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MAGMATISM AND THE LIQUIÑE-OFQUI´ FAULT ZONE, CHILE SUR (40°-46° S. LAT.)

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K-Ar and $^{40}Ar/^{39}Ar$ single-crystal laser fusion (SCLF) dating techniques are establishing a more comprehensive geochronology of the Northern Patagonian Batholith (NPB) in southern Chile. This extensive terrane of plutonic rocks exposed by Pleistocene glaciation, records the magmatic and tectonic history of an important segment of the western margin of South America that has been a convergent plate boundary since the break-up of the Gondwana super continent and the westward migration of South America during the last 300 Ma. This region, now, is just north of the Chile Rise-South America triple junction thus of particular interest because of Late Cenozoic volcanism, plutonism, active pull-apart basins and regional faulting along the Liquine-Ofqui Fault Zone (LOFZ) display the most recent manifestations inboard of a terminal subduction zone.

Regional reconnaissance studies (Garcia, et al.,1988, Hervé, et al.,1988, Beck, et al.,1991, and Cembrano, et al., 1990) and preliminary K-Ar and SCLF Ar-Ar dating (Munizaga, et al.,1988, and Drake, et al.,1990) , and Rb/Sr dating (Pankhurst et al.,1990 and1991) have revealed a broad range of plutonic ages. Most fall into discrete groups that document major magmatic events around 295 ± 5 Ma, 170± 10 Ma, 120± 10, 80±5, and 25-3 Ma which are recognized more broadly along the Chilean continental margin . Here, however, plutonic ages are more diverse and their patterns of distribution appear to be much more complicated and enigmatic than further north where discrete N-S plutonic belts display a systematic decrease in age from west to east during the Mesozoic and Cenozoic (Drake, et al., 1982 and Farrar, et al., 1970). This apparent diversity in plutonic ages and complexity of distribution patterns may be due, in part,

to the cross-cutting, hence partial thermal overprinting, by successive plutonic belts reflecting long term changes in the subduction trends and corresponding magmatic loci along the evolving continental margin. Most plutons yield a high degree of concordancy between K-Ar and Ar-Ar mineral ages and with Rb/Sr WR isochron ages. Some, however, exhibit marked discordancy which suggests either thermal overprinting or prolonged cooling histories. The occurrance of Muscovite-garnet granites <10 Ma old also indicate rapid uplift.

Tectonic processes may also have disrupted once continuous age belts and juxtaposed them to other terranes along major trans-current fault systems such as the LOFZ. So far, field and paleomagnetic evidence does not support such large scale displacements along the LOFZ (Garcia, et al., 1988), but some right-lateral faulting and slight clock-wise block rotations have been documented and may be late Cenozoic manifestations of an obliquely convergent plate-margin (Beck, 1988). If relative N-S stresses have existed between the Nazca and SA plates as a consequence of oblique subduction, then it is reasonable that the thermally conditioned crustal zone traversed my magmas of the active arc would yield most readily. However, since faults such as the LOFZ trend NNE-SSW, if they are right-lateral, they eventually butt into the continent in contrast to the San Andreas Fault in California, which trends NW-SE and has completely severed the continent. Any northward displacements of terranes outboard of LOFZ faults, therefore, must be accommodated by a complementary E-W extension or clock-wise rotation similar to that proposed for the pull-apart origin of the Gulfo de Penas (Forsythe and Nelson, 198-?. Pleistocene glaciers have preferrentially excavated along hundreds of kilometers of the LOFZ and parallel fault or fracture zones and display regional patterns consistent with this observation. Also, several Holocene volcanic cinder cones have erupted within these N-S fijords and glacial valleys attesting to on-going tectonic/magmatic activity.

At 40° S., two parallel belts of Paleozoic (295±5 Ma) and inboard Jurassic (170±5 Ma) plutons follow a NW-SE trend marking the southern-most occurrence of these age groups and suggesting a prior alignment of the continental margin in this direction. Subsequent, emplacement of mid-to-late Cretaceous and Miocene to Pliocene plutons along N-S trends may have effectively extended the continent southward and created its present configuration.

Between 40°30' and 41°30' S. plutons west of the LOFZ are Miocene age:12-10 Ma (K-Ar) and 16±1 Ma (Rb-Sr) and, near Chaiten, 43° S., 20 Ma (K-Ar). In contrast, plutons on the east side of the LOFZ yield mid-Cretaceous ages:100-115 Ma (Ar/Ar) along Estero Reloncaví, 41.5° S. and 117± 10 Ma (Ar/Ar) at Futaleufú and 110-115 (Rb/Sr) near Palena, 43° 20' to 43°40' S. Miocene-Pliocene plutons: 10-3 Ma (Ar/Ar) also occur on Isla Llancahue, 42° 10' S. South of 42° preliminary K-Ar and Rb/Sr dates suggest a reversed pattern with Miocene plutons east of those of mid-Cretaceous age. The diversity and age distribution of plutons on both sides of the LOFZ needs to be better defined but, in general, the locus of Miocene -Pliocene plutons and the active volcanic arc is remarkably narrow and, for the most part, coincident with the LOFZ and its sub-parallel branches. So far, these data imply that the locus of subduction related arc magmatism at these latitudes has remained nearly stationary, in an E-W sense, since the Jurassic in contrast to the 150-200km. eastward migration seen further north along the W margin of SA. during the same time period.

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