

## Costa Rica



Costa Rica is situated on the Central American isthmus between 8° and 12° N latitudes and 82° and 86° W longitudes, including all its territories covers a total area of 51.100 Km<sup>2</sup>. The population was estimated in 2011 to be 4. 870.000 people. Due to Costa Rican environmental political, roughly 25% of territory is constituted as National Park or Reserve.

The Directorate of geology and Mine (DGM), is one dependence of Ministry of Environment and Energy of Costa Rica. Its a very small Directorate, and has staff of 10 geologists for all functions (only 2 geologists have as responsibility the construction of geological maps).



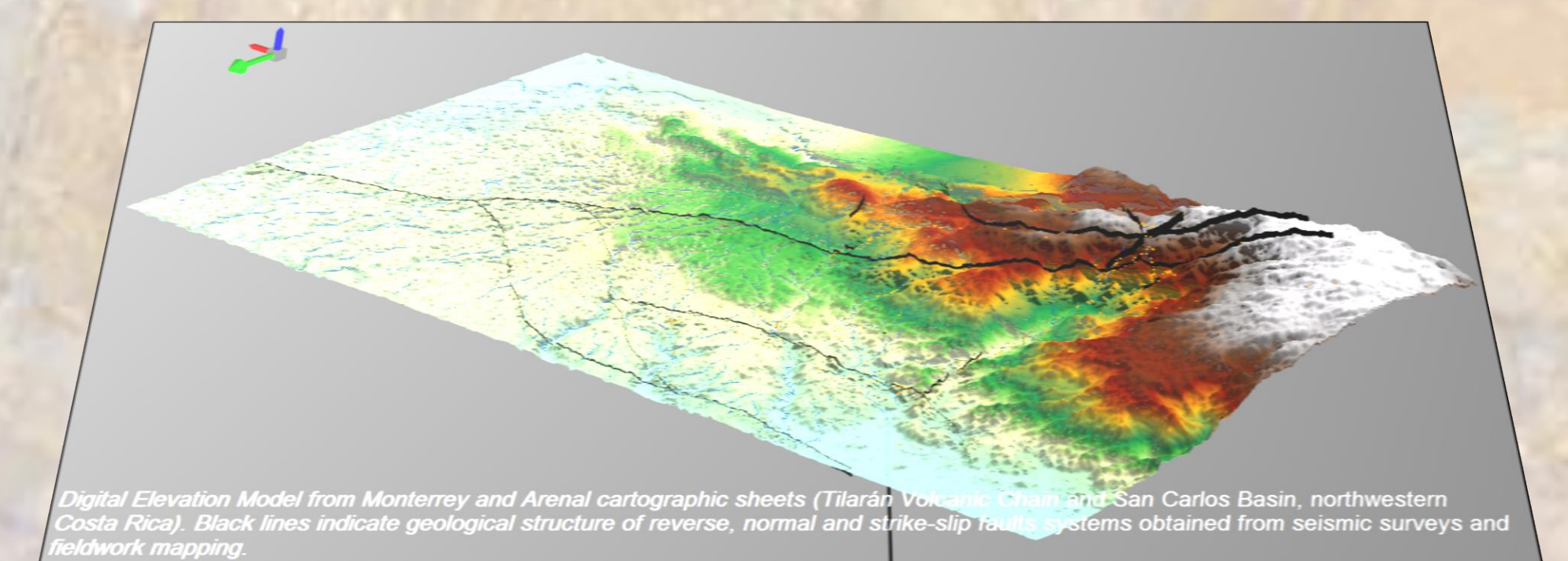
## Methodology

### Previous fieldwork:

**Bibliography:** articles, reports, geological, geomorphological, hydrogeological, structural maps, etc.

**Compilation of previous data:** topographic, geophysical, boreholes, geochemical, petrological, miner, remote sensing (<https://urs.earthdata.nasa.gov>) and aerial photography (CENIGAMINAE).

### Construction elevation model



Digital Elevation Model from Monterrey and Arenal cartographic sheets (Tilarán, Volcans, San Carlos Basin, northwestern Costa Rica). Black lines indicate geological structure of reverse, normal and strike-slip tectonisms obtained from seismic surveys and fieldwork mapping.

### Fieldwork:

Observation and collection of data (structural measurement, among other things) from documentations points, and from bands of overlap of the mapped area, samples collection for different studies, photographs..



