
Fluvial dynamics and evolutionary trend reconstruction throughout multi temporal dataset analysis. A case study from Basilicata rivers (Southern Italy).

Nicoletta Maria De Musso^{*1}, Massimo Caldara^{†1}, Domenico Capolongo^{‡1}, and Luigi Pennetta^{§1}

¹Department of Earth and Environmental Sciences, University of Bari – Via Orabona 4, 70125 Bari, Italy

Abstract

This study shows a reconstruction of fluvial dynamics and evolutionary trends, applied to the terminal sectors of Bradano and Basento rivers (Basilicata Region, South of Italy) using historical maps, aerial photos and more recent remote sensed images.

In order to cover the widest possible time range, 1873-'75 and 1943-'45 old maps, were integrated with aerial photos (1972, 1954-'55, 1987, 1996) and optical satellite data (2011, 2013). Data analysis was conducted in a G.I.S., which allowed the comparisons and quantitative geomorphic river measures.

After a preliminary image processing of the all dataset, we have applied on the historical maps, a planimetric accuracy analysis - the extent to which distances and bearings between identifiable objects coincide with their true value - which is useful to indicate the geometric reliability of information extracted. For this purpose we have used the technique based on *Map Analyst*, a Java software application (developed and maintained by Bernhard Jenny, RMIT University, Melbourne; with the contribution of Adrian Weber, at ETH Zurich) for the automatic generation of accuracy visualizations.

The 1972, 1987, and 1996 aerial photos were orthorectified with the *LPS* – Leica photogrammetry Suite-2011, a digital photogrammetry software, using the "camera frame" model, as camera calibration certificates were available.

The 1954/'55 aerial photos, for which only camera type and focal length were available, were georeferenced paying attention to Root Mean Square Error value, bearing a maximum RMSE value of about 1.5 m. All of the data mentioned were finally integrated with Bing Maps – GeoEye satellite (acquired on February 22th, 2011) and Google maps – Worldview satellite (acquired on May 18th,2013), which did not need any pre-processing step.

*Speaker

†Corresponding author: massimoangelo.caldara@uniba.it

‡Corresponding author: domenico.capolongo@uniba.it

§Corresponding author: luigi.pennetta@uniba.it

Each preliminary data processing was conducted to make a rigorous quantitative analysis, which could be, as far as possible, accurate. Then, for each dataset, was conducted a photo interpretation and digitization, aimed to highlight fluvial geomorphic characteristics (among them, channel width, sinuosity and degree of braiding).

The analysis shows a rapid channel changing, probably linked to climatic, geological and geomorphological region features which was connected to the semi-arid environment.

Keywords: old map, aerial photo, satellite image, G.I.S., evolutionary trend, fluvial dynamics