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EFECTOS MAGMATICOS DE LA SUBDUCCION PLIOCENICA DE UNA DORSAL EN EL PUNTO TRIPLE DEL MARGEN SUR DE CHILE: GEOCRONOLOGIA K-Ar

MAGMATIC EFFECTS OF PLIOCENE RIDGE SUBDUCTION IN THE SOUTHERN CHILE MARGIN TRIPLE JUNCTION: K-Ar GEOCHRONOLOGY

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During the last 14 Ma the southern Chile Margin Triple Junction (CMTJ) migrated northwards along the Chile trench being at present located offshore the Peninsula de Taitao area (46°05'S). In the CMTJ, a short segment of the Chile Rise is parallelly being subducted at the sediment filled trench. South of the CMTJ and seaward of Peninsula Tres Montes (Figure 1) two other short segments of the Chile Rise were previously subducted at 6-5 and 3 Ma (HERRON et al, 1981; CANDE & LESLIE, 1985). Recent field work carried out in Peninsula Tres Montes allowed the recognition of a complex suite of young anomalous "near trench" plutonic and volcanic rocks which seem to have been emplaced coevally with subduction of Chile Rise segments in the Pliocene (FORSYTHE et al., 1985).

Figure (1) is a simplified map of Peninsula Tres Montes and surrounding islands. The oldest rock unit is a thick turbidite sequence, similar to some of the pre Upper Jurassic "basement" fore-arc assemblages of the Patagonian archipelagos (FORSYTHE & MPODOZIS, 1983; GODOY et al., 1984). At Puerto Barroso - Surgidero Stokes (Fig. 1) this "basement" is unconformably covered by shallow water conglomerates and sandstones (*Tres Montes sequence*, FORSYTHE et al., 1985b), of possible Eocene age, while in the Chaicayan islands (Hereford, Croslett, Fig. 1) and along the southern shores of the Peninsula de Taitao the basement is also covered by more than 300 m of Late Miocene sediments (*Islas Chaicayan sequence*, FORSYTHE et al, 1985b; DE VRIES and SLOTT, 1984). Tertiary sequences of Peninsula Tres Montes and Islas Chaicayan are part of the sedimentary infill of the Golfo de Penas basin that, according to FORSYTHE and NELSON (1985) was formed in the Tertiary as a "pull apart" basin at the trailing edge of the "Chiloe block", moving northwards along the Liquiñe–Ofqui fault. Both, the basement and the Tertiary sediments are intruded by a number of porphyritic and coarse grained stocks, while in the Cabo Raper area (Fig. 1) there are large outcrops of a young ophiolite complex (*Taitao Ophiolite*, FORSYTHE et al., 1985a). 23 K-Ar analyses were performed in the magmatic rocks of Tres Montes in order to understand their emplacement ages and tectonic setting.

The plutonic rocks consist of: (1) coarse grained stocks (2) orthopyroxene bearing dacitic porphyries and (3) amphibole dacitic porphyries. Coarse grained granitoids are