- Data integration and field data analysis.
- Correlation with other data sets and interpretations .
- Creation of the Geological Mapping Database related with GIS.
- Selecting and labelling samples.
- **Digital geologic mapping - GIS** of Costa Rica, consistent in: lithology, age, structural geological elements, mineral resource, hydrology, geodynamic phenomena and GIS database structure.

Since 2008, the DGM, through inter-institutional cooperation and international technical cooperation with the Czech Geological Survey, started the program of geological map of Costa Rica at 1:50 000 scale, which involves the geological map construction of 135 topographic sheets same scale.



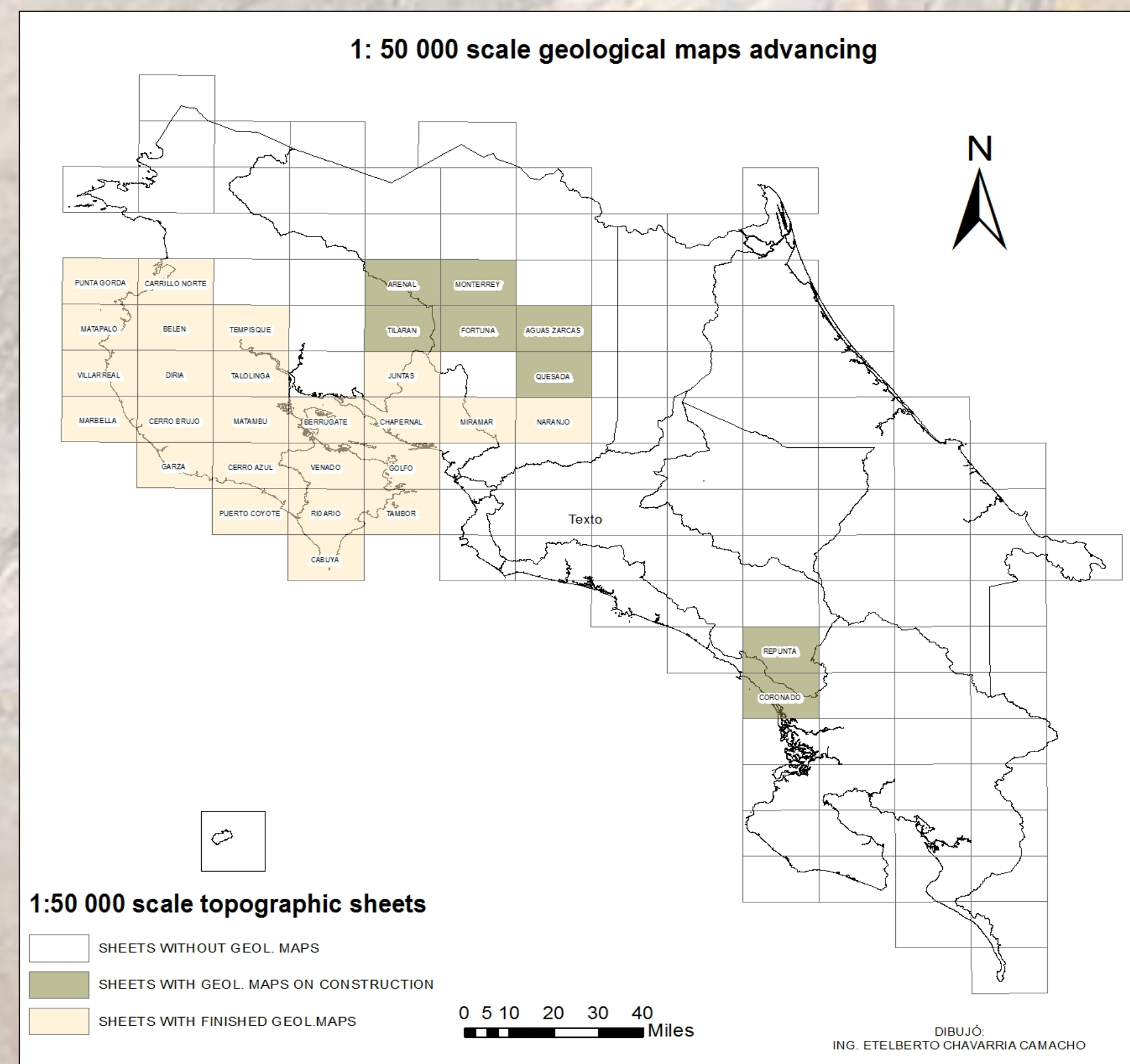
Technical national Cooperation DGM-Escuela de Geología, University of Costa Rica - 2015.



