

MOUNTAIN CARTOGRAPHY IN THE ARGENTINIAN MOUNTAIN

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ABSTRACT:

This article presents the different mountain chains that exist in Argentina. Then taking the most important of these, "Cordillera de los Andes", and dividing the country into regions, a brief description, mentioning the highest peaks in each of them. Then, the different types of mountain cartography and the most important cartographic national agencies and private companies that are dedicated to make cartography on the mountain areas, making a description the main characteristics of its cartographic products, especially how is represented the relief. Also we can see in which format there are available products. There are some pictures of different mountain cartographies and in them you can see the differences and similarities between them. We present the problems that currently have the NGI, the last changes and future projects. Accompanies this article an Argentina's map with the cartographic coverage on 1:50,000 and 1:100,000 scales and in what format are they available. Finally, a list of email addresses and Website addresses of each of these companies and cartographic agencies.

Keywords: *mountain, cartography, cartographic agencies, maps.*

1. INTRODUCTION

The "Cordillera de los Andes" runs along the western border of Argentina. Also we can find in interior of the argentinian territory develops three small chains of mountains: "Sierras Sub-Andinas", to the east and parallel to Cordillera, at the Northwest region, "Sierras Pampeanas", longitudinally through the Córdoba y San Luis provinces, and finally "Sistema de Tandilia", in southern Buenos Aires province.

As the Andes mountain chain is the most important, we stick to it. If we divide the country into regions, we find that the mountains run along three of them:

1. *Northwest Region*, called "La Puna". Its mountains rise from 3,000 to 3,500 meters above sea level. In this region there are many peaks over 6,000 meters. The highest peak is the "Macizo Ojos del Salado", with its 6,891 meters above sea level.

2. *Cuyo Region*: the average height of this region is a little lower than the previous one, but we found an elevation above 6,000 meters, as the "Aconcagua", the highest peak in South America, with its 6,959 meters above sea level.

3. *Patagonia Region*: the height of this region decreases from north to south, being in Tierra del Fuego, the heights of the hills of no more than 1,500 meters. In this region there are many glacier lakes surrounded by green forests and many trekking trails in the parks. The highest peak in the Patagonia region is "Volcán Domuyo" in the Neuquén Province, its height above sea level is 4,079 meters.

Finally we should mention that this mountain chain, extends below the Atlantic Ocean and back to hover in the Antarctic Continent, only NGI produce Antarctic Cartography Mountain at 1:500,000 and 1:1,000,000 scales.

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Some national agencies and private companies have produced different kinds of mountains cartography for several years now, with a range of targets ranging from scientific research to tourism. National agencies have a total but outdated coverage on scales range from 1:50,000 to 1:500,000. Private companies only cover the territories of major tourist attraction. Their scales range between 1:40,000 and 1:1,000,000. These companies are based in mountain towns, so they find it very easy to have their products updated.

2. KINDS OF MOUNTAIN CARTOGRAPHY

- Topographic Maps (NGI, National Geographic Institute)
- Geological Maps (SEGEMAR, Argentine Geological Mining Service)
- Trekking Maps (private publications)
- Tourist and Rout Maps (private publications)

Topographic Maps: The “National Geographic Institute (NGI)” is the agency responsible for the update official mapping of the entire national territory. The NGI has a total coverage at mountainous area in 1:100,000 scale (**Fig. 1**). Only have topographic maps in 1:50.000 scale (**Fig. 2**) at the Mendoza and southern Neuquén Province. In recent years there has been a part of this cartography updated in digital format, especially at scale 1:100.000, the rest is only available on paper (**Fig. 3, Fig. 4**).