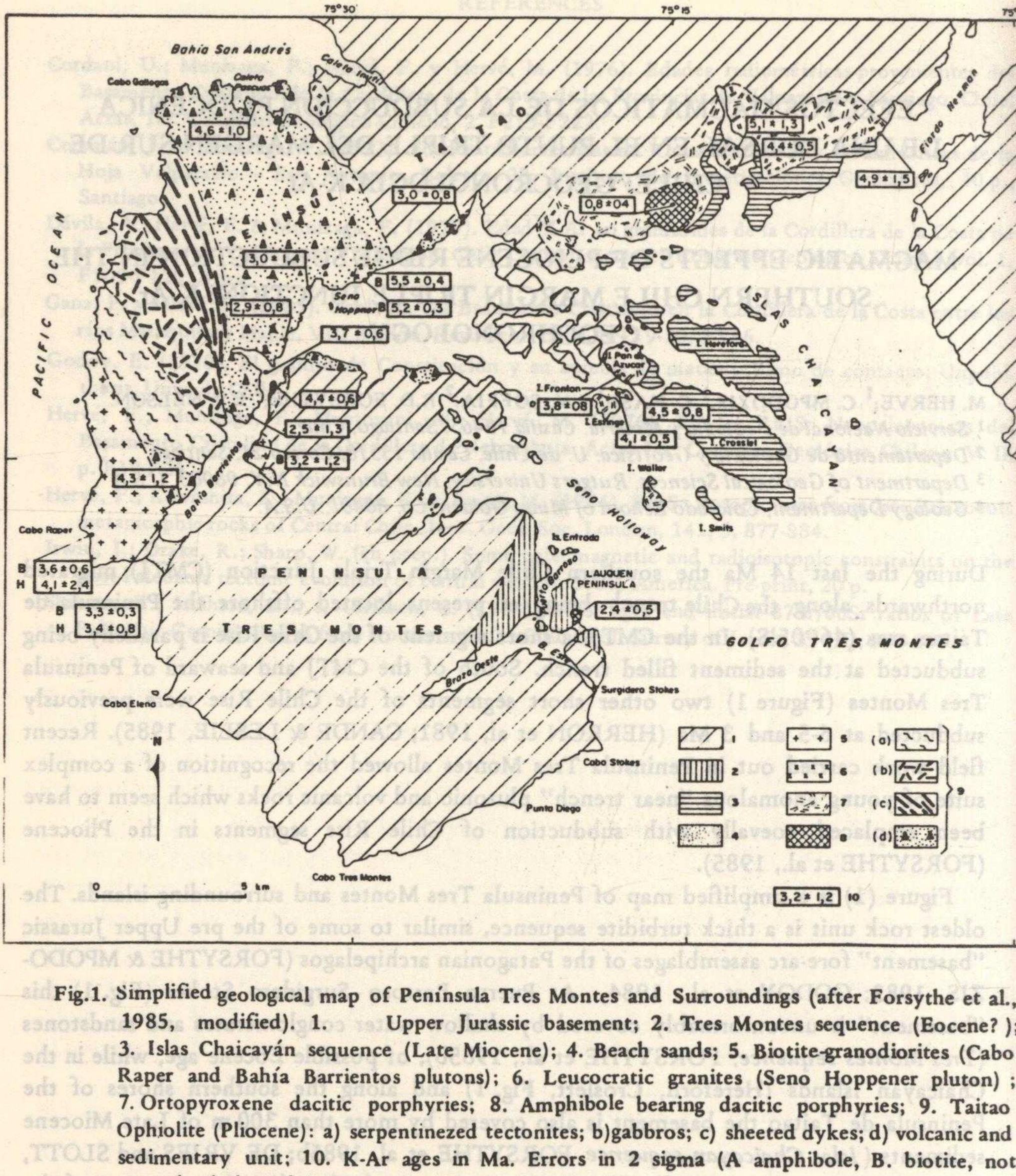

Fig.1. Simplified geological map of Península Tres Montes and Surroundings (after Forsythe et al., 1985, modified). 1. Upper Jurassic basement; 2. Tres Montes sequence (Eocene?); 3. Islas Chaicayán sequence (Late Miocene); 4. Beach sands; 5. Biotite-granodiorites (Cabo Raper and Bahía Barrientos plutons); 6. Leucocratic granites (Seno Hoppener pluton) ; 7. Ortopyroxene dacitic porphyries; 8. Amphibole bearing dacitic porphyries; 9. Taitao Ophiolite (Pliocene): a) serpentinezed tectonites; b)gabbros; c) sheeted dykes; d) volcanic and sedimentary unit; 10. K-Ar ages in Ma. Errors in 2 sigma (A amphibole, B. biotite, not quoted; whole rocks).

