The Gondwanide deformation along the southwestern border of the Río de la Plata Craton: Geochemical and geochronological constraints on ductile shear zones from the Ventania System basement, Argentina

Carlos A. Ballivián Justiniano [a,c,*], Sebastián Oriolo [a,c], Miguel A.S. Basei [d], Mabel E. Lanfranchini [b,e], Rodolfo O. Christiansen [f], Norberto J. Uriz [g], Sebastián E. Vázquez Lucero [a,c], Daniela A. Del Bono [a,h], Marnie A. Forster [i], Ricardo O. Etcheverry [a,e], Colombo C.G. Tassinari [d], Marcos A. Comerio [a,j], Claudia B. Prezzi [a,c]

[a] Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Argentina
[b] Comisión de Investigaciones Científicas de la Provincia de Buenos Aires (CICBA), Argentina
[c] Instituto de Geociencias Básicas, Aplicadas y Ambientales de Buenos Aires (IGEBA), Universidad de Buenos Aires–CONICET. Intendente Güiraldes 2160, Ciudad Universitaria (Pabellón II, Piso 1), CP 1428, Buenos Aires (CABA), Argentina
[d] Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq). Centro de Pesquisas em Geocronologia e Geoquímica Isotópica (CPGeo), Instituto de Geociências, Universidade de São Paulo. Rua do Lago 562, Cidade Universitária, 05508-080, Butantã, São Paulo, Brazil
[e] Instituto de Recursos Minerales (INREMI), Universidad Nacional de La Plata–CICBA. Calle 64 s/n, CP 1900, La Plata, Buenos Aires, Argentina
[f] Hydrogeology Department, Institut für Geologie, Mineralogie und Geophysik, Ruhr-Universität Bochum. Universitätsstraße 150, 44801, Bochum, Germany
[g] Museo de La Plata, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata. Paseo del Bosque s/n, B1900FWA, La Plata, Buenos Aires, Argentina
[h] Centro de Investigaciones en Ciencias de la Tierra (CICTERRA), CONICET–Universidad Nacional de Córdoba. Av. Vélez Sarsfield 1611, X5016GCA, Córdoba (Capital), Córdoba, Argentina
[i] Research School of Earth Sciences, Australian National University, Building 142, 1 Mills Road, Acton, Canberra, 2601, Australia
[j] Y-TEC (YPF Tecnología), Av. del Petróleo s/n, CP 1923, Berisso, Buenos Aires, Argentina

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ABSTRACT

This work deals with the study of Gondwanide ductile shear zones developed in Neoproterozoic–middle Cambrian basement rocks of the Ventania System and possibly related to the reactivation of the Sierra de la Ventana Shear Zone. This reactivation was caused by the northeastward migration of the Gondwanide deformation from the North Patagonian Massif. The crustal shortening related to the Gondwanide Orogeny gave rise to thrusting of the Ventania System basement over Paleoproterozoic rocks of the Río de la Plata Craton. This work focuses on the study of muscovite ± quartz phyllonites of the Ventania System basement and quartz ± muscovite veins crosscutting basement and Paleozoic cover rocks of the system. Structural and magnetic surveys were performed in order to characterize the Gondwanide structures of the basement, while petrographic, X-ray diffraction, geochemical, and geochronological studies were carried out in order to investigate the nature, P-T conditions, element mobility, and age of these shear zone-related rocks. In the Sauce Chico Inlier, mylonitized basement rocks crop out along the western edge of the system, near the basement–Paleozoic cover interface, where the main structures are top-to-NNE reverse ductile shear zones with related phyllonites. Ductile shearing under greenschist-grade conditions (125–340 MPa and 300–400 °C) promoted major and trace element mobility. Phyllonites are the result of extreme hydrolysis of feldspars from the acidic igneous rocks of the basement, producing muscovite and releasing aqueous SiO_2 later redeposited as quartz veins. These phyllonites developed in connection with reactivated contacts between basement units and also the basement–Paleozoic cover interface. New Rb–Sr quartz-muscovite and Ar/Ar muscovite ages for phyllonites and a quartz vein indicate a protracted tectono-metamorphic history mainly restricted to the Cisuralian (ca. 287 Ma), comprising regional folding and metamorphism, shear zone activity, vein-type mineralization, and syntectonic deposition of the Tunas Formation. Subsequent reactivations during the Lopingian (ca. 256 Ma) and probably in Late Triassic times (ca. 227 Ma) resulted from localized shearing along mylonitic belts.