Comunicaciones Nº 42 - 1991: 44 - 48
Departamento de Geología, Universidad de Chile, Santiago

IS EARLY PALEOZOIC ACCRETION OF THE CHOAPA METAMORPHIC COMPLEX IN CENTRAL CHILE COMPATIBLE WITH THE PRECORDILLERA TERRANE ?

Reinaldo Charrier, Estanislao Godoy, Sofía Rebolledo and Francisco Hervé.
Departamento de Geología, U. de Chile. Casilla 13518 Correo 21, Santiago.

The Complex

Low grade polimetamorphosed pelitic, quartz, mafic and minor ultramafic schists and marbles structurally underlie devonian to early carboniferous turbidites (Arrayán Formation of Cecioni, 1962) along the chilean coast, 200 km west of the argentinian Precordillera. They crop out as either fault or jurassic intrusive bounded blocks from isla Chañaral to rio Choapa (fig. 1), some of them 20 km long and made up entirely by greenschists.

Irwin (in Rebolledo, 1987) reports a 359±36 Ma K-Ar amphibole age and a 311±89 Ma Rb-Sr isochron (Irwin et al, 1988) in the complex. Amphiboles are strongly zoned, with both edenite-pargasite and actinolite-tschermakite end members (Hervé, 1982; Godoy and Charrier, 1991). Other K-Ar age determinations are grouped in either a 284-256 or a 220-125 Ma range (Rivano y Sepúlveda, 1991), what most likely reflect resetting by late carboniferous-permian and jurassic granitoids. The former occur as inclusions in andesitic dykes crosscutting the complex and have been dated by the U-Pb method (Berg and Charrier, 1987). Polimetamorphism of the complex and thus a probable early paleozoic age of the complex is also supported by microprobe study of garnets from quartz-pelitic schists, which preserve a zoning characteristic of medium grades.

According to Charrier et al (1985) some of the steeply dipping fault zones in the complex are pre-Permian and may represent contacts associated to stacking in an accretionary prism. Boudin rich gently dipping fault zones found in the devonian turbidites around the complex may, on the other hand, represent marginal core-complex extensional features. No evidence for an important strike-slip component has been reported.

Sepulveda (1984) describes this accretionary prism as active until the late Carboniferous, with an interruption before the late Devonian. Thiele

and Hervé (1984) extend accretion in this area into the early Permian, whose turbi–dites they see progre–ssively me–tamorphosed.

Trace element con–tents from greenschists, some of which show pillow structures, are similar to those of in–traplate oceanic basalts or, less frequently, bear a MORB signature (Godoy, 1986; Rebo–lledo, 1987; Irwin et al, 1988).

THE TERRANE

Westward deepening platform carbonates and slope turbidites of cambrian to devonian age which crop out tec–toni–cally sandwiched between the Precam–brian southern Sierras Pampeanas and the late Paleozoic to Triassic Frontal Range in Ar-gentina constitute, according to Ramos et al (1986), the Precor–

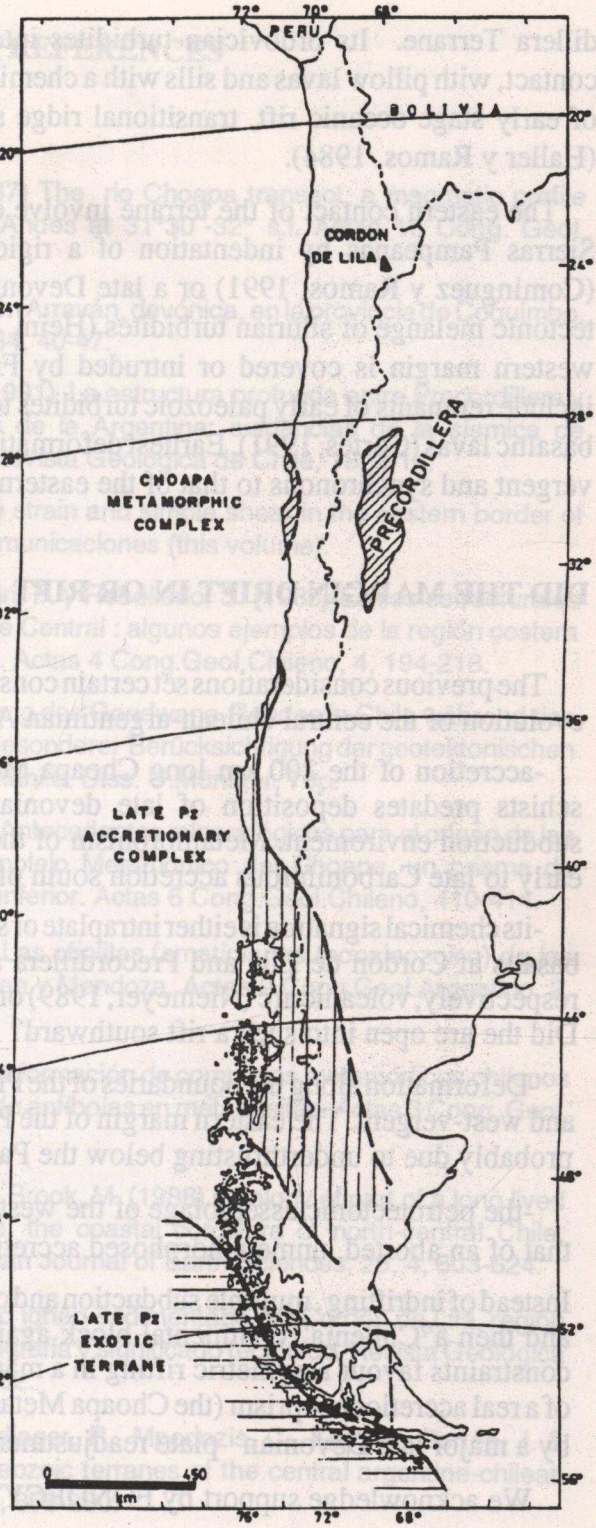

Fig. 1: Regional setting of the Choapa Met. Complex.

dillera Terrane. Its ordovician turbidites interfinger, near the western contact, with pillow lavas and sills with a chemical signature similar to that of early stage oceanic rift, transitional ridge segment or back-arc basin (Haller y Ramos, 1984).

The eastern contact of the terrane involve either delamination of the Sierras Pampeanas by indentation of a rigid Precordilleran basement (Cominguez y Ramos, 1991) or a late Devonian to early Carboniferous tectonic melange of silurian turbidites (Heim, in Ramos et al, 1986). The western margin is covered or intruded by Frontal Range rocks which include remnants of early paleozoic turbidites tectonically imbricated with basaltic lavas (Cortes, 1991). Earliest deformation is described as westward vergent and synchronous to that of the eastern boundary.

DID THE MARGIN DRIFT IN OR RIFT AWAY?

The previous considerations set certain constraints on the early paleozoic evolution of the central chilean-argentinian Andes. Some of them are:

-accretion of the 200 km long Choapa Metamorphic Complex mafic schists predates deposition of late devonian turbidites on a renewed subduction enviroment. Metamorphism of the complex also predates the early to late Carboniferous accretion south of 34° s.l. (fig.1).

-its chemical signature is either intraplate or similar to MORB. Ordovician basalts at Cordón de Lila and Precordillera are, instead, comparable to, respectively, volcanic arc (Niemeyer, 1989) or early stage oceanic rift ones. Did the arc open into such a rift southward?

-Deformation along the boundaries of the Precordillera was synchronical and west-vergent. The eastern margin of the Precordillera basin is lacking, probably due to underthrusting below the Pampeanas basement.

-the petrotectonic assemblage of the western Precordillera ressembles that of an aborted, unmetamorphosed accretionary prism.

Instead of indrifting, multiple subduction and collision of first a Precordillera and then a"Chilenia" continental block against a growing margin, these constraints favour assymetric rifting in a marginal basin located eastward of a real accretionary prism (the Choapa Metamorphic Complex), followed by a major late Devonian plate readjustment and basin closure.

We acknowledge support by FONDECYT 1224.

REFERENCES

Berg,K. and Charrier, R. (1987) The rio Choapa transect: a magmatic profile across the chilean Andes at 31°30´-32° s.l. Actas 10 Cong. Geol. Argentino, 4, 11-14.

Cecioni, G. (1962) La Formación Arrayán, devónica, en la provincia de Coquimbo. Boletín U.de Chile, 34, 40-47.

Cominguez, A. y Ramos, V. (1991) La estructura profunda entre Precordillera y Sierras Pampeanas de la Argentina: evidencias de la sísmica de reflexión profunda. Revista Geológica de Chile, 18, 3-14.

Cortés, J. (1991) Progressive strain and simple shear in the eastern border of Chilenia terrane. Comunicaciones (this volume).

Charrier, R., Arcos, R., Malbrán, F. y Rebolledo, S. (1985) Estilos estructurales en los Andes de Chile Central : algunos ejemplos de la región costera y Cordillera Principal. Actas 4 Cong.Geol.Chileno, 4, 194-218.

Godoy, E. (1986) Die Entwicklung des Gondwana-Randes in Chile während des Paläozoikums unter besonderer Berücksichtigung der geotektonischen Stellung der Metavulkanite. Diss. U.Münster, 70p.

Godoy, E. y Charrier, R. (1991) Antecedentes mineralógicos para el origen de las metabasitas del Complejo Metamórfico del Choapa, un prisma de acreción Paleozoico inferior. Actas 6 Cong.Geol.Chileno, 410-414.

Haller, M. y Ramos, V. (1984) Las ofiolitas famatinianas (eopaleozoico) de las provincias de San Juan y Mendoza. Actas 9 Cong.Geol.Argentino, 2, 66-83.

Hervé, F. (1982) Condiciones de formación de complejos metamórficos chilenos a partir de la química de anfíbolas en metabasitas. Actas 3 Cong. Geol. Chileno, 2, 93-115.

Irwin, J., García, C., Hervé, F. & Brook, M. (1988) Geology of part of a long lived dynamic plate margin: the coastal cordillera of north-central Chile, lat.30°51'-31°. Canadian Journal of Earth Sciences, 25, 4, 603-624.

Niemeyer, H. (1989) El complejo ígneo-sedimentario del Cordón de Lila, región de Antofagasta: estratigrafía y significado tectónico. Revista Geológica de Chile, 16, 2, 163-182.

Ramos, V., Jordan, T., Allmendinger, R., Mpodozis, C., Kay, S., Cortés, J. & Palma, M. (1986) Paleozoic terranes of the central argentine-chilean Andes. Tectonics,5, 6, 855-880.

Rebolledo, S. (1987) Geología y análisis estructural del basamento metamórfico del area Punta Claditas, región de Coquimbo, Chile. Depto.Geol. U.de Chile. Memoria de Título. 166p.

Rivano, S. y Sepúlveda, P. (1991) Hoja Illapel. Servicio Nacional de Geología y Minería. Carta 69.

Sepúlveda, S. (1984) Geología del Paleozoico de la zona costera del Norte Chico. Servicio Nacional de Geología y Mineria, Miscelanea 4, J1-J7.

Thiele, R. y Hervé, F. (1984) Sedimentación y tectónica de antearco en los terrenos preandinos del Norte Chico, Chile, Revista Geológica de Chile, 22, 61-76.