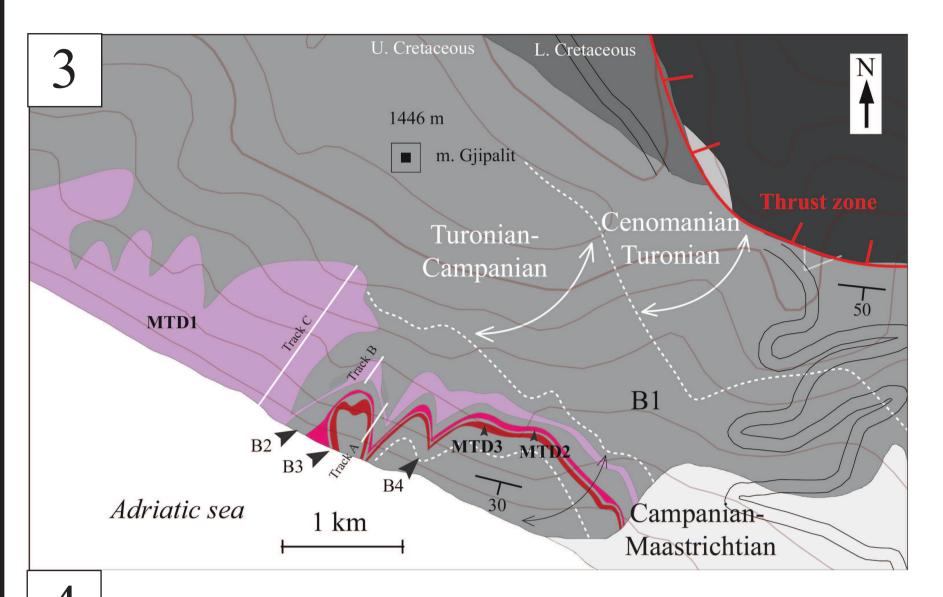
Seven units have been identified and continuously mapped over the Mali Gjere, giving an accurate representation of the architectural framework for this outcrop analogue (Fig. 5 & 6).



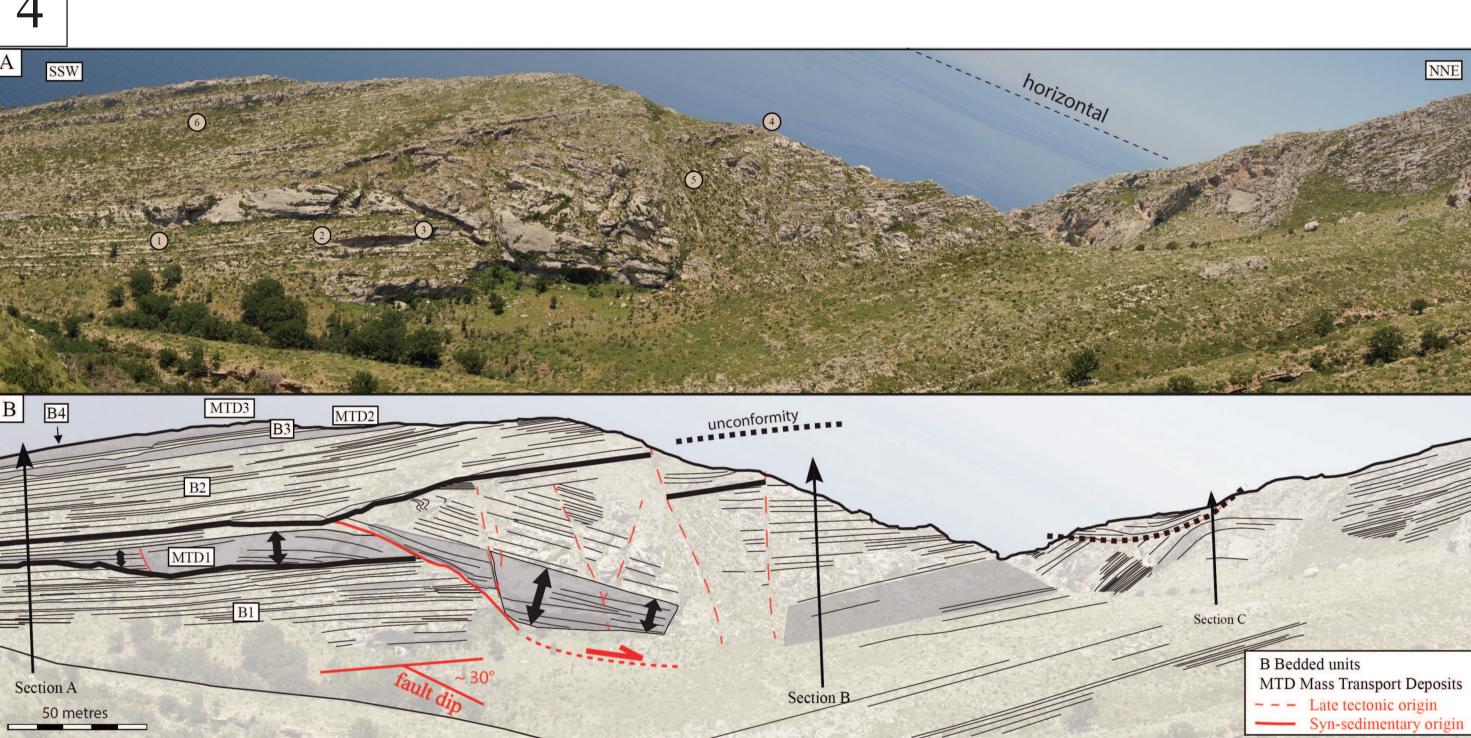
Le Goff et al., in prep.