Fig.1 Mapa geológico simplificado de Península Tres Montes e islas vecinas (modificado de Forsythe et al., 1985b). 1. Basamento pre-jurásico; 2. Secuencia de Tres Montes (¿Eoceno?); 3.Secuencia Islas Chaicayán (Mioceno Superior); 4. Arenas de playa; 5.Granodioritas de biotita (Plutones Cabo Raper y Bahía Barrientos; 6.Granitos leucocráticos (Plutón Seño Hoppener); 7. Pórfidos dacíticos de Ortopiroxenos; 8. Pórfidos dacíticos con anfíbola; 9. Ofiolita Taitao (Plioceno): a) serpentinas tectónizadas; b) gabros; c) enjambres de diques; d) unidad volcánica-sedimentaria; 10. Edad K-Ar en Ma. Error en 2 sigma (A: anfíbola, B: biotita, sin prefijo : roca total).

leucocratic monzogranites (Seno Hoppner pluton) with biotite K-Ar ages of 5,5 and 5,2 Ma and biotite granodiorites (Cabo Raper and Seno Barrientos plutons) in which 4.1–3.6

and 3.4–3.3 Ma K-Ar ages from amphibole-biotite pairs were obtained while a third sample yielded a 3,2 Ma biotite age. The orthopyroxene dacitic porphyries are small isolated stocks with columnar jointing (Isla Pan de Azucar) for which whole rock K-Ar data indicates pliocene ages (Isla Pan de Azucar, 3,8 and 4.5 Ma; Isla Fronton 4,1 Ma and Fiordo San Pedro with 5,1 and 4.4 Ma). The amphibole (hornblende) bearing porphyries are only two small isolated stocks (Peninsula Lauquen, Cupula San Pablo) that have yielded young and probably reset whole rock K-Ar ages of 2.4 and 0.8 Ma.

The Taitao Ophiolite, cropping out in the Peninsula de Taitao north of Bahia Barrientos (Fig. 1) is a northeast tilted, fault - bounded, block in which a "stratigraphical" sequence of serpentinized tectonites, gabbros and sheeted dykes is capped by large exposures of pillow lavas and volcanic breccias with pliocene sedimentary intercalations (FORSYTHE, et al, 1985a,b). Lavas range in composiition from basalts to rhyolites showing "calc-alkaline" chemical affinities. The oldest whole rock K-Ar ages of the lavas were obtained in samples from the Pacific shore of the Peninsula de Taitao (Bahia San Andres) and Bahia Barrientos (4.6, 4.4, 4.4 and 3.7 Ma) while sligthly younger ages (3.0, 3.0, 2.9 and 2.5 Ma) were obtained along the northwest shores of Seno Hoppner and Bahia Barrientos (Fig. 1).

The K-Ar ages clearly indicate that a magmatic event occurred in the Tres Montes area mainly between 5-3 Ma. This Pliocene event inmediately postdated the subduction of a short segment of the Chile Rise between 5-6 Ma south and west of Peninsula Tres Montes (CANDE & LESLIE, 1985). Timing of magmatic activity in Tres Montes is coherent with the theoretical "blow torch" effect that accompanies ridge subduction, ptedicted by DE LONG et al., (1979). According to this model subduction of an active ridge segment is followed by a rapid and strong pulse, 2-3 Ma later, of anomalous high heat flow in the near trench and forearc region that enhances magma generation at short distances from the trench axis. Nevertheless, the subduction of a younger ridge segment west of Peninsula Tres Montes at 3 Ma (CANDE & LESLIE, 1985) was not followed by renewal in magmatic activity, as the model predicts. While most of the plutonic rocks emplaced certainly from small magma blows cutting across the "basement" assemblages, the emplacement history of the Taitao Ophiolite is less clear. A possible origin by upwelling of basic magmas along the landward extension of the Tres Montes fracture zone is not excluded. Repeated subduction of short ridge segments in front of Peninsula Tres Montes ("strong-ridge trench interaction", CANDE & LESLIE, 1985) seems to have, in some way, controlled the magmatic activity. Long, but single, segments of the Chile Rise collided with the trench south of Golfo de Penas between 14-6 Ma but near trench related magmatism has not yet been found in that area.

In conclusion the spectacular Pliocene near trench magmatic activity recently discovered at Peninsula Tres Montes is a major effect of the subduction of segments of the Chile Rise in southern Chile. This effect of ridge subduction can be well compared with ridge subduction related near trench magmatism, described in other places such as Alaska (MARSHACK & KARIG, 1977; HILL et al., 1977), Antarctic Peninsula (BAKER, 1982), Japan, (UYEDA & MIYASHIRO, 1977) or the Marianas (BLOOMER et al., 1983).

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