

## Tectonic forcing encoding in the geomorphic and stratigraphic records of a tight source-to-sink system (Northeastern Sicily, Italy)

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*Keywords:* NE-Sicily, source-to-sink system, tectonic forcing.

Recognizing tectonically- vs. climatically-induced base level change signals encoded within the stratigraphic and geomorphic records of coupled source-to-sink systems is still a challenge (Sharman et al., 2019). In this study, we integrate sedimentological, geochronological, and geomorphic approaches to investigate the relationship between geomorphic transience and sediment deposition in a tight tectonically-uplifted source-to-sink system. At the sink we built a luminescence-based age model for the late Pleistocene Pagliara fan-delta complex, located on the eastern side of the Peloritani Mts. (NE-Sicily, Italy), and explored the signal periodicities encoded by environmental proxies. At the source we modelled the base level fall history and the paleo-erosion in the catchment. The ~150-200m-thick Pagliara fan-delta complex deposits are exposed up to an elevation of ~300 m a.s.l. and onlap steep east-dipping bedrock at the coast. Infrared-stimulated luminescence (IRSL) ages of the delta deposits range from ~327 ka to ~208 ka, and provide a vertical long-term sediment accumulation rate as rapid as ~2.2 cm/yr during MIS 7. Cosmogenic <sup>10</sup>Be concentrations measured in two samples collected along the delta indicate MIS 8-7 paleo-erosion rates consistent with the modern rate of ~1 mm/yr (Cyr et al., 2010). In addition, the Magnetic Susceptibility time series analysis evidences the occurrence of some millennial to sub-millennial periodicities pointing out to cyclical past environmental changes, and inspirationally allowing to speculate on the origin of sediment in the source. The Pagliara fluvial topography recorded an unsteady base level fall history, in phase with eustasy and superimposed on a longer, tectonically-driven signal, the rate of which increased from ~0.95 mm/yr to ~1.8 mm/yr in the past 150 ky (Pavano et al., 2024). Finally, we reconstruct the accommodation space history of the hanging wall basin that hosted the Pagliara fan-delta complex deposits. We reconstructed an integrated geomorphic and depositional dynamics of the Pagliara source-to-sink system, evolving in response to regional-to-local tectonic deformation, and climate forcings.

Sharman G.R. et al. (2019) - Conversion of tectonic and climatic forcings into records of sediment supply and provenance: Scientific Reports, 9, 4115.

Cyr A.J. et al. (2010) - Quantifying rock uplift rates using channel steepness and cosmogenic nuclide-determined erosion rates: Examples from northern and southern Italy. Lithosphere, 2(3), 188-198.

Pavano F. et al. (2024) - Integrated uplift, subsidence, erosion, and deposition in a tightly coupled source to sink system, Pagliara basin, northeastern Sicily, Italy. Basin Research, 36(1), e12851, <https://doi.org/10.1111/bre.12845>.