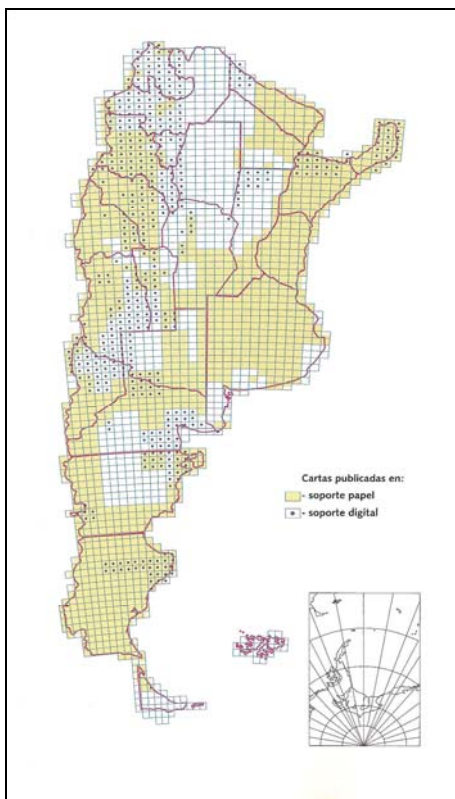


Fig. 1 Coverage on 1:100.000 scale

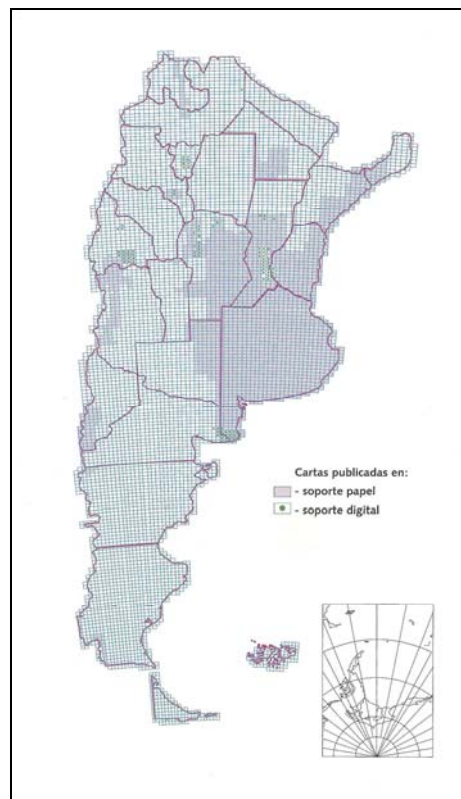


Fig. 2 Coverage on 1:50.000 scale

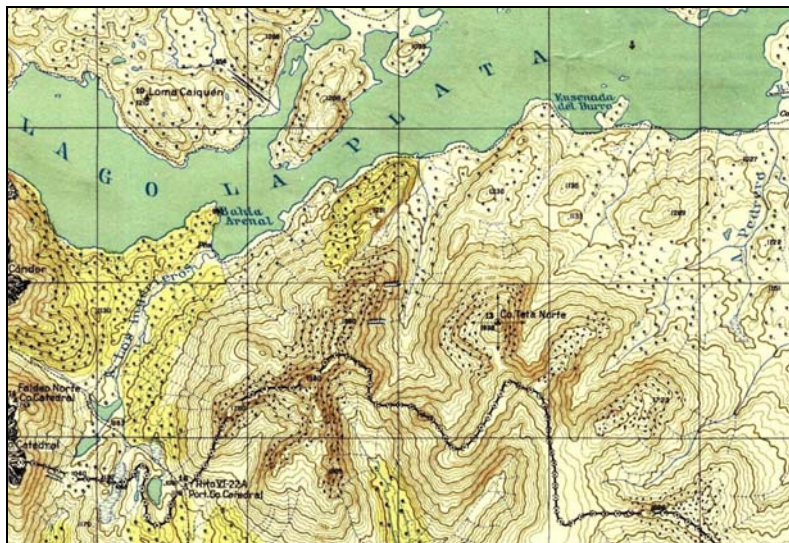


Fig. 3 Lago La Plata (1:100.000 - IGN)



Fig. 4 Lago Paimún (1:50.000 - IGN)

Geological Maps: SEGEMAR is the agency responsible for geological surveys and mining throughout the country. Its geological mountains cartographies are made on 1:100.000, 1:200.000 and 1:250.000 scales. The relief is represented by contour lines. They have a full coverage. In 2006 worked on a new product, which combines geologic information with tourist information (Fig. 5). This product was made on 1:100.000 scale. The original geological map has nine layers of geological information, but the geological-tourist map has only the three most significant of them and to add lots of tourist information.