Technical National Cooperation DGM-Civil Engineering Laboratory, University of Costa Rica, 2010-2012.



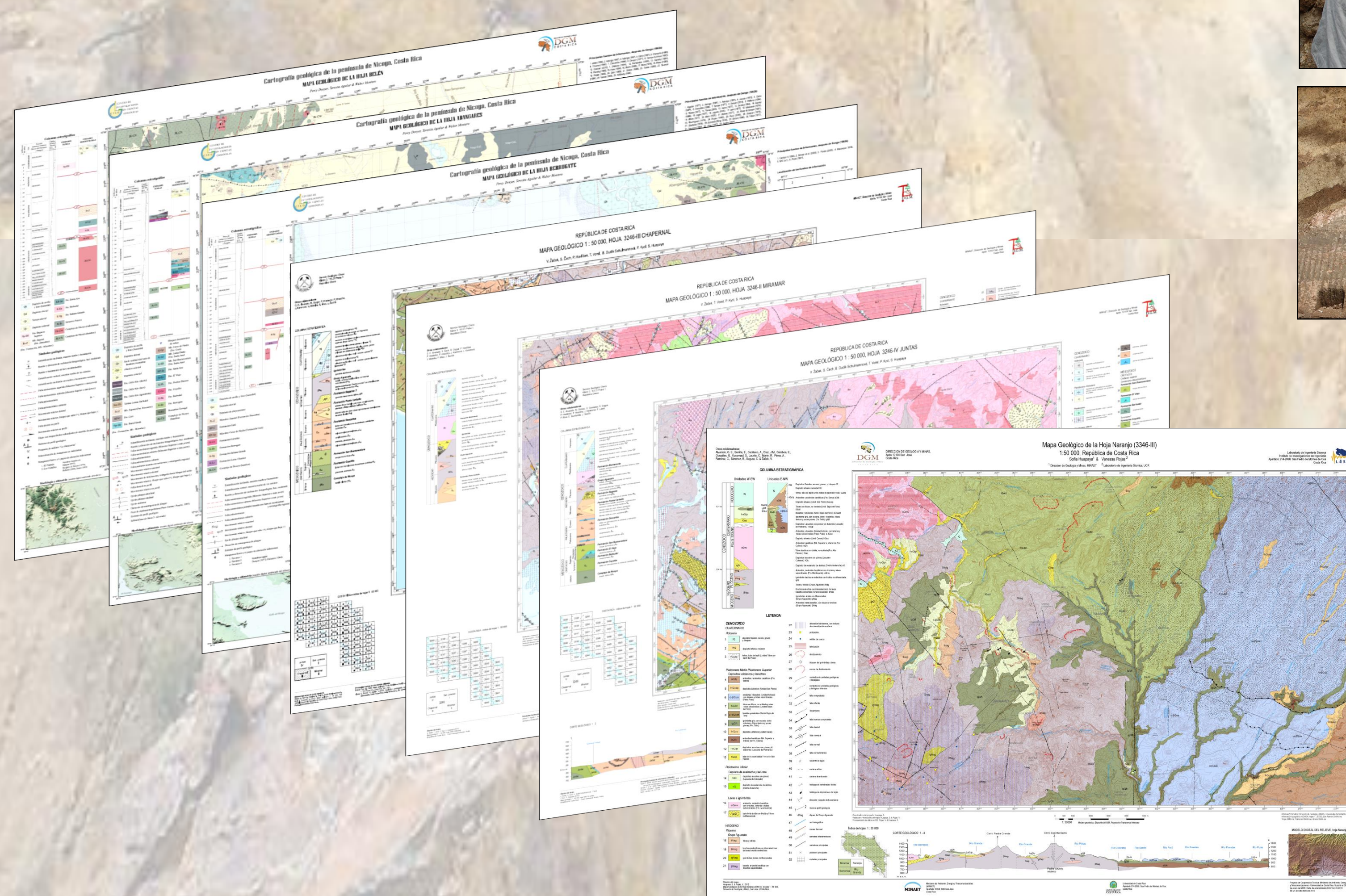
Geological international cooperation DGM-Czech Geological Survey, 2007-2010.



. In spite of our poor budget and shortage of workforce (geologists), the 1:50 000 scale program is currently in progress with nearly 18% of the total surface (51 000 km<sup>2</sup>) already covered.

