

DEPOSITIONAL ARCHITECTURES AND CONTROLS UPON A SUBMARINE SLOPE CHANNEL SYSTEM, NUMIDIAN FLYSCH, SICILY, ITALY

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The Cenozoic Numidian flysch is a foreland basin deposit representing the most widespread tectono-stratigraphic unit in the western Mediterranean. Numidian outcrops may be found in the Alpine belts of Spain, Morocco, Algeria, Tunisia, Sicily and Calabria. Sediments were fed northwards into an east-west oriented foreland basin (Maghrebian flysch basin) which resided in the western palaeo-tethys realm between a growing accretionary prism to the north and the passive African margin to the south. The formation is typically interpreted as deep marine slope and basin floor fan deposits.

Despite great controversy regarding the provenance of the Numidian sandstones, a review of the main lines of evidence clearly constrains the Numidian source to be the north African margin. The tectonic position of Numidian nappes demonstrates consistent deposition proximal to the African margin, while the clastic fraction also contains a Precambrian zircon suite which is inherent to an African craton source. Paleocurrents, assumed by many to point from source to sink, have traditionally suggested a northern source, however our review shows no statistically significant direction, and comparison with analogue foreland systems demonstrates this assumption to be invalid.

The Numidian flysch of northern Sicily contains a variety of depositional architectures including sheet sandstones and channelized deposits. Large slump bodies throughout the stratigraphy indicate a slope environment throughout. In Finale, northern Sicily, coastal outcrops allow characterisation of 16 large channel complexes over an area of 20 Km². Complexes range from 100 to 400 m in width, and reach 80 m thick. Complexes show an incisional geometry and no evidence of levee development. Outside the confines of the complexes, the dominant facies is hemipelagic mudstone, frequently interbedded with thin turbidite deposits. Within channel complexes, density flow facies include turbidites, conglomeratic frictional-debris and grain flow deposits, and cohesive debrites. Massive sandstones up to 8 m thick have previously been interpreted as hyperpycnal flow deposits but may also represent stacked and amalgamated frictional debrites. Channel complexes show a multi storey fill, with storeys defined by channel wide incisional surfaces. Large slump bodies are observed proximal to the margins, and small scale lateral accretion packages occur in the uppermost part of some examples. With younging, complexes migrate up to 5 Km laterally, and show a systematic variation in paleoflow, interpreted as sinuosity and sweep of the system. The coarse erosive nature of the deposits and the incisional geometry of the channels, suggest a high energy upper slope location.

New biostratigraphic and palynological dating shows the Sicilian Numidian to be Aquitanian to end Burdigalian in age, and the channel system to be upper Burdigalian and spanning probably less than 1 Myrs. Thrust faulting from the accretionary prism reached the Numidian slope in the Langhian to Serravelian, such that during channel development, the slope was subsiding through orogenic loading to its north. Also coeval with deposition, an Oligocene to mid Miocene transgression is recorded throughout the Mediterranean. The channel system therefore formed during transgressive to highstand conditions contrary to traditional sequence stratigraphic concepts.

In terms of allocyclic controls, Atlas uplift of the entire north African margin occurred contemporaneously with Numidian deposition. Peaking in the late Oligocene, uplift correlates extremely well with the entire Numidian depositional history. In addition, Oligocene-Miocene climatic warming, punctuated by short glacial episodes, has been previously shown in Malta to increase drainage from the African craton at this time. Current work analysing the clay mineralogy of the Finale section will serve as a climate proxy to help determine its role. We envisage a control of hinterland uplift, coupled with increased climatic humidity to drive erosion, and reworking towards the basin.