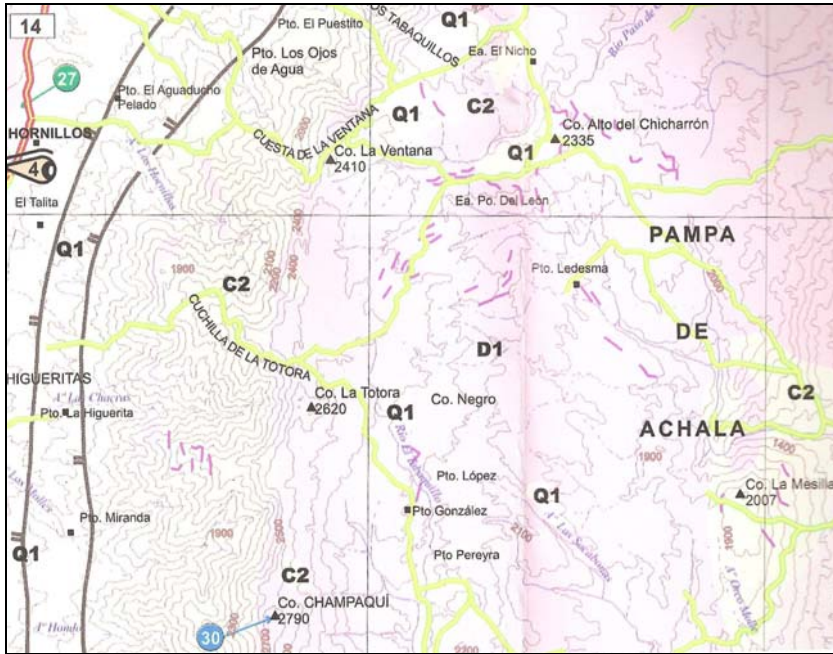


Fig. 5 Valle de Calamuchita (1:100.000 - SEGEMAR)

Trekking maps (private publication): the following are most important in Argentina. All of them have in common the representation of the roads, trails, peak heights, shelters, campgrounds, geographic coordinate grid, etc., some of them have additional information on the reverse. Then, the main characteristics and some differences between them:

1. "*Chalten Out Door Maps*", a relatively new company, with a very good product, data from different points with GPS, times march between points, etc.. The relief is represented by contour lines, satellite image on background and shadow relief, has recently introduced a new kind of paper (synthetic) in some of their products, known as "waterproof map", you can fold it up any time you want without damage the paper, wind resistant and water resistant. Its catalog map covers the south of Patagonia in both Argentina and Chile. Its larger scales are 1:60,000 to 1:100.000. For example, the trekking map "Chaltén - Fitz Roy, Torre" (Fig. 6) on the one side we can see a map at 1:100.000 scale and on the reverse 1:60.000 scale.

2. "*Ediciones Sendas y Bosques*": usually they do mapping of the National Parks in the area of Patagonia Region mountains. Then they make a cut of a small area with a particular interest and them to make an extension of that rectangle. For example, the National Park map on 1:200.000 scale and another with a zoom area on 1:50.000 scale (Fig. 7). Also there are many march time date. The relief is represented by contours and hypsometric scale. Their scales range from 1:50,000 to 1:200,000.

