DEFINING SEDIMENT PATHWAYS AND BASIN GEOMETRY OF THE NUMIDIAN SANDSTONE (MIOCENE, SICILY) USING DETRITAL ZIRCON ANALYSIS

Pinter, P.R.[1]; Butler, R.[1]; Hartley, A.[1]; Maniscalco, R.[2]; Marques, J.C[3]

[1]University of Aberdeen, UK;[2] University of Catania, Italy; [3]Universidade Federal do Rio Grande do Sul, Brazil

ABSTRACT: U-Pb zircon geochronology has been successfully applied in many sediment provenance studies, but it is less commonly considered on paleogeographic and tectonic reconstructions. Here, we explore the provenance of the Numidian sandstones of Sicily, using LA-ICPMS (UCL, London) radiometric dating in detrital zircons to establish basin geometry and sediment pathways in a tectonically complex turbidite basin. By using detrital zircon data, we establish whether turbiditic pathways have switched sediment source and the connectivity between different depocenters. The Numidian is a turbidite system widespread in the Central Mediterranean, sediments were originally deposited along the ancestral foredeep basin that existed between Europe and Africa during final closure of the Tethys Ocean in the early Miocene. These African-sourced sediments that form the ultra-mature Numidian sandstones(>98% quartz) have attracted attention not only from their composition but also because they are considered a rather unusual deposit for a foredeep basin, classically expected to have major input of orogen-sourced sediments. Competing studies still debate whether Numidian are coming from the proximal active orogenic beltlaid at north of the foreland basin or from the African craton, located originally at south of the foreland basin. A third and less in vogue theory suggests that the Numidian is a “mixed succession” with sediments coming from both European and African terranes. In attempt to test the sediment provenance, source evolution and potential contamination with other sediment sources, we sampled two depocenters of the Numidian turbidites for detrital zircon analysis located in northern (Pollina) and central (Mt. Salici) Sicily. We primarily compare our new zircon ages obtained from the Sicilian depocenters and further compare our data with previous published zircon data from the Numidian sandstone of Sicily and from other parts of the chain (i.e. Tunisia and southern Italy). Our research shows consistent zircon signatures for both Sicilian depocenters, indicating that the sediment source for the Numidian has not changed during the Miocene period and neither indicates contamination with other sources, discarding the “mixed succession” theory. We have also obtained four main zircon age peaks of 550-700 Ma, 1800-2220 Ma, 900-1100 and 2500-2700 Ma, which reveals a strong African signature. These zircon ages have been reported in the literature for the Numidian of southern Italy suggesting that these areas were supplied by the same sediment source, presumably forming a long and narrow turbidite basin that received African-sourced sediments and flushed them directly to down-system areas (now southern of Italy).

KEY-WORDS: SEDIMENT SOURCES; TURBIDITES; U-Pb DETRITAL ZIRCONS AGES