

Idea submitted to the International Polar Year Planning Group

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Recent tectonic deformations and implications in a global perspective: integrated studies on the development of the Scotia Arc

The development of the Scotia Arc since the Oligocene constitutes one of the main tectonic deformations that have large impact in the recent evolution of the Antarctica. The break-up of the continental crustal strip that connected South America and the Antarctic Peninsula produced the isolation of the Antarctic continent and the instauration of the Antarctic Circumpolar Current. This oceanic current has a large incidence in the climatic evolution of the region and has also consequences in the large scale pattern of oceanic circulation. Moreover, the tectonic deformation continues up to present day, during the development of the Scotia and Sandwich plates, producing a complex setting of continental crustal fragments and small oceanic basins along the boundary with the Antarctic Plate.

Although this region constitutes one of the most active tectonic areas of Antarctica, where large earthquakes and recent volcanism occur, the present-day boundary between the Antarctic Plate and the Scotia and Sandwich plates is poorly known. In addition, there are scarce available data to constraint the motion of each continental fragment that continue active up to the present day.. The development of the Scotia Arc determined a dextral rotation of the Antarctic Peninsula, and its prolongation along the South Scotia Ridge that constitutes the northern boundary of the Weddell Sea and constraint the instauration of the Weddell Gyre.

This proposal aims to develop an interdisciplinary study of the development of the Scotia Arc, mainly focused in its southern branch, where is located the northern boundary of the Antarctic Plate. This study should comprise marine and field geological, geophysical and geodetical measurements that allows to constraint the recent tectonic evolution. The main activities, which should be developed in the base of an international collaborative work, should be:

+Geological and geomorphological observations of emerged areas in the Antarctic Peninsula, South Shetland, and South Orkney islands. The aim is to constraint the propagation of the deformation related to the plate boundary, including faults, folds and volcanism. The microtectonic observations will allow to the determination of the evolution of the paleostress field while the measurement of the stresses at surface (e.g. by overcoring methods) may indicate the present-day field. The geomorphological researches will determine the variability in the uplift rates and the relief evolution along the region.

+The present -day activity of the main tectonic structures in the region may be characterized by the installation of a dense network for GPS Geodetic measurements that constraint more exactly the rates of relative motion of the different blocks. Each structure may be characterized by seismological, field observations or marine geophysical data.

+The tectonic development of the Scotia Arc may be determined by the integration of paleomagnetic measurement in outcropping areas that constraint block rotations and a detailed acquisition in key areas of new oceanic magnetic anomaly

profiles that allows determine a detailed reconstruction of the evolution of each continental block.

+The analysis of the sedimentary sequences and structures, mainly supported by multichannel seismic profiles, will allow determining the changes involved in the oceanic circulation in the region.

In Spain there are marine and field research groups including researches of different universities (Univ. Autónoma de Madrid, Univ. Granada, Univ. Barcelona, CSIC, IGME, among others) that may be interested in this proposal. Also, this proposal may be of interest for different field and marine research groups of a large number of countries (Argentina, Brazil, Bulgaria, Czech Republic, Chile, China, Ecuador, Italy, Japan, Korea, Peru, Poland, Russia, Spain, United Kingdom, USA, Uruguay) that have developed studies in the region, although there have been not opportunity up to date to contact with all the potentially interested groups. It may be integrated with the aims of the SCAR ANTEC group.

Anyway, the proposed activities should be developed only on the basis of an international collaborative work, including the integration of previously available data and new field and marine observations in the frame of the IPY. The research results will allow to a better understanding of the relationships between the recent tectonic deformation and oceanic circulation that has large incidence in the climatic evolution.