## The map contains:

1. Geological map s.s.: include legend to the geological map, lithostratigraphic column, geological cross-section., summary of geological mapping, index map.
2. Explanatory notes to the Geological Map of Costa Rica a 1:50 000 scale.
3. Documentation and data related to the Geological Map of Costa Rica a 1:50 000 scale: graphic illustrations, written documentation, documented geological samples, information of database.



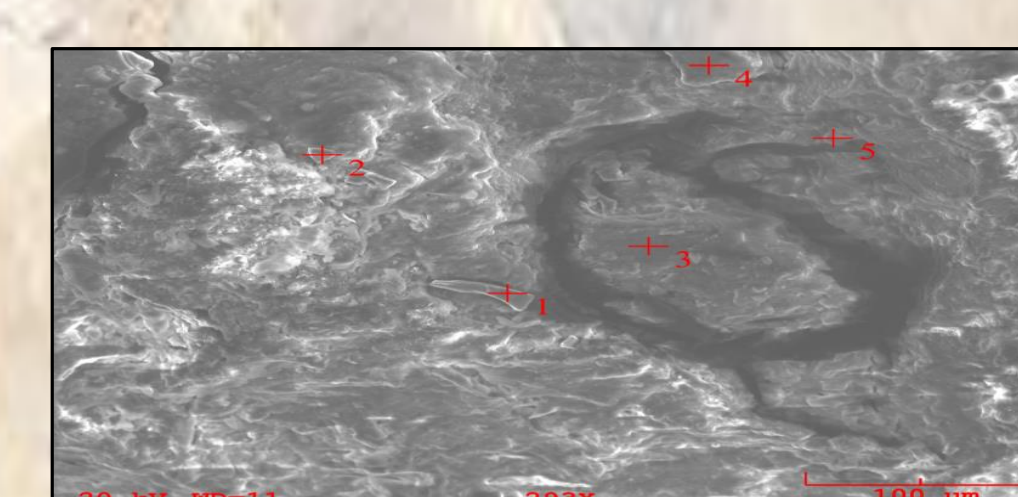
Software application of database

For the quality control of the maps, the DGM has made instruction notes for the elaboration of geological maps, document named "Instructions and cartographic standards for the construction of the geological map of Costa Rica at 1:50 000 scale", which is being improved at present with help of Association of Geological Surveys of Ibero-America (ASGMI) and Czech Geological Survey.

