

Application of Multi-Source and Multi-Stage Historical Aerial Photographs and Maps on Environment Change Analysis - a Case Study of Taiwan's Chenyulan River Watershed

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Historical aerial photographs and maps are important cultural properties with high values on recording the environment change in time and space. However, photographic film, paper maps or photographs are often damaged and aging due to variations in physical properties. In view of this, the Center for Geographic Information Science Research, Academia Sinica, had actively cooperated with many units who preserved those aerial photographs and maps, and had constructed core architecture of the researches of past environment change in Taiwan by building digital archives in recent years.

In order to verify the value of multi-source and multi-stage historical aerial photographs and maps on environment change, we chose Chenyulan River Watershed in Taiwan as a study area, and integrated: (1) black and white aerial photographs (1947~1952, and 1961); (2) colorful aerial photographs (1999~2010); (3) photo base maps; (4) colorful photographs from unmanned aerial vehicles; (5) Taiwan maps in Japanese colonial period on the geographic information system platform. Different ways were used for assigning the geographic coordinates of varies kinds of aerial photographs and maps, and land cover maps produced over time were also compared based on the classifications of basic land use in Taiwan.

The results showed that the digital aerial photographs and maps are easy to save and use. They are also powerful evidences for the researches of environment change after being given the geographic coordinates. The landscape change information from historical aerial photographs and maps can be used for analyzing the population migration, agriculture, deforestation, and characteristics of settlement in mountainous areas by pairing with the knowledge of history, anthropology, geography and sociology. It will be helpful to understand the long-term spatial relationship and the causations between human activities and natural environment. The historical aerial photographs and maps can be further combined with historical image database of systematic changes in time and space as well, and the depth and breadth of the research of man-land relationship will be greatly expanded.

Keywords: historical aerial photographs and maps, digital archives, environment change, man-land relationship

多源多期歷史圖資於環境變遷分析之應用 -以臺灣陳有蘭溪集水區為例

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摘要

航空照片與歷史地圖為重要文化資產，具有記錄環境時空變遷之珍貴價值。但航照像片、紙本地圖或原始底片常因年代久遠而產生物理性質損毀與老化。有鑒於此，中央研究院地理資訊科學研究專題中心近年來積極與臺灣歷史航照原始保存單位合作，進行航照底片與歷史地圖數位化掃描，以建立臺灣歷年時空變遷研究之核心架構。

為驗證多源多期歷史圖資於環境變遷分析之應用價值，本研究以陳有蘭溪集水區為研究區，於地理資訊系統(Geographic Information System, GIS)平台上整合：(1)1947~1952、1961黑白航照；(2)1999~2010彩色航照；(3)歷年像片基本圖；(4)無人載具拍攝之彩色航照；(5)日治時期臺灣老地圖，除分別採用不同之糾正與正射方法賦予不同類型航照與歷史地圖地理座標外，亦依據地表分類項目產出不同時期之地表覆蓋圖層並套疊比較歷年變遷。研究結果顯示，數位化歷史圖資不僅具完善保存資料與流通便利之功能，在賦予地理座標後亦可作為環境變遷研究完整且有力之證據。而透過歷史圖資所獲得之地景變遷資訊亦可搭配歷史學、人類學、地理學與社會學等不同學門研究方式，針對山地集水區人群遷徙、農墾伐林，以及聚落選址特性進行探討，此將有助於了解長期時自然環境變遷與人為活動之空間關聯與因果關係。而未來更可進一步結合歷史影像資料庫進行系統性時空變遷分析，相信將能大幅拓展人地關係研究之深度與廣度。

關鍵字：歷史圖資、數位化、環境變遷、人地關係

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