ABSTRACT

The “Argentina 500 K” Atlas is an innovative product made by the Argentine National Geographic Institute (NGI) and the Argentine National Commission for Space Activities. It was designed to appeal to both professionals and amateurs, with features that make it one of the most innovative cartographic products in Argentina to date. The atlas consists of 169 1:500,000 scale satellite images and cartography covering the whole country. It also offers certain cartographic elements related to tourism, a DVD with all the georeferenced geographic information contained in the Atlas book, plus a web site where users can download all this information free of charge. It also offers detachable pages that allow the construction of a mosaic of a particular region or, if the user happens to have enough room, the whole country. This is the first NGI product to include shaded relief, a technique which defines its design, particularly in mountainous areas.

Keywords

INTRODUCTION

Due to the lack of cartographic material in Argentina using the modern techniques of representation, the NGI undertook to create, compile and edit a different type of publication, capable of offering the user a new design, better quality and new tools. This paper describes the most distinguishing features that make the new Atlas “Argentina 500K” an innovate product.

SPECIAL FEATURES

This Atlas (Figure 1) is completely different from previous publications of its kind. Users will find that the Geographic Information behind the maps comes from only the Argentine National Geographic Institute, but also from the Argentine National Commission for Space Activities. This is the first time that such a product has been supported in this way by both State Agencies.

MAIN CONTENTS

The Atlas is basically divided into two parts:

• The first part provides institutional information, plus references and necessary additions for a better understanding of the Atlas.
• The second part comprises the 1:500,000 scale maps. Argentina has been divided into 169 sectors, each of them represented by two maps: a satellite image one and a topographic one. At the end of the book there is one last map, at a much smaller scale, of Argentine Antarctica and the islands of the South Atlantic. There is also an additional map (on a diptych sheet) used as a guide and reference to locate each map sheet by its number in the sector it belongs to within the country (Figure 2), and through three colors, information related to different height levels.

TECHNICAL ASPECTS

Cartographic Projection
A single projection has been chosen for the whole Atlas to enable users to “put the whole country together” without any kind of inconsistency. The projection is “transverse cylindrical”, where its meridional tangent is located at 64º W longitude, the closest line to the average between to the easternmost and westernmost extremes of Argentina.

As the official cartography and associated data of Argentina uses seven cartographic strips in Gauss Kruger Projection, all the vector geographic information had to be transformed to the chosen projection. Once all the content was projected, the sheets were cut into a rectangular grid system specially devised for this atlas, moving from the meridians and parallels used for sheet borders in the past to the new half-degree system for this scale.

Satellite Image
The atlas satellite image content previously mentioned (Figure 3) were captured from the SAC-C satellite, which was built for meteorological purposes, and which has a 175-metre resolution. This was not the most suitable resolution for the scale of the atlas, so the images underwent a delicate radiometric and geometric correction to make the content (homogeneous radiometry across Argentina) and scale appropriate. Additionally, the images were collected from an Argentine satellite made by a group of Argentine scientists.

Topographic Map
Our first goal when preparing this material was the production of an innovative Atlas complying with all the applicable modern techniques of representation (Figure 4) learnt through participating in the ICA Commission on Mountain Cartography. This is the first time we have processed a DEM (Digital Elevation Model) to be used as base material to generate contour lines, shadowed relief and a soft hypsometric colour scheme. The contour lines, as well as being analytically-generated were changed from the established sepia color to a neutral grey for this atlas.

Nearly all the rest of the symbols used comply with the NGI Cartographic Symbols Handbook for this scale. The only symbols that were excluded are the ones related to pipelines, power lines, some symbols related to coasts, vegetation areas and/or soils. It is important to highlight that a reference information was added on the main tourist activities in Argentina.

Digital Elevation Model
The DEM used is captured by the Shuttle Radar Topographic Mission (SRTM) with a 90-metre resolution. It was previously processed to fit our orthometric benchmarks. Based on this, the following Atlas elements were generated:

Contour lines: a slope study had been previously made leading to three height levels (10, 50, 200 metres) being applied to the area. The difference with the old contour lines is the colour and width of the guideline contours, which were reduced from 0.3 to 0.15 mm.

Shadowed Relief: In order to generate the lighting of the model, a 315º azimuth and 45º height horizon elevation were applied. The generated shadow, which
Figure 3. Some examples of Satellite images.

Figure 4. Detail of a small mountainous area of a topographic map.
was very dark at first (Figure 5), became softer when the obtained raster opacity was reduced.

