

Preliminary study of gravimetric anomalies in the Magallanes-Fagnano fault system, South America

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ABSTRACT

The main objective of this research is to recognize several geological structures associated with the shear zones of the MFFS (Magallanes – Fagnano fault system) by the analysis and interpretation of gravimetric anomalies. Besides, to compare the gravimetrical response of the cortical blocks that integrate the region under study, which is related to the different morphotectonic domains recognized in the region. This research was developed employing data obtained from World Gravity 1.0, which includes earth and satellite gravity data derived from the EGM2008 model. The study and interpretation of the MFFS from the analysis and processing of the gravimetric data, allowed appreciation of a noticeable correlation with the most superficial cortical structure.

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1. Introduction

Tierra del Fuego Island has a complex tectonic situation as it is crossed by the MFFS (Magallanes-Fagnano Fault System), a continental transform margin arranged in an echelon geometry with an E–W direction. MFFS runs through approximately 600 km [1] across the island. This left-lateral strike-slip fault trends between 80°N and 100°N [2].

The MFFS is recognized from the west extreme of the Magellan Strait to the Argentina continental shelf, at the north of the States Island and it continues eastwards along of the North Scotia Ridge, ending at the northern tip of the South Sandwich Islands [3–5] (Fig. 1).

The region under study is poorly covered by terrestrial gravity measurements due the scarcity of handling gravimeters and

transport difficulties, fundamentally in those regions that are climatically and topographic inaccessible. Gravimetric data obtained from satellite missions have the advantage that allows viewing underground density variations within a high spatial stability and without disturbances by mathematical approximations.

The present work aims to define the set of geological structures associated to the MFFS and its spatial continuity based on satellite gravimetric data processing and analysis. This fault system is tectonically associated to the largest continental segment of the southernmost boundary between Scotia and South American plates.

Finally, this paper also tries to determine if there is a correspondence between the main morphotectonic units previously recognized in the region [7] and the observed gravimetric potential field.

2. Geological setting

The southern Andes can be divided into two large sections, one with north-south trend, the Patagonian Andes and a second section with an east-west disposition called Fueginian Andes [8]. The studied area were recognized at least five morphotectonic domains that spread as parallel fringes among each other, and curving eastward in solidarity with the Andes flexure (Fig. 1). The western



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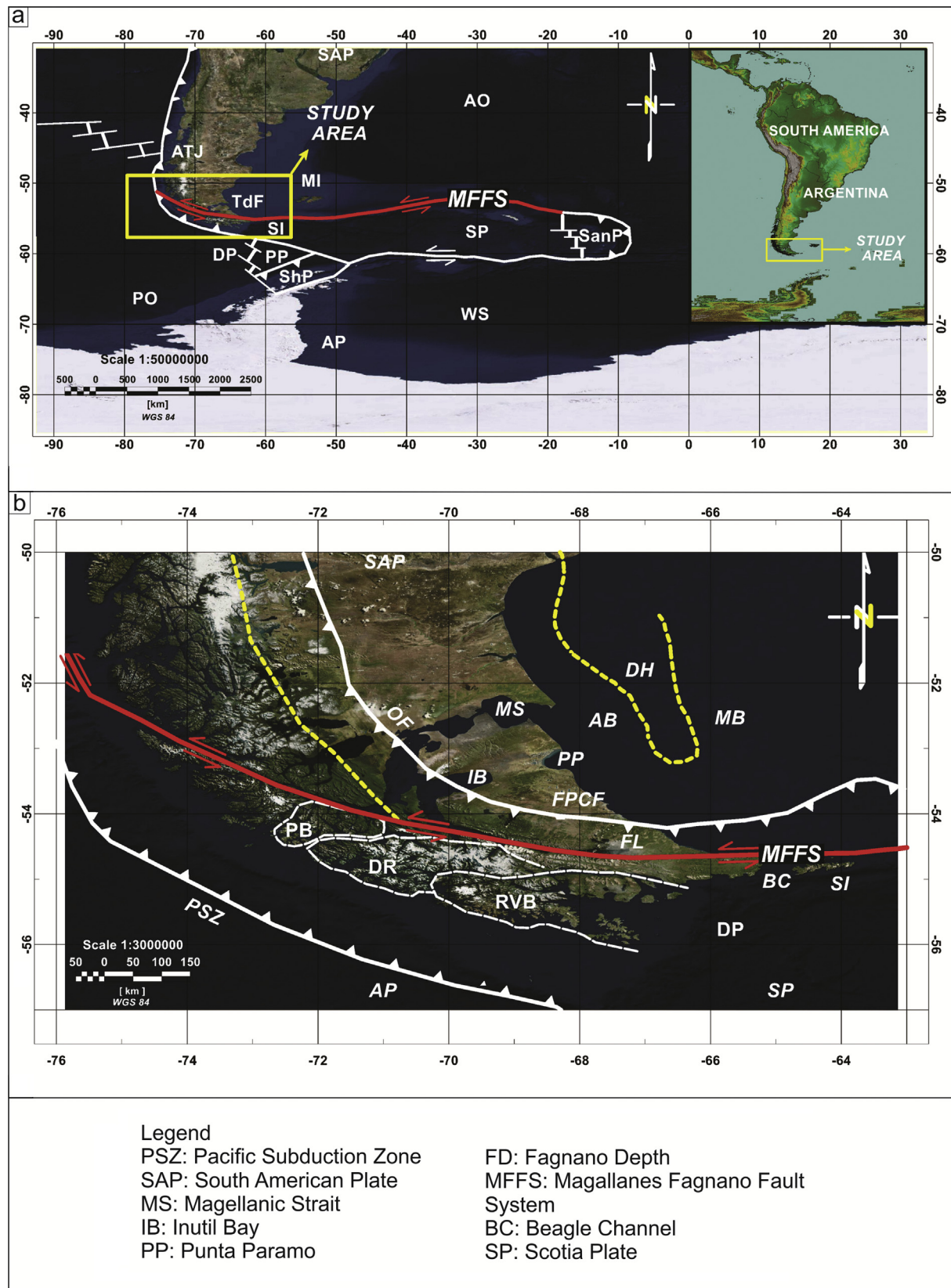


Fig. 1. a) Tectonic setting of the Isla Grande de Tierra del Fuego (modified from Ref. [5]); b) Map of the Southernmost Andes showing five main tectonic provinces and their boundaries (after [5,32,33]). The internal domain, with basement-involved contractional deformation, includes the Patagonian Batholith, CD (Cordillera Darwin), and the Rocas Verdes Basin (RVB). The thin-skinned FTB (fold-thrust belt) constitutes the external domain. The MFFS (Magallanes–Fagnano fault system) is the boundary between the South American and Scotia Plates. The orogenic front separates the Fuegian foreland fold-thrust belt to the S–SW from the Austral and Malvinas basins to the N–NE (Modified from Ref. [8]).

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