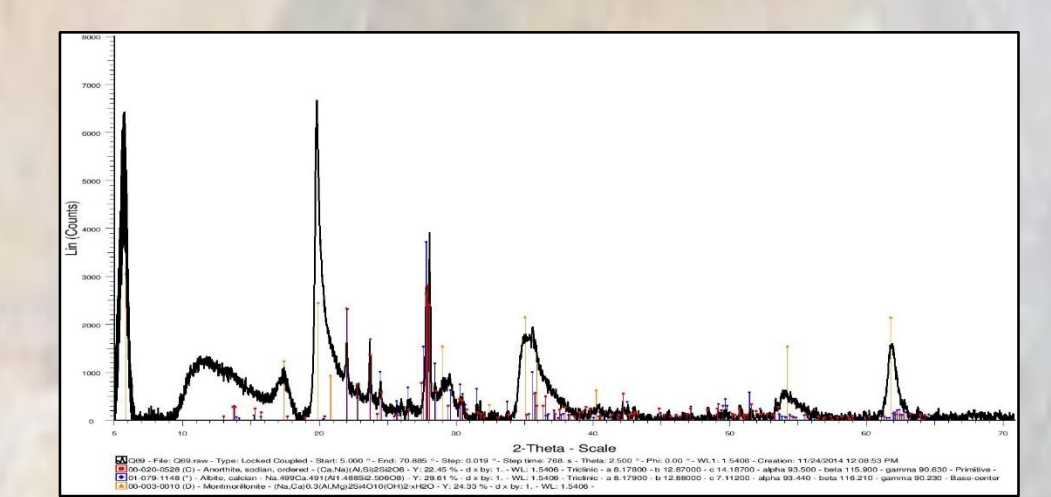


## Geological data are complemented by information acquired through applied research:

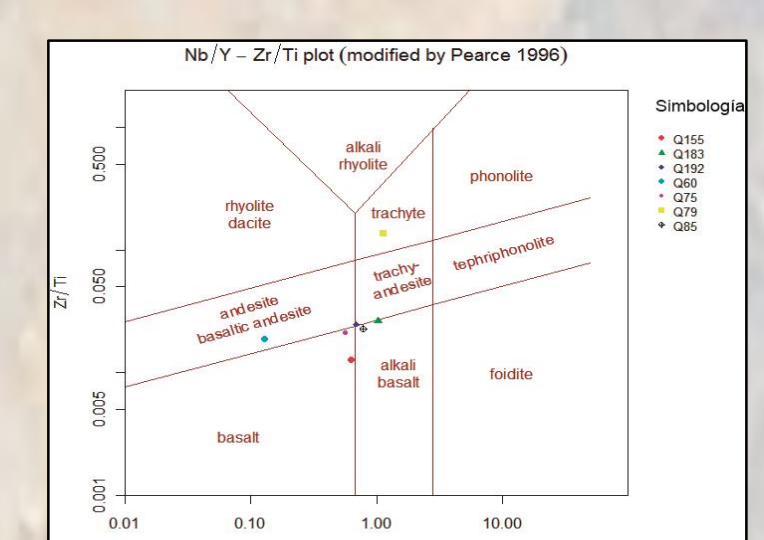
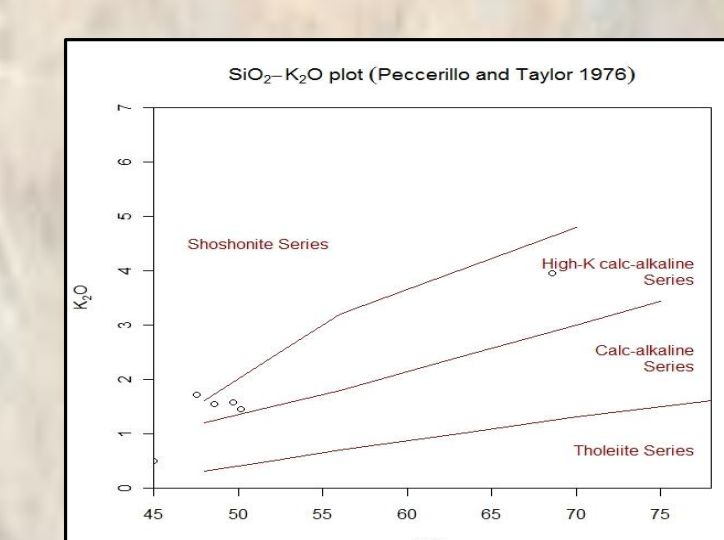
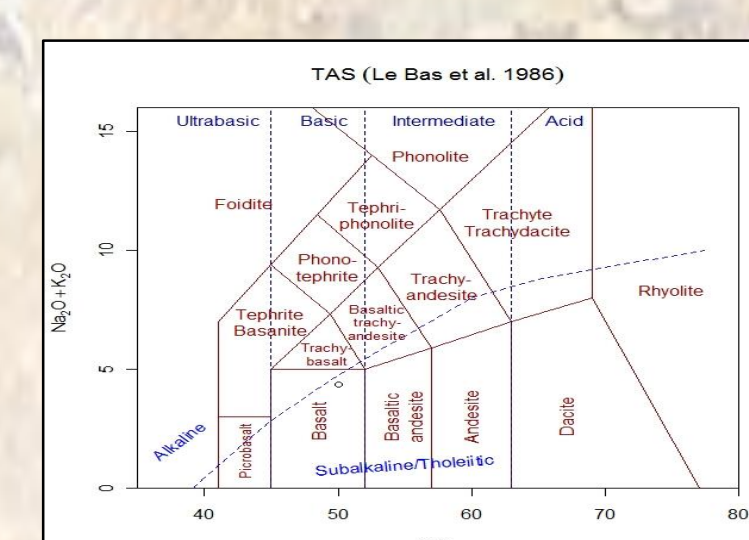
- Whole-rock geochemical composition
- X-ray powder diffraction
- K-Ar geochronology
- Petrography
- Mineralogy
- Scanning Electron Microscope



a. The glassy matrix in the ignimbrite rock, example of photo whit Scanning Electron Microscope.



b. Diffractograms, X-ray analysis of an ignimbrite rock.



c. Showing the different diagrams used for geochemical classification of volcanic rocks: TAS (Le Bas et al. ;1986 and Cox et al. ;1979), SiO<sub>2</sub>-K<sub>2</sub>O (Pescerillo & Taylor; 1976), A/CNK vs A/NK (Shand; 1943).



Representatives of ASGMI, DGM, University of Costa Rica and other national institutions. Seminario-Taller: "Lineamientos y estándares del Mapa Geológico de Costa Rica"