3. "*Zaggier & Urruty Publications*": the product combines contour lines with satellite image on the background. Contains additional information such as march times and coordinate GPS points. Also cuts in areas such as ski and mapping outside at 1:7000, case

Ushuaia Trekking Map, 1:50.000 scale (**Fig. 8**). Its larger scales range from 1:50.000 and 1:125.000. They have a huge, covering the mountains of Patagonia region and something of Cuyo region.

4. "Aoneker" (**Fig. 9**), represents the terrain by contour lines, and fund a merger of satellite imagery and shadow relief, being so far the only company to apply this new technique. Its larger scales range from 1:40,000 and 1:200,000. Their huge range: Patagonia, Cuyo and some of the Northwest region, for example "Ojos del Salado" at 1:75.000.

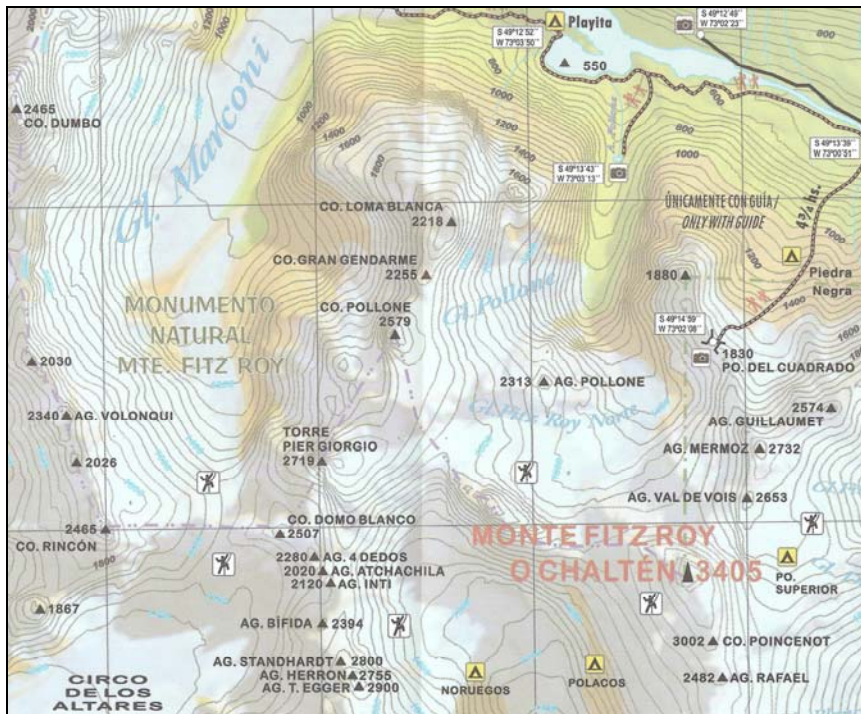


Fig. 6 Chalten-Fitz Roy, Torre (1:60.000 - Chalten Out Door Maps)

Tourist Map (private publication): The main characteristic is that they are made to smaller scales. In the North West is the only available cartography with full coverage. It highlights two of these companies:

5. "Producciones Cartograficas", tourist and routes maps, its products cover large areas such as scales 1:700.000. The relief is represented with the help of satellite images and brings plenty of tourist information. Also these maps have GPS data points. Their catalog covers several mountain areas of the country.

6. "Editorial Asiru (**Fig. 10**), tourist maps, also its products are at small scales and each area is represented by one side with satellite imagery, routes information, cities, place names and peak heights, and on the reverse, without satellite imagery, but much more tourist information and relief by hypsometric scale. Their scales range is 1:400,000 approximately. Their catalog covers the Northwest of Argentina.

