L'AEROFOTOTECA NAZIONALE RACCONTA.....MULTI-TEMPORAL PHOTOINTERPRETATION

by Roberto Graciotti

Aerial photographs, if taken to allow a stereoscopic vision, can increase the physical and anthropic information of terrestrial survey acquired by means of direct field surveying.
The synoptic view from above even of vast areas shows, almost immediately, the configuration of the terrain, the mutual relationships of the elements and objects present and the main forms of erosion and accumulation that characterize it.
The observation of aerial photos allows to investigate even inaccessible areas, characterized by steep slopes, high altitude, little or no traffic, where access is difficult, or areas where access is impossible.
It is therefore clear that photointerpretation is a particularly useful investigation technique in the field of Earth Sciences, especially for geological and geomorphological studies. In some university courses, geological photo-interpretation or photogeology has been, and still is, a teaching discipline in its own right.

Multi-temporal photointerpretation

Photointerpretation can be defined multi-temporal when observation concerns photograms covering the same portion of territory in different periods. The study of the various photograms allows us to evaluate the natural and anthropogenic changes in a given territory, in a precise time interval and also to estimate their evolution in terms of speed.
Multi-temporal photointerpretation is particularly useful in geomorphology, when certain morphotypes must be monitored, such as geometry and morpho-evolutive characteristics of landslides, damage caused by intense flood events, amount of volcanic eruptions and forms of accumulation and erosion that they generate in the landscape, area and volumetric variations of the glaciers, extension deltas, retreat of high cliffs and evolution of the aeolian dunes, etc.
Finally, the increasingly growing use of multi-temporal photointerpretation in the estimation of landscape changes following anthropic morphogenetic processes (such as earthworks, terracing, mining activities and so on) is worth mentioning.
Of course, the study of a given territory or of a single morphotype will be the more accurate and detailed the more images will be available, and the larger the time span they embrace will be.

MAPRW (RAF and USAAF) and GAI flights

It should be noted that with Google Earth imagery the changes in landscape and its evolution can be observed only since 2001. However, if we consider the aerial photos taken by the Gruppo Aerofotogrammetrico Italiano (GAI) we might observe the whole Italian territory in the years 1954-1955; and if we add to them those taken during World War II by the Allied Forces on a large part of central-northern Italy it is even possible to go back in time up to the years 1943-1945.
These two distinct sets of photographs are very important, precisely because they allow us to examine the territory respectively around 65 and 75 years ago, establishing comparisons and differences in its structure. The GAI flight is available at the Istituto Geografico Militare, based in Florence; the Allied coverage of Italy (collectively known as MAPRW, Mediterranean Allied Photo Reconnaissance Wing, and mainly taken by RAF and USAAF air forces) are available from Aerofototeca Nazionale (AFN), based in Rome, and from the National Collection of Aerial Photography (NCAP), based in Edinburgh.

Two case studies

a) *The delta of the Tiber river*

Fig. 1 - AFN, MAPRW collection, frame 3076 of mission no.26, taken by 23rd Squadron RAF on August 20, 1943, 8,30 a.m.; 24" focal, altitude 31,500 feet.

Fig. 2 - © Google Earth, 2004

Fig. 4 - © Google Earth, anno 2019

Fig. 3 - AFN, MAPRW collection, frame 3112 of mission no.12S-175, taken by 3rd Photo Group USAAF on August 26, 1943, 9,30 a.m.; focal 24", altitude 29,000 feet.

Image n. 3076, taken on August 20, 1943 (fig. 1), shows the mouth of the Tiber river and the various systems of beach ridge, marked by light-colored arched bands formed during the progradation of the delta alternating with darker bands of beach ridge, showing the presence of finer sediments and organic matter.
The image in fig. 2 roughly covers the same area shown in fig. 1. We immediately notice the great anthropic changes that have affected and transformed the environmental context of this area.
The part where the beach ridge were earlier clearly visible is now notably reduced, due to urban expansion; both river banks near the mouth have been completely invaded by residential settlement and harbor works that have modified and altered the coastal morphodynamics of this particular natural ecosystem.

b) *Ostiense district - via della Villa di Lucina*
The area represented in the image in fig. 3 includes a part of the urban territory between the Basilica of San Paolo fuori le mura and the Via Cristoforo Colombo, that appears still under construction.
In earlier IGM maps the area circled in red is named as "Marrana di Grotta Perfetta", from the name of the homonymous tributary of the Tiber river on its left side. Until the early 1960s this was a depression, consisting of palustrine deposits, of poor consistency and poor geotechnical characteristics.
The image in fig. 4 points out the deep anthropic changes brought in the area, highlighted with the red ellipse in the previous image, between Via Ostiense (left) and Via Cristoforo Colombo (right). This area of "marrana", characterized palustrine deposits with poor physical and mechanical characteristics, has been reclaimed by filling with large quantities of landfill. The reclaimed area was then urbanized, with the construction of several buildings of considerable size, whose excessive weight on unsuitable terrains caused, in a short time, prolonged and significant subsidence that caused their heavy inclination.

Conclusions

The two case studies described above clearly show the great importance of multi-temporal photointerpretation, particularly if performed with the aid of historical aerial photos, taken in times when the territorial context was nearly everywhere profoundly different compared to the current one.
In the first case the progradation of the Tiber delta can be studied in its natural geo-environmental context and the morphodynamic evolution of the coastline can be compared before and after the anthropic expansion of the 1960s.
In the second case it is evident that the timely use of this survey technique would have provided a better physical knowledge of the territory, and the serious damages suffered by the anthropic works carried out on unsuitable foundation terrains could have been avoided.

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KEYWORDS

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