andesite lava flows yielded miniplateau ages (about 30% of gas released) of ca. 170-175 Ma at high temperatures (Figs. 1,2). Microprobe analyses of unaltered plagioclases within theses rocks show that their Ca/K composition correspond to $^{37}Ar_{Ca}/^{39}Ar_K$ for high temperature steps (Fig .1), therefore the mini plateau ages are likely close to the extrusion age of the volcanic rocks. Furthermore, stratigraphical relations with overlaying sedimentary rocks indicate a maximum middle Bajocian age for the Jurassic Oficina Viz Formation (Kramer et al. 2005).