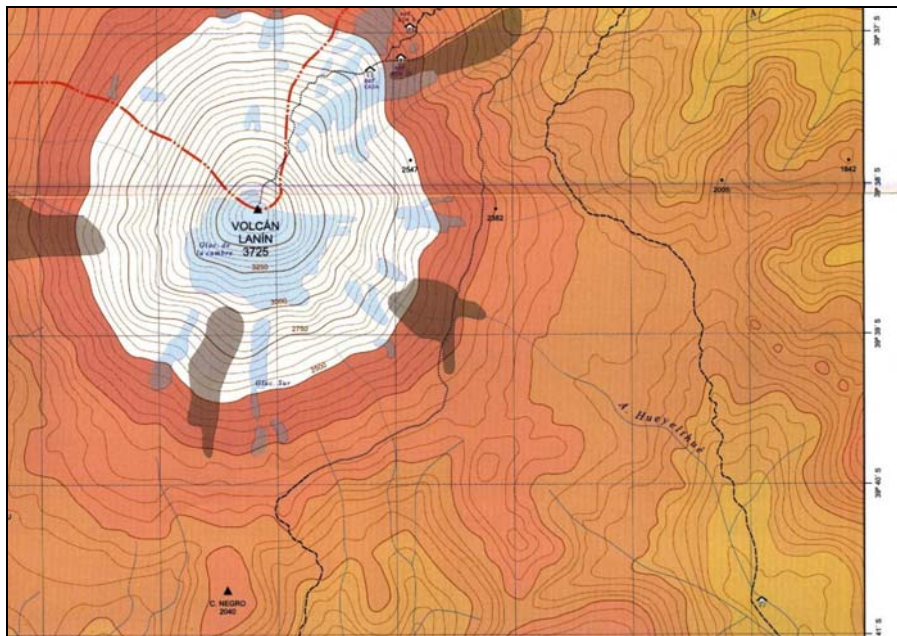


Fig. 7 Volcan Lanin, (1:50.000 - Ediciones Sendas y Bosques)

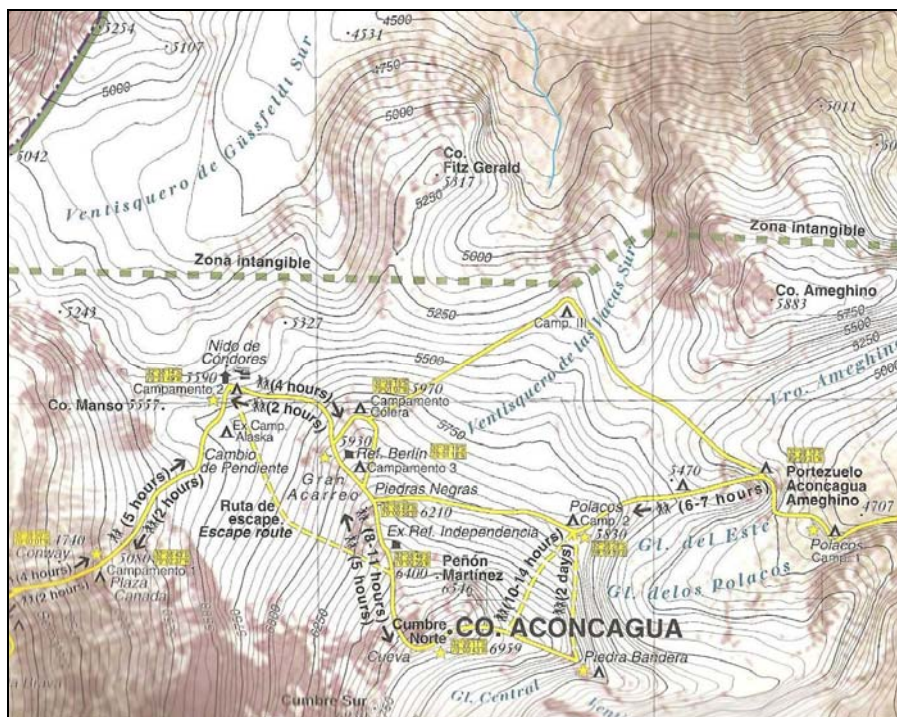


Fig. 8 Aconcagua (1:50.000 - Zaggier & Urruty Publications)

