Land use cartography from multispectral images

June 2005/Version 2

Image from the Landsat satellite.

Images from Landsat satellites have been used for the extraction of thematic cartography for more than 30 years. One of the methods used most frequently for obtaining land use maps is the supervised classification of multispectral images.

Since 1982, the ICC has carried out a classification of the land uses of Catalonia from satellite images in the Landsat series every five years, defining a legend of up to 21 classes, with accurate error determination. The map has been used for territorial analyses that cover the whole of the territory of Catalonia or significant areas of the territory. In 2003 the fifth version of this map was commenced, using a minimum of 3 images from the ETM sensor of the Landsat-7 satellite as the base elements.

For this classification of the territory it is necessary to take the last land use map into account, in order to minimize errors that may be introduced in the updating process. For this reason, work is performed with a contextual classifier, which arranges the pixels of the image into natural parcels or mosaics that are assigned to a class en bloc.

There is also a control process performed by experts with considerable knowledge of the territory, in order to detect possible inconsistencies in the automatic process, but at all events, work continues with the mosaics as entities, and these are reassigned to a new class if necessary. Naturally, advantage is taken of the ICC's orthographic series of Catalonia at different scales, specifically at 1:25 000 and 1:5 000, in color or infrared color. For the more urban classes a special process is employed, given that the resolution of the Landsat images is considered inappropriate for these legend entries. The ultimate aim is to obtain a land use map with an accuracy of over 85% for all the entries in the legend, when work is performed with all the data (with the whole of Catalonia). This degree of confidence in the data drops sharply when work is undertaken with smaller units, such as districts or municipalities. In order to assure these levels of confidence, in 2003 the degree of supervision will be increased, with the aim of maintaining the level of accuracy for all the classes, including the regional (*comarca*) level.

Applications

A parallel application of the land use map is the annual determination that the ICC has made since 1986 of the zones of more than 50 hectares affected by forest fires (more than 20 hectares from 2002 onwards). In this case, a multispectral classification is made with images taken from before and after the fire, so that the area affected can be determined. By making an overlap with the last land use map, the uses affected by the fire can be established, and with the subsequent maps a follow-up can be made of the development of the areas affected by forest fires.

The main applications that use this data are those orientated towards territorial organization, territorial planning and analysis or monitoring of the environment.

The thematic information of the map is defined by 21 classes of land use.
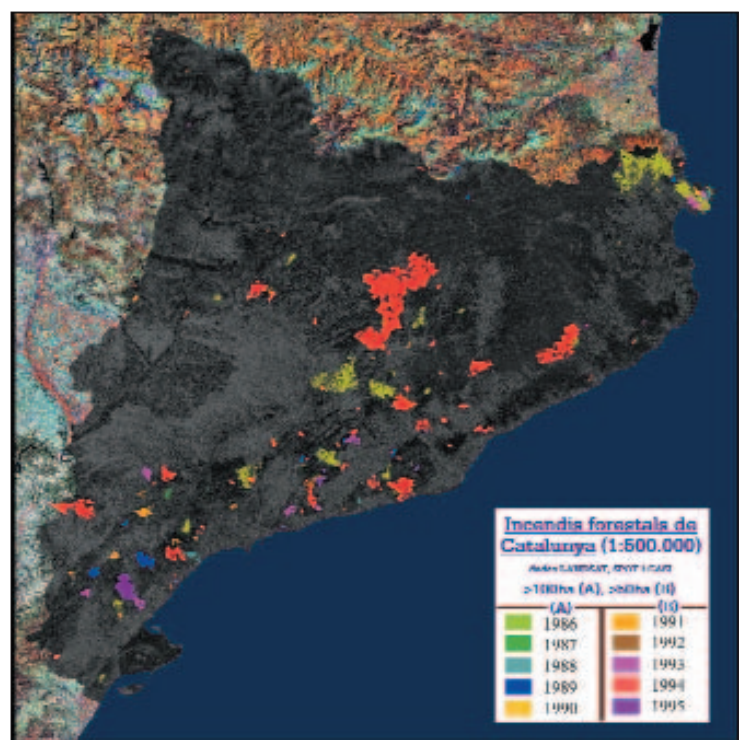
Map of zones affected by forest fires.