Deciphering Deception Island's magma plumbing system:

An interdisciplinary approach

A. GEYER[*,1], A.M. ÁLVAREZ-VALERO[2], G. GISBERT[3], M. AULINAS[4], D. HERNÁNDEZ-BARREÑA[2], A. LOBO[1], J. MARTI[1]

[*,1] Institute of Earth Sciences Jaume Almera, ICTJA, CSIC, Lluis Sole i Sabaris s/n, 08028 Barcelona, Spain (agustin.lobo@ictja.csic.es; joan.marti@ictja.csic.es) *correspondence: ageyer@ictja.csic.es

[2] Departamento de Geología, Universidad de Salamanca, 37008 Salamanca, Spain (aav@usal.es; danihern@usal.es)

[3] Instituto de Geociencias, CSIC-UCM, Severo Ochoa 7, 28040 Madrid, Spain (ggisbertp@hotmail.com)

[4] Departament de Mineralogia, Petrologia i Geologia Aplicada. Universitat de Barcelona, Marti Franques s/n, 08028 Barcelona, Spain (meritxellaulinas@ub.edu)

Deception Island (South Shetland Islands) is one of the most active volcanoes in Antarctica, with more than 20 explosive eruptive events registered over the past two centuries. Recent eruptions (1967, 1969, and 1970) and the volcanic unrest episodes that happened in 1992, 1999, and 2014–2015 demonstrate that the occurrence of future volcanic activity is a valid and pressing concern for scientists, technical and logistic personnel, and tourists, that are visiting or working on or near the island. Understanding the current state of the island's magmatic system, and its potential evolution in the future, is fundamental to increase the effectiveness of interpreting monitoring data during volcanic unrest periods and hence, for future eruption forecasting. We present here a unifying evolutionary model of the magmatic system beneath Deception Island by integrating new petrologic and geochemical results with an exhaustive database of previous studies in the region. The results obtained reveal the existence of a complex plumbing system composed of several shallow magma chambers (≤ 10 km depth) fed by magmas raised directly from the mantle, or from a magma accumulation zone located at the crust-mantle boundary (15–20 km depth). Our conclusions reinforce the perception of Deception Island as a very active and candidate volcano for a new eruption in the near future. This research was supported by the POSVOLDEC (CTM2016-79617-P)(AEI/FEDER, UE) research project.