PLATFORM OUTCROP

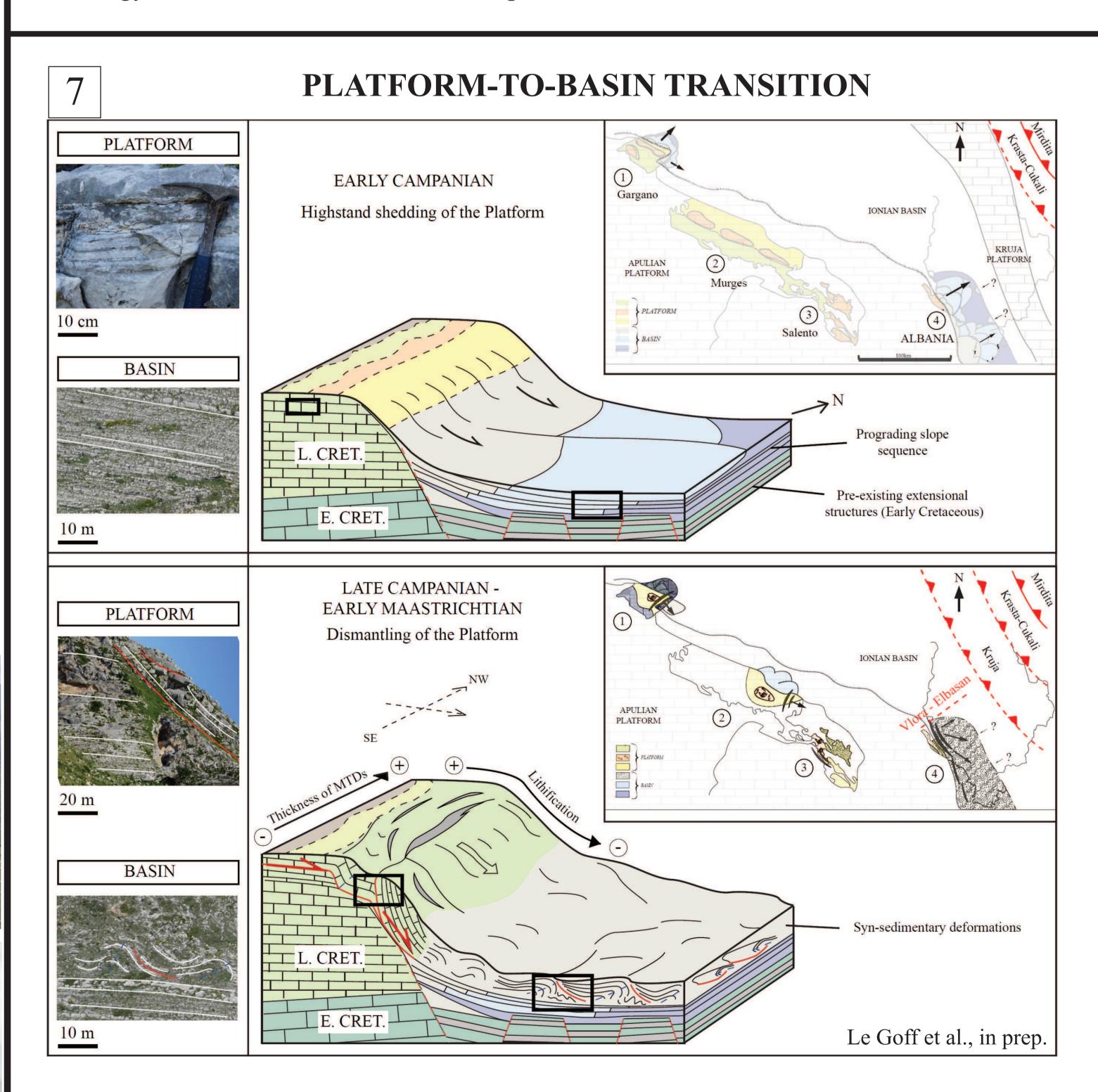
Mass-failures in large-scale carbonate systems result in Mass Transport Deposits (MTDs) made up of large amounts of sediments (1-1000 km³). Because of such volumes they present geohazards affecting seafloor infrastructures, and may pose possible tsunami risks. However they are also promising reservoir targets. The factors controlling downslope transport of unlithified sediment and architecture of MTDs are still poorly understood.



On the Sazani Zone (Fig. 2) deformation features provide evidence for heavy dismantling processes affecting three specific units (MTD1 to 3) each of which being capped by undeformed deposits. These units are mapped in Figure 3.



Syn-sedimentary reworking can be confidently inferred for MTD1 to 3. These deposits reflect three catastrophic events occurring in a 3 to 5 My time-lapse during the Late Campanian-Early Maastrichtian. Well-bedded series of shallow-subtidal and intertidal rocks cover each syn-sedimentary deformed unit and show the re-establishment of a flat, shallow-water and low-energy environment after each catastrophic event.



A continuum of gravity-driven processes occur along continental margins. MTDs are episodic failures of the platform margin that result in the deposition of sedimentological units showing syn-sedimentary deformations of multiple gravity-flow beds in the Ionian Basin. These syn-sedimentary deformations are time-constrained to the Late Campanian – Early Maastrichtian and probably related to tectonic events that affected the whole margin.