towards Popocatépetl volcano which current eruptive cycle began at 23 ka. However, recent K-Ar and ^{14}C age determinations of lavas and pyroclastic deposits from the northwest end of the Sierra Nevada (TTVC) indicate ages younger than 32 ka, suggesting that the proposed magmatic migration is not clearly displayed.

Iztaccíhuatl volcanic products with ages from ~1.7 Ma to 12 ka are represented by calc-alkaline andesitic-dacitic lava flows, minor occurrence of basaltic andesite, domes, pyroclastic deposits and some scoria cones. Trace element patterns show enrichments of LILE with respect to HSFE. Together with negative anomalies of Nb, Ta, P, and Ti, and positive anomalies of Ba, Rb and Pb for the majority of the rocks, this suggests a depleted magma source in the subcontinental lithosphere modified by subduction fluids and some influence of slab components. The isotopic results for the IVC products show the following ranges: $^{87}Sr/^{86}Sr$ from 0.70381 to 0.70538, εNd from –0.35 to +4.08, $^{206}Pb/^{204}Pb$ from 18.60 to 18.77, $^{207}Pb/^{204}Pb$ from 15.55 to 15.63 and $^{208}Pb/^{204}Pb$ from 38.28 to 38.63, suggesting different degrees of interaction with the continental crust.

The Tláloc-Telapón VC products are composed of calc-alkaline early andesitic – late rhyolitic lava flows, important pyroclastic deposits and minor domes. The trace element patterns also suggest a depleted source in the subcontinental lithosphere with an important influence of slab components. The isotopic results for the TTVC vary as follows: $^{87}Sr/^{86}Sr$ = 0.70441 - 0.70519, εNd = –0.51 - +1.64, $^{206}Pb/^{204}Pb$ = 18.62 - 18.76, $^{207}Pb/^{204}Pb$ = 15.55 - 15.67 and $^{208}Pb/^{204}Pb$ = 38.32 - 38.85. In general, rocks from this complex display stronger evidence for magma interaction with the continental crust in comparison to other central TMVB volcanoes such as Iztaccíhuatl, Popocatépetl and Nevado de Toluca.

U-Pb LA-ICP-MS age determinations of growth impulses in zircons from Carboniferous post-orogenic granites, Sierra de Velasco (NW-Argentina)

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The central and eastern part of the Sierra de Velasco (Sierras Pampeanas) is formed by the large Huaco (*HG*) and Sanagasta (*SG*) syeno- to monzogranite massifs, the small zinnwaldite and fluorite bearing La Chinchilla monzogranitic stock (LCS), and unnamed tourmaline bearing equigranular monzogranite bodies (*eqG*). The two voluminous granites intrude Famatinian metagranites (Ordovician) and crosscut Devonian mylonitic shear zones (Höckenreiner et al. 2003). The *LCS* sharply intrudes into the *HG*, whereas the *eqG* are inner and boarder facies of the *HG*.

Cathodoluminescence (CL) investigations of the zircons from all granites reveal a multi-phase crystallization history. The inner most part of the zircons is formed by inherited cores (except in the Sanagaste granite). These cores are subrounded to globular and consist of magmatic growth structures. The lack of angular fragments and a homogeneous age distribution imply that the zircon cores were formed by dissolution processes following Ordovician magmatic events.

Ages of inherited zircon cores represent two phases of crystallization at 476 ± 5 Ma and 454 ± 4 Ma (2σ). This two-phase age distribution is identical to that found in monazites from surrounding Famatinian metagranites (De los Hoyos et al. 2008), and suggests that the metagranites represent the dominant source rocks of the Carboniferous monzogranites.

To identify the formation mechanism of the four Carboniferous granite bodies, U-Pb LA-ICP-MS age determinations were carried out on the zircons. CL investigations on zircons of all granites demonstrate a three-phase in-situ crystallization history. The large ratio of zircon overgrowth to core or even the absence of such cores in the Sanagasta granite indicates debut of undersaturation of Zr in the melt.

The inner seed crystallization domain is often elongated and needle-shaped with fuzzy-looking zoning. Its bright luminescence pattern implies a lower content of foreign elements, including U and Pb, than in darker overgrown younger domains. An interruption of zircon growth between seed and main domains is well documented by smoothly rounded dissolution surfaces with disruption of former growth phases. Corrosion of the seed growth phase documented by the dissolution surface marks a phase of temporary zircon-undersaturation in the melt. This implies, that, zircon-supersaturation in the newly formed melt was lower during the subsequent main crystallization phase than in the older seed crystallization phase. These observations together with Rapakivi-like textures in K-feldspar megacrysts imply a significant change in magma composition.