**Hypsometric Layers:** The hypsometric scale contains many more divisions when compared to previous similar scales, the shift from one colour to another being almost imperceptible.

**Mosaics**

When users open the Atlas, they will see the satellite image on the left and the topographic map corresponding to that image, on the right. As the book has a ring binding system, its sheets are detachable, so that users can make mosaics by overlapping the sides of the sheets, both topographic (Figure 6) and satellite image (Figure 7). The mosaics can be of small sectors, provinces, regions, or the whole country. The sheets have two blank stripes providing side information, such as: graphic scale, parallel and meridian identification and map number. All the sectors have got the same map number, even though the Satellite Image will be, for example, “A123” and the Topographic Map “B123” (Figure 8). Another aspect to take into account is that no cartographic feature belonging to any neighbouring country has been added, only their corresponding satellite images and shadow model.

---

*Figure 5. DEM colour before the treatment that reduced its opacity.*

*Figure 6. Topographic map mosaic.*
Figure 7. Satellite image mosaic.

Figure 8. Satellite image (A123) on the left and topographic map (B123) on the right.
OTHER CONTENTS

Tourist Activities
An introduced item is a group of cartographic elements related to the tourist activities across the country, notwithstanding the old tradition of observing the regulations. Some of these activities have been omitted due to scale constraints. There are a total of 13 tourist cartographic elements (Figure 9), four of which are modifications of the original NGI ones, the rest being specifically designed for this Atlas.

ADDITIONAL MAPS

Geographic Environments
There is a part of the atlas describing each geographic environment (Figure 10), showing via satellite image how each of them appears and in which sheet these environments are located.
**Provincial Counties or District Borders**
As only a small quantity of counties and districts can be located in the marginalia, it is impossible to place all their names. Therefore it was decided to add eight more pages with that information, so users, having found the representation of county and district borders in the topographic maps, can look up the reference maps where they can find the corresponding county or district name for quick identification and in which sheet they are located (Figure 11).

**Ruler**
The Atlas has got a plastic ruler which has three uses (Figure 12). On one side of it, there is a millimeter ruler, on the other side a scaled kilometre ruler to measure at the 1:500,000 scale. The ruler also has two triangles, one at each end. They are used for an approximate identification of features on one of the maps and the map opposite. Users only have to match the vertex of a triangle with the feature in one sheet and look for the feature near the vertex of the opposite triangle (Figure 13). It is only approximate, since each sheet of the atlas is subject to lateral movement due to the ring binder system.

**DVD**
Even though it is included in the Atlas, the Atlas does not need the DVD (Figure 14) and vice versa. By means of a series of easy menus, the user may select the location of each sheet in the map of the Argentine Republic by means of a single click, and may view the map sheet and its satellite image counterpart, or go to neighboring sheets.

The DVD adds great value in itself, having important technical and institutional information, 340 maps that cover the Argentine Republic, the possibility of installing a viewing program that allows users to surf every map and to locate points by means of coordinates, to measure areas and distances, to vectorize, to label, to overlap cartographic elements and to export the generated view in a standard graphic format.

The adding of “jpgw” files for each map allows the most advanced users to georeference raster map sheet files in a GIS, to perform comparative studies with files of their own and/or to digitize different features.

**FREE WEB SITE AND SALES POLICY FOR ATLAS**
In order to satisfy the demand of the geographic community, a web site (Figure 15) was created where all the information included in the DVD can be found, viewed and downloaded free of charge. Users do not need to register or provide any kind of personal information (URL on next page).
This Atlas itself has a low price. Furthermore, a cheaper price has been set for governmental agencies, and for teachers and students of all levels. For Version 2, an agreement has been signed with one of the most important book seller chains in Argentina. Thus in future the Atlas will be available at all its branches across the country.

CONCLUSION

To sum up, all the characteristics previously described make us believe the product we developed fits the innovate techniques which we were eager to find in this kind of Publications, and which comply with the new tendencies of those countries in the vanguard of cartographic representation.

ADDITIONAL INFORMATION

The Web Site to access the free atlas DVD data is: www.argentina500k.com.ar/.

ACKNOWLEDGEMENTS

The author is grateful to translators Allen G. (a great friend) and Londero S. (Instituto Geográfico Nacional). Without their help this work would have been impossible, and especial thanks to geographer and engineer Benedetti J.C. (IGN Assistant Director) for everything learned working with him.