

# NEWSLETTER

INSTITUT CARTOGRÀFIC DE CATALUNYA

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## AVALANCHE CARTOGRAPHY

**T**he *Mapa de zones d'allaus de Catalunya* 1:25 000 (avalanche areas) represents a new series of thematic cartography produced by the ICC, which, in 14 sheets, shows the areas liable to be affected by avalanches in the Catalan Pyrenees, that is to say, those areas in which avalanches of various sizes have occurred in the past. Through the study of geomorphological, vegetational and historical evidence, it is possible to determine the size of avalanches.

**“THE SHEETS SHOWING  
THE NORTHERN VAL D'ARAN  
AND THE SOUTHERN VAL D'ARAN  
CAN BE FOUND AT THE ICC DIS-  
TRIBUTION AND SALES CENTERS”**

By photointerpretation of vertical aerial photographs and orthophotomaps without snow the geomorphological characteristics, the roughness of the terrain and the various types of vegetation of the areas affected by avalanches are observed. Furthermore, with the help of the inclination map, the area affected is delimited.

Following this, field work is undertaken to identify and describe the avalanche areas previously determined by photointerpreta-

tion. By means of direct observation on the terrain while there is no snow, detailed characteristics that cannot be observed by photointerpretation are collated, and verification is made of the morphology of the slope and the delimitation of the areas (especially the area where the avalanches arrive).

Finally, a survey is made among local people in order to obtain information about the various avalanche incidents (types, frequency, period in which they occurred, etc.) and their limits. This information is complemented by bibliography and data from the ICC's nivometeorological observation

network, rural organizations and hikers in general. There are thinly-populated and little-visited sectors where the lack of information is evident.

**“ALL THE INFORMATION  
COLLECTED TO PRODUCE  
THE SERIES IS INCORPORATED  
INTO THE ICC'S AVALANCHE  
DATABASE”**

This cartography and its associated databases are very useful for territorial planning and they will provide the basis for studies on the minimization of the risk represented by this natural phenomenon.



Partial image of the northern Val d'Aran sheet

### Areas covered

1. Northern Val d'Aran
2. Southern Val d'Aran
3. Ribagorçana-Sant Nicolau
4. Northern Pallaresa-Marimanya
5. Vall d'Àneu-Sant Maurici
6. Vall d'Àssua-Vall Fosca
7. Lladorre-Certascan
8. Vallferrera
9. Santa Magdalena-Pic de l'Orri
10. Northern Segre-la Llosa
11. Cadí-Pyrenean foothills
12. Moixeró
13. Freser-Núria
14. Ulldeter-Serra Cavallera

## SUMMARY

Avalanche cartography

www.icc.es

Cartography for the Argentinian Republic

Vegetation maps at 1:50 000

Maps of Lleida and Girona

Airborne gravimetry

New seismic network

Territorial boundary marking

Aerial photographs of Catalonia

The MTN. Its presence in the Cartoteca de Catalunya

CARTOSUR

Aeronautical distinction

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Institut Cartogràfic  
de Catalunya

**www.icc.es**

**N**ew content has been added to the ICC's avalanche Website for the 1998-99 season. In addition to the forecasting of avalanches and of meteorology for the Catalan Pyrenees, information about the forming and type of avalanches, the safety measures to be taken into account in a hazardous situation, the telephone numbers for information about avalanches in the Pyrenees in Huesca, Navarra, Andorra and France, and the European scale of avalanche danger. It is also possible to consult the most important addresses related to the world of snow in Europe and America, cartography showing the total snow thickness and the accumulated snow precipitations in the last 24, 48 and 72 hours, and a summary of daily data recorded from November to May by the ICC's network of automatic nivometeorological stations located above 2 000 meters in altitude.

This information, which is completed by news, separata and reports on the subject,

**“DURING THE 1997-98 WINTER SEASON THE AVALANCHE WEBSITE RECEIVED MORE THAN 8 000 INQUIRIES”**

also includes a questionnaire aimed at persons who have observed an avalanche in the Catalan Pyrenees, in order to supplement the registry of cartography of the avalanche areas.



# CARTOGRAPHY FOR THE ARGENTINIAN REPUBLIC

In 1998, the Argentinian Republic project, that begun in 1995 as a result of a collaborative agreement with the Instituto Geográfico Militar (IGM) of Argentina was completed.

This project consisted of the production of satellite image cartography by the ICC at 1:50 000, 1:100 000 and 1:250 000 scales and the technology transfer to the IGM that enables it to perform the tasks to create this cartography and to continue towards coverage of the entire territory.

During the initial phase, a pilot test was made in order to ascertain the problems rela-

ting to the changes in the reference system, the quality of the images obtained at the local reception stations and their distribution, and the difficulties involving the location and measurement of ground control points for the orientation of the images.

