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# CHANNEL PLANFORM CHANGES OF THE LOWER CALORE RIVER, SOUTHERN ITALY (1870-1998)

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The results of a GIS-aided analysis of historical topographic maps and aerial photos aimed at reconstructing the planform changes experienced by the Lower Calore River (southern Italy) between 1870 and 1998 are here presented.

The Calore R. is the main left tributary of the Volturno R., has a total length of approximately 110 km and a 3050 km<sup>2</sup>-wide basin. The last 27 kilometers upstream to the confluence into the Volturno R. constitutes the Lower Calore River, whose basin (also known as Telesina Valley) is about 252 km<sup>2</sup>-wide. The Lower Calore R. is an un-confined alluvial river, as it entirely flows on its own alluvial deposits, mainly consisting of Holocene-aged polygenic gravels and sands.

The present study was carried out by introducing into the ArcGis 9.3 software: (i) 1:50,000-scale historical topographic maps, dated back to 1870, 1909 and 1936, respectively, (ii) 1:25,000-scale topographic map, dated back to 1957, and (iii) 1:10,000 nominal scale color orthophotos, dated back to 1998. The topographic maps, produced by Italian Geographic Military Institute (IGMI), and the orthophotos, provided by Regione Campania, were all geo-referenced in the Gauss-Boaga coordinate system. The active channel, the centerline, the valley axis and the fluvial bars were manually digitized and automatically measured by the software. The obtained results were checked and/or integrated in the field.

The results showed that:

- between 1870 and 1909, the Lower Calore R. experienced a widening by 66%, as the mean width increased from 137 to 228 m, coupled with a straightening, as sinuosity decreased from 1.32 to 1.23 (i.e., -6.6%) and an increase in the fluvial bars area by 57%;
- between 1909 and 1936, the planform channel changes consisted in a slight narrowing (from 228 to 217 m, i.e. -5.1%) and straightening, as sinuosity decreased from 1.23 to 1.21 (i.e., 1.5%), while fluvial bars area decreased by 26%;
- between 1936 and 1998, the river narrowed by 80%, as mean width decreased from 217 to 43 m, while sinuosity increased by 10.8% (i.e., from 1.21 to 1.35) and the fluvial bars area decreased by 86%.

The channel morphology in 1870, 1909 and 1936 was single-thread with few large-sized bars; sinuous with alternate bars in 1957; and, finally, it was again single-thread in 1998, even if much narrower than in 1870, 1909 and 1936 and with a higher number of small-sized bars. The described results are coherent with the pre-existing literature, as both narrowing and widening are reported for Italian rivers between the end of the XIX and the first half of the XX century, while severe narrowing (coupled with incision) is the dominant process in the second half of XX century.