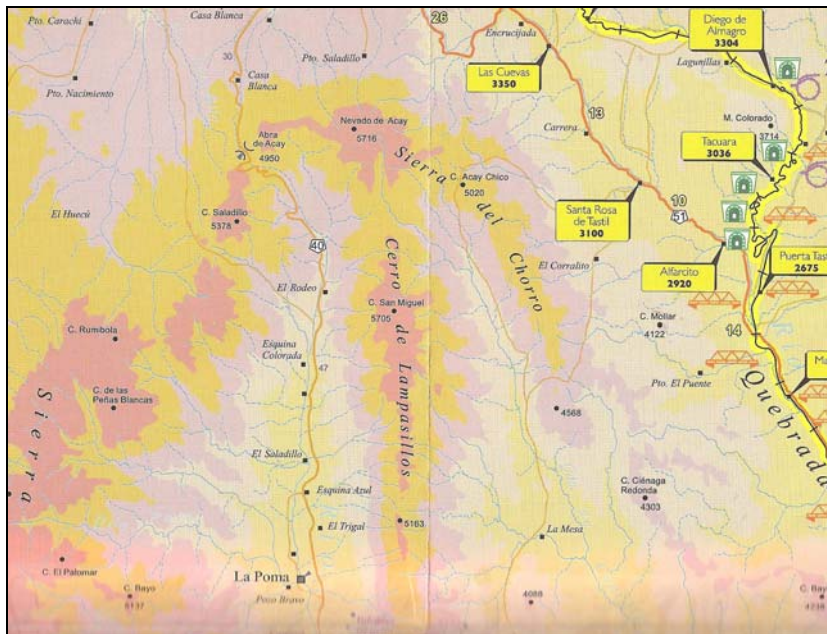


Fig. 10 Tren a las Nubes (1:500.000 approx. – Asiru)

3. AVAILABILITY

Nowadays, all these agencies work in digital format, but you cannot buy their products in digital format. Only SEGEMAR has some products for sale in this format. The rest is done on paper in the stalls for or buying over the Internet.

4. PROBLEMS

NGI is developing a project to upgrade the entire national territory. The problems with this task are: its large area and small technical staff, which is not enough. Because of this, NGI cannot compete with private companies. Anyway we must emphasize that all these companies use our cartographic basis to produce their maps. NGI information is the most reliable source especially in terms of altimetry data, for example contour lines.

Another problem is that in some cases, the mountains topographic maps was edited a few decades ago, so they are in another reference system, "Inchauspe 69", in case you have to use them due consideration should be given transformation of this system to WGS84.

5. PROJECTS:

The NGI is currently in the process of transformation from a Military Institute into a National Institute, which means a change in the quality of its products, its working methodology and in the incorporation of new techniques and equipment. This transformation also involves new cartographic training plans for the staff. The aim of this new phase is to improve sales and make agreements with different governmental survey offices and agencies as well as universities to train their staff and produce homogeneous products.

This is the first time that we are working with SRTM models for 1:500,000 scale. In the following years we plan to work with them for large scales. Thanks to the SRTM model, we have changed our mapping of mountains has been the same for the past twenty years. These models have helped to NGI to transform its old method of making maps.

Among the short-term projects, NGI includes the creation of the Technical Commissions on: Mountain Cartography, Urban Cartography and Antarctic Cartography.

ADDITIONAL DATA

IGN

(National Geographic Institute)

E-Mail: ventas@ign.gob.ar

Web site: <http://www.ign.gob.ar/>

SEGEMAR

(Argentine Geological Mining Service)

E-Mail: mjanit@mecon.gov.ar

Web Site: <http://www.segemar.gov.ar>

Chalten Out Door Maps

E-Mail: demianmorellato@yahoo.com.ar

Web Site: <http://www.chalten-outdoor.com/>

Ediciones Sendas & Bosques

E-Mail: editorial@guiasendasybosques.com.ar

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Zaggier & Urruty Publications

E-Mail: sergio@zagier.com

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