During the process, the campaign was defined to measure the control points with GPS receivers and in this way to adjust the image deformation models, and to create an elevation database to rectify the satellite images of the mountainous areas.

The total number of satellite images computed in order to prepare the 717 sheets of the project was 226 (69 are SPOT images, from SPOT Image, and 157 are Landsat-TM images,

from the Instituto Nacional das Pesquisas Espaciais –INPE– in Brazil).

In 1999, a new project commissioned by the IGM will be defined, which will also last 4 years. The aim is to produce topographic cartography at 1:100 000 scale of 40% of the Republic territory (approximately 1 000 000 km<sup>2</sup>), and there will be a total of 728 sheets.

As in the case of the completed project, there will be a technology transfer to the IGM, so that this institution may complete the production of this cartography within its territory. For this purpose, the production line will be established, a complete system of the ICC programs will be installed, and the IGM technicians will be trained.

## General characteristics

Number of published sheets	717
Years of execution	1995-1998
Total covered area	2 200 000 km <sup>2</sup>
Projection system	Gauss-Krüger
Datum	Campo Inchauspe (1995-1997) and Posgar (1998)
Number of the land uses represented	27

## Dates of the images acquired

- Thematic Mapper sensor of Landsat-5 satellite  
15 May 1990-24 August 1997  
80% captured 1994-1996  
89% during southern summer (October-March)
- Multispectral mode of SPOT satellite  
22 September 1988-13 February 1995  
95% captured 1995  
52% during southern summer
- Panchromatic mode of SPOT satellite  
14 January 1990-13 February 1995  
78% captured 1994-1995  
26% during southern summer

## Characteristics of each scales

	1:50 000	1:100 000	1:250 000
Number of sheets	153	395	169
Covered area	65 000 km <sup>2</sup>	677 000 km <sup>2</sup>	2 200 000 km <sup>2</sup>
Covered zone	Principally urban areas	North of parallel 39 and Tierra del Fuego	Principally north of parallel 39 and Tierra del Fuego
Images acquired from	Landsat-5 satellite: Thematic Mapper sensor SPOT satellite: multispectral mode panchromatic mode	Landsat-5 satellite: Thematic Mapper sensor SPOT satellite: multispectral mode	Landsat-5 satellite: Thematic Mapper sensor



Coverage of Salta, San Miguel de Tucumán and San Fernando del Valle de Catamarca zones

## RESEARCH AND

## AIRBORNE GRAVIMETRY

In autumn 1998, the ICC made the first gravimetric flight over Catalonia. The flight was completed with the Cessna Citation-I jet plane and the Litton LTN-101 inertial sensor combined with a high-precision GPS receiver was employed. Processing of the data obtained will make a homogeneous set of gravitational anomalies available, with a view to improving the UB91 geoid of Catalonia in the future.

**“ONE OF THE MOST INNOVATIVE  
TECHNIQUES IN THE FIELD  
OF AIRBORNE GRAVIMETRY  
IS THE INTEGRATION OF INERTIAL  
SYSTEMS WITH GPS RECEIVERS”**

Knowledge about the variations in the gravitational field is of great importance for geodesy, geophysics and navigation, particularly since the introduction of satellite-based positioning systems. The efficient and accurate modeling of these variations, specifically the determination of the geoid, is one of the principal activities of current geodetic research.

The gravitational field can be determined by various types of measurements: gravimetry and satellite/land gradiometry, the combination of GPS heights with leveling, airborne gravimetry, satellite altimetry,

astronomic deflections from the vertical... At a certain level of precision, airborne gravimetry is considerably superior to land methods in terms of cost and efficiency. Furthermore, it offers great measuring potential in areas that are remote and difficult to reach.

One of the most innovative techniques in the field of airborne gravimetry is the integration of inertial systems (INS) with GPS receivers. Basically, use is made of the differences between the INS and GPS accelerations in order to obtain gravitational anomalies. The INS (also used for the orientation of sensors) enable the acceleration due to gravity to be determined, plus that due to the dynamics of the plane, while the GPS only provides the acceleration due to the dynamics of the plane.

Estimation of gravity based on INS-GPS measurements is a complicated technique because of the noise present in the INS-GPS data, which is quite considerable - a noise/signal ratio in excess of 1 000 - and highly dependent on the dynamics of the plane. At the same time, the optimum way in which to use the gravitational anomalies obtained for the determination of the geoid is an open problem. The accuracy that can be obtained using this method is in the order of 2-3 mGal and sufficient for the determination of an accurate geoid.



# VEGETATION MAPS AT 1:50 000

As a result of an agreement with the Institut d'Estudis Catalans (catalan studies) and in collaboration with the Departament d'Agricultura, Ramaderia i Pesca (agriculture, stockbreeding and fishing) of the Direcció General del Medi Natural



Partial image of La Seu d'Urgell 215 (34-10) sheet

(environmental), the ICC has been publishing the *Mapa de vegetació de Catalunya 1:50 000* since 1994.

The thematic information for the series is prepared by the Department of Plant Biology of the University of Barcelona through field work and the interpretation of aerial photography. The structure of each sheet enables it to be read on three

**“IN DECEMBER 1998 6 SHEETS ARE AVAILABLE FOR PURCHASE AT THE ICC'S DISTRIBUTION AND SALES CENTER”**

different levels: the physiognomy of the vegetation, the units of current vegetation and the potential domains of the area studied.

The cartographic information is drawn from the databases of the ICC: the altimetric database, toponymic database and digital cartography database 1:50 000 symbolized by means of semiautomatic processes.

The sheets are accompanied by two vegetation profiles, each with an appropriate legend, a hypsometric map, a lithological map of the area at 1:250 000 scale and a guide map at the same scale.

Furthermore, although they are not part of the series, since the section is different, vegetation maps of the Ribes valley and the valleys of Espot and Boí have been published.

Each sheet includes a record that adds to the information about the area mapped. The physical environment is shown (position, physiography and substratum, stratigraphy and climatology), the phytotopography and dynamics of the plant landscape, a description of the units mapped and a syntaxonomic plan. Furthermore, the legend is extended and the bibliography consulted is included.

**NEW**

## MAPS OF LLEIDA AND GIRONA



As a result of collaborative agreements with the Diputació de Lleida and Diputació de Girona (regional councils), the ICC has published a topographic map at 1:200 000 scale of the province of Lleida, and, an administrative and a topographic maps at the same scale of the province of Girona, which, in addition, are published at 1:100 000 scale.

The aim of these cartographic products is to provide an overall perspective of the territory shown. There are geographic elements that are represented on these maps due to their importance in the territory. This is the case, for example, of the road network, which, in broad terms, may be said to have a structuring influence on the space, like the hydrographic network.

With respect to the topographic maps, the information is represented on a hypsometric base with shaded areas depicting the mountains. The orography, constructions, communications, hydrography, administrative boundaries and bathymetry are all visible. The name of the *comarca*, of the municipality and of other smaller units that are classified according to their number of inhabitants are also shown. The information has been drawn from various cartographical and geographical databases of the ICC.

With respect to the administrative maps, the main levels on which they may be read, in accordance with their subject matter, relate in the first place to the *comarques* and municipalities, and to a lesser extent to the geographic features bordering on the Mediterranean and the adjacent areas. The *comarques* are marked by different shades of color, the element that provides the reader with an idea of their size, borders and position. Furthermore, the official name of each *comarca*, that of its capital, the name of the municipality and that of the municipal capital and the name of other smaller territorial units are marked in writing that employs various typology.

The design of these maps enables them to be read on different levels: a global perspective is possible thanks to the coloring and the graphic representation of the main elements that make up the territorial structure, while a detailed view is gained through the use of legible lettering.

## DEVELOPMENT

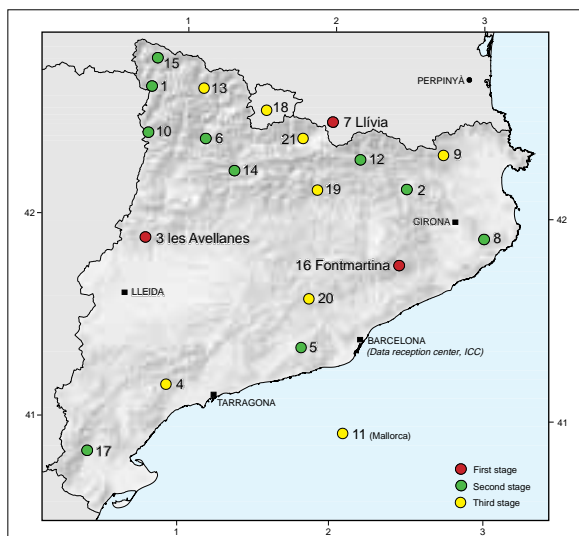
### NEW SEISMIC NETWORK

With the dual aim of providing Civil Defense services, the media and society in general with rapid information in the event of an earthquake and of obtaining systematic quality seismic data for the scientific community, a project has been drawn up for a new seismic network in Catalonia that plans to install up to 20 seismic stations equipped with three-component broadband sensors with a considerable dynamic range. The stations will have VSAT antennae to send the seismic information via satellite in almost real time to the ICC, which will have a mini-HUB for reception purposes. The data will be processed using a set of programs that make it possible to automatically locate the earthquakes of interest, to file the complete data and to quickly circulate the basic information about the seismicity recorded.

A study has been made with respect to the siting of the stations and a full project has been completed, providing definition of the field stations, the satellite

communication system, the reception and analysis center, and the comparative measurements with a broadband sensor for calibration of the new instrumentation and for definition of the method of characterizing the background noise of the sites.

At the end of 1998, during a first phase, three seismic stations with this new technological configuration serve the Catalan network, together with the seismic data reception center and the corresponding link via the Hispasat satellite.



Operational stages in the new seismic network

## BRIEF NOTES

### THE MTN. ITS PRESENCE IN THE CARTOTECNA DE CATALUNYA

As part of the policy to increase the resources of the ICC's Cartoteca de Catalunya (map library), the civil and military versions of the *Mapa Topográfico Nacional 1:50 000* series have been completed, published by the current Instituto Geográfico Nacional and the Servicio Geográfico del Ejército respectively.

In both versions the MTN consists of 1 130 sheets, of which 1 036 cover the territory on the peninsular, 42 cover the Canary Isles, 26 show the Balearic Isles, one shows the Columbretas and one the Alborán Sea, while the remaining 24 cover the sea.

The first sheet of the civil version, corresponding to Madrid, was published in 1875, and the last, covering La Palma in the Canary Isles, in 1968. With respect to the military version, the first sheet is from the year 1968 and corresponding to Almagro (Ciudad Real), and the last, from 1986, covering Fonsagrada (Galicia).

The cataloguing of this cartographic material and of the successive editions and reprints, forming a total of 6 400 sheets (2 900 in the civil and 3 500 in the military version), makes it possible to monitor the evolution of the territory over the course of one hundred years, and it constitutes a first-rate source of knowledge relating to the geography and history of Spain.

### CARTOSUR

The Servicio Autónomo de Geografía y Cartografía Nacional (SAGECAN) of the Republic of Venezuela has commissioned the ICC to produce 525 digital radar orthoimages in black and white at 1:50 000 scale. A total area of 266 616 km<sup>2</sup> is to be covered, corresponding to the states of Amazonas and Bolívar, to the south of the River Orinoco.

The territorial information is captured and processed by means of an airborne radar system with a synthetic opening and interferometric techniques are employed to produce the elevation models of the terrain and the contour lines.

Through this project SAGECAN aims to acquire cartographic documentation for the inventory, control, evaluation and spatial siting of the natural resources of the area, to facilitate the monitoring and control of the plans, programmes and projects that the Venezuelan state is undertaking in the area, and to establish suitable support for the production of basic cartography of this territory at 1:50 000 scale.

### AERONAUTICAL DISTINCTION

The ICC has been awarded the white-emblemmed Cross of Aeronautical Merit (BOD number 121, of 24 June 1998). The award, received by Mr. Jaume Miranda Canals, General Director of the ICC, was made by the Instituto Nacional de Técnica Aeroespacial "Esteban Terradas" in recognition of the ICC's long history in the use and development of airborne photogrammetric systems and remote sensing. In some cases, the ICC has been a pioneer in the implementation of this technology and in the development of its use in the various technical fields in which the Generalitat de Catalunya has authority.

Congratulations!

## TERRITORIAL BOUNDARY MARKING

Precise knowledge of the municipal limits is essential for the correct administration of the municipalities, and in this respect the ICC provides various official organizations with technical support relating to territorial boundary marking.

The tasks involved in this support are basically the preparation of the delimitation proceedings, which include the modifications to the boundary lines and certification of these.

With respect to the proceedings, once the demarcation record on which each of the new boundary markers are described has been signed by the town councils, the ICC prepares the information about each boundary marker, including its coordinates, and draws the new line on the corresponding sheets of the orthophotomap at 1:50 000 scale.

Certification consists in a study to pinpoint the theoretical location of the boundary markers and then they are looked for on the terrain. This study is necessary, since the numerous transformations in the territory lead to the disappearance of a considerable number of boundary markers. Coordinates are given to the markers that are found, and in this way those that are not currently marked are duly positioned.

Surveying of the coordinates of the boundary markers is completed with GPS, with reception of differential corrections by radio (Rasant system).



Móra d'Ebre, in black and white

Olot, in color

Palafrugell, en infrared color

## AERIAL PHOTOGRAPHS OF CATALONIA

In the distribution and sales centers of the ICC it is possible to purchase vertical aerial photographs of Catalonia in black and white, color and infrared color, obtained between the year 1963 and the present. There are various scales, the most notable being 1:70 000, 1:60 000, 1:32 000, 1:22 000 and 1:5 000.

This material may be purchased in the form of contacts or enlargements. The con-

tacts are on paper measuring 23 x 23 cm and may be obtained with or without stereoscopic vision. The enlargements may be on paper or transparency and can be purchased in various formats and approximate scales; if the plate permits, it is possible to make enlargements of up to 7 times the size of an entire photograph or part of any section of a photograph.

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