VOLCANISM AND TECTONICS OF THE PLEISTOCENE-HOLOCENE VOLCANIC ARC, SOUTHERN ANDES (40.5°-41.5°S)

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INTRODUCTION

The volcanic arcs, especially those which are emplaced at convergent margins, present a complex configuration which is expressed in their geometry and temporal evolution of magmatism. Although volcanic arcs conform to a margin-parallel belt on a continental scale, these belts consist of many transverse chains that comprise different types of volcanic centres (stratovolcanoes, flank and monogenetic cones). This internal anisotropy can reflect, in the sense of Nakamura (1997), the overpressure of the regional stress field. However, Fedotov (1981) has analized these variations from the thermodynamic point of view relating the building of stratovolcanoes/monogenetic cones to the magmatic input rate from the asthenosphere. Takada (1994) developed an 'output stress' diagram which incorporates the combined effect of strain rate and magmatic input in volcanic regions of continental scale.

We document this effect in the Southern Andes, where the architecture of the volcanic arc includes NE-SW and NW-SE transverse chains of morphologically and geochemically heterogeneous volcanic centres. These transverse alignments are associated with a long-lived structural system.

VOLCANIC CENTRES AND STRUCTURES

This study relates to the arc segment between 40.5° and 41.5°S (FIG.1). It concerns the Carrán-Los Venados group, a chain of 70 basaltic cones and maars of N50E orientation; the Cordillera Nevada-Cordón Caulle- Puyehue volcanic chain, a line of colapsed stratovolcanoes, fissural vents of rhyolitic composition, and monogenetic cones; the Grupo Casablanca, a basaltic stratovolcano together with flank and monogenetic cones of NE-SW orientation; and the Osorno-Puntiagudo chain, a group of stratovolcanoes and cones of the same orientation. The Liquiñe-Ofqui Fault behaves as an axis of

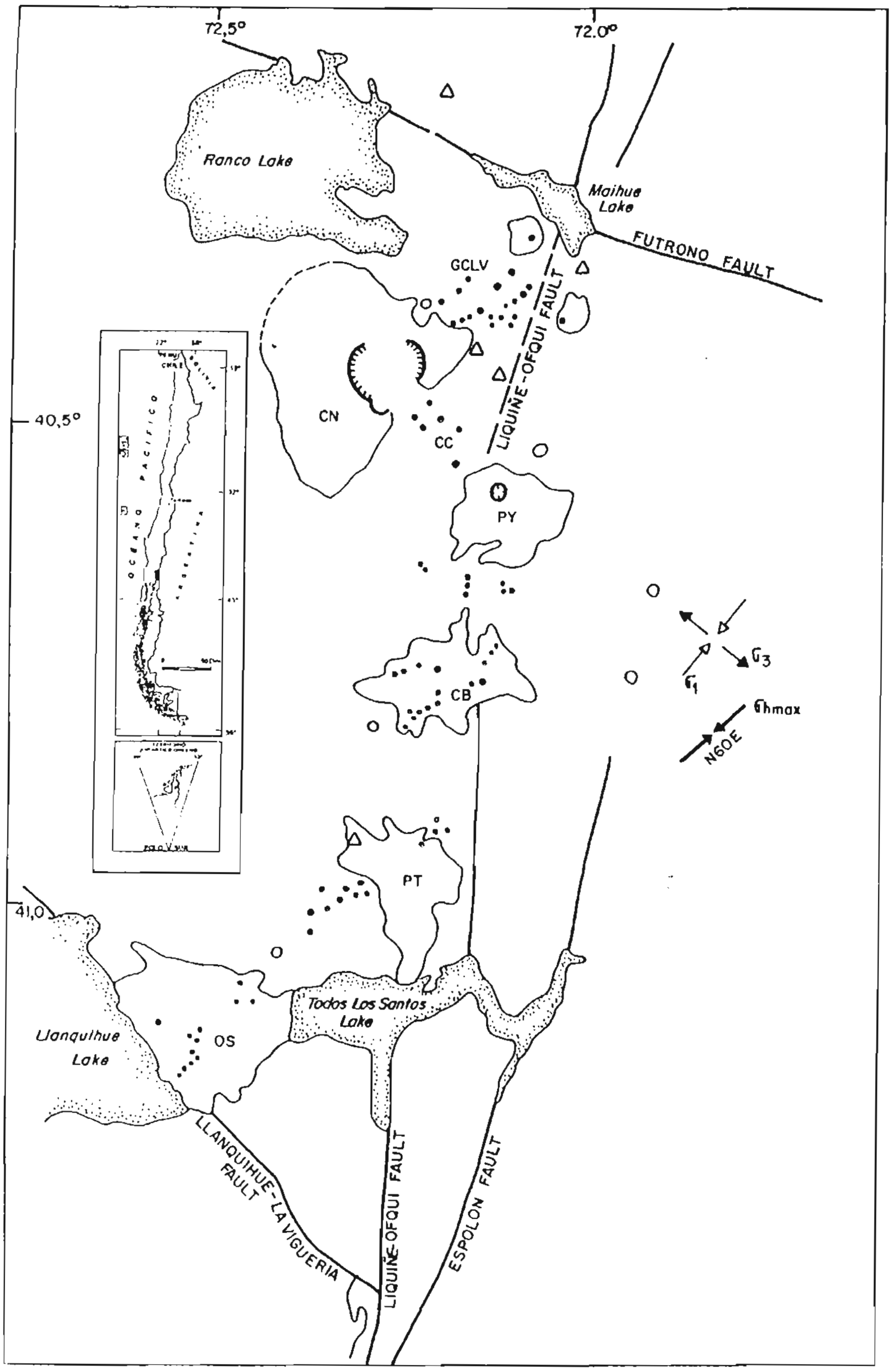

FIG.1. Volcanic centres and structures in 40.5°-41.5° segment of Southern Volcanic Zone. Chile.

Key: GCLV: Grupo Carrán-Los Venados; CN: Cordillera Nevada; PY: Puyehue; CB: Casablanca; CC: Cordón Caulle; PT: Puntiagudo; OS: Osorno.

○ Plio-Pleistocene volcanoes

● Holocene pyroclastic cones, domes and fissural vents

→← Holocene σ_{hmax} axis

→↕← Miocene-Pliocene σ_1-σ_3 axis (*e.g.*, Lavenu *et al.*, 1997)

△ 1992-1995 crustal earthquakes (depth: 10-30 km; M:4.1-4.9)

the basement causes the preferential reactivation of NE-SW structures, leading to local distortions of the deformation regime. In addition, local factors such as weight and internal anisotropy of stratovolcanoes have an important effect on the force balance.

In the present study, we expect to bring together the record of mesostructural kinematics, to analyze the volcanic morphology and its relation to the deformation regime, and to design a field experiment of the record of natural crustal earthquakes in order to quantify the instantaneous deformation in this segment.

The above tools will allow us to develop a methodology of regional study of volcanological behaviour of an arc segment, and to develop individual models relating to the evolution and hazards associated with single volcanic centres.

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