Mafic enclaves of the HG and the SG and further geochemical data (Grosse et al. 2008) suggest hybridization with a more primitive, possibly mantle-derived component. Zircon concentration of the mafic enclaves, which are twice as high as those of the host granites and the higher temperature of the incorporated mafic melt may have resulted in the corrosion of the pre-existing zircons in the melt. Based on U-Pb dating of zircons from all granites, the Early Achalian zircon seed growth phase is well determined at 368±2 Ma. The U-Pb zircon ages of individual granite bodies vary slightly between 371.4±5.0 Ma (SG), 369.8±4.7 Ma (eqG), 368.1±3.4 Ma (HG) and 366.0±2.7 Ma (LCS) but are identical within error (2σ).

The subsequent main zircon crystallization event is best documented in the eqG. It is the only granite in which zircons developed solely during the main crystallization phase are predominant. They are short prismatic to globular. The inner domain is bright in luminescence grading into a phase of lesser luminescence but with a regular oscillatory zoning pattern. In zircons of HG and SG only this second growth stage is developed as an overgrowth on the seed domain. In the LCS the main zircon growth phase is nearly missing.

The change in magma composition is contemporaneous with the main zircon growth phase and has been dated at 350 ± 2 Ma (2σ; mean value; Middle Achalian) in three of the granite bodies. U-Pb zircon ages of individual granite bodies vary between 351.4 ± 3.4 Ma (eqG), 351.1 ± 6.1 Ma (LCS) and 348.6 ± 5.2 Ma (HG) but are identical within error (2σ). The age of main zircon growth period of the fourth granite, the SG, is slightly younger at 345.1 ± 5.9 Ma (2σ). This slightly younger age, combined with the geochemical and isotopic trend towards more primitive mantle compositions in the SG melt supports the idea of cumulative degree of assimilation of mantle-derived components with time in the Carboniferous granites of the Sierra de Velasco (Grosse et al. 2008). One of the youngest and most primitive products of this evolution could be the San Blas granite (340 ± 3 Ma; Dahlquist et al. 2006). Conventional U-Pb determinations on monazite from HG and SG are identical in age with that of the main zircon growth phase at 350 ± 2 Ma (Grosse et al. 2008).

Furthermore, zircons of all granites show an outer rim, prevalently without any luminescence. This black rim in the CL images is up to 40µm wide at pyramidal apices and forms the euhedral outer shape of all the crystals. The lack of any luminescence is in agreement with a very high content of foreign elements (up to 4300 ppm U). The high amount of radioactive elements (Th/U = 1 to 2.8) accounts for the damage of the crystal lattice which resulted in loss and/or gain of radiogenic lead. Reliable analyses of this outermost rim were achieved only on zircons from the LCS, because of their remarkably broad domain and a low but visible luminescence with widely-spaced oscillatory zoning. In most cases, the main growth zone is separated from the rim by a dissolution surface, as well, which supports the trend of changing melt composition with time.

Nine concordant U-Pb analyses of the outermost rims of LCS zircons yield an age of 335.7 ± 2.9 Ma (2σ). This is the youngest age determined by the LA-ICP-MS method on a single zircon growth phase in Sierra de Velasco granites and represents the very last intrusion phase, marked by small stocks. This age is somewhat younger than the corresponding monazite age (344.5 ± 1.4 Ma; Grosse et al. 2008), but similar to that of zircons from the San Blas granite obtained by conventional U-Pb analyses (334 ± 5 Ma; Báez et al. 2004).

In conclusion, the magma chamber that produced the different bodies of Carboniferous monzogranites in the Sierra de Velasco was active for about 30 Ma. During the life-span of the magma chamber, the magma composition changed progressively due to an increase of primitive mantle-derived components.

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Fluid inclusions and cathodoluminescence of hydrothermal breccias from the La Carolina volcanic field, San Luis, Argentina: Implications for the genesis of ore mineralization in epithermal systems

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Introduction: The Tertiary (12-13 to 1.9 Ma) metallogenic belt of San Luis is located between latitudes 32º45'S and 33º14'S in the southeastern extreme of the Central Andean flat-slab segment between 27ºS and 33ºS. Volcanic rocks and associated ore deposits occur within a 80 km long WNW-trending belt, about perpendicular to the main reverse faults delimiting the San Luis range. The volcanic rocks intrude and overlie the Precambrian-Paleozoic basement. The main volcanic centers are (from west to east) La Carolina, Cañada Honda-Cerros Largos, Cerros del Rosario, and El Morro. The mesosilicic magmas belong to normal to high-potassium calc-alkaline and shoshonitic suites. The lithologies comprise andesites, dacites, latites, and trachytes. The rocks become progressively younger and K-rich to the east.

The La Carolina district represents a maar-diatreme system, which was disturbed by dome emplacement. Sampling includes lavas and volcanoclastic rocks. Lavas were emplaced as domes or as andesitic and latitic flows. Volcanoclastic rocks include phreatomagmatic breccias, autoclastic flow breccias and hydrothermal breccias. Gold and silver is found in base metal sulfide-rich epithermal deposits, which combine stockworks, disseminated mineralized zones, and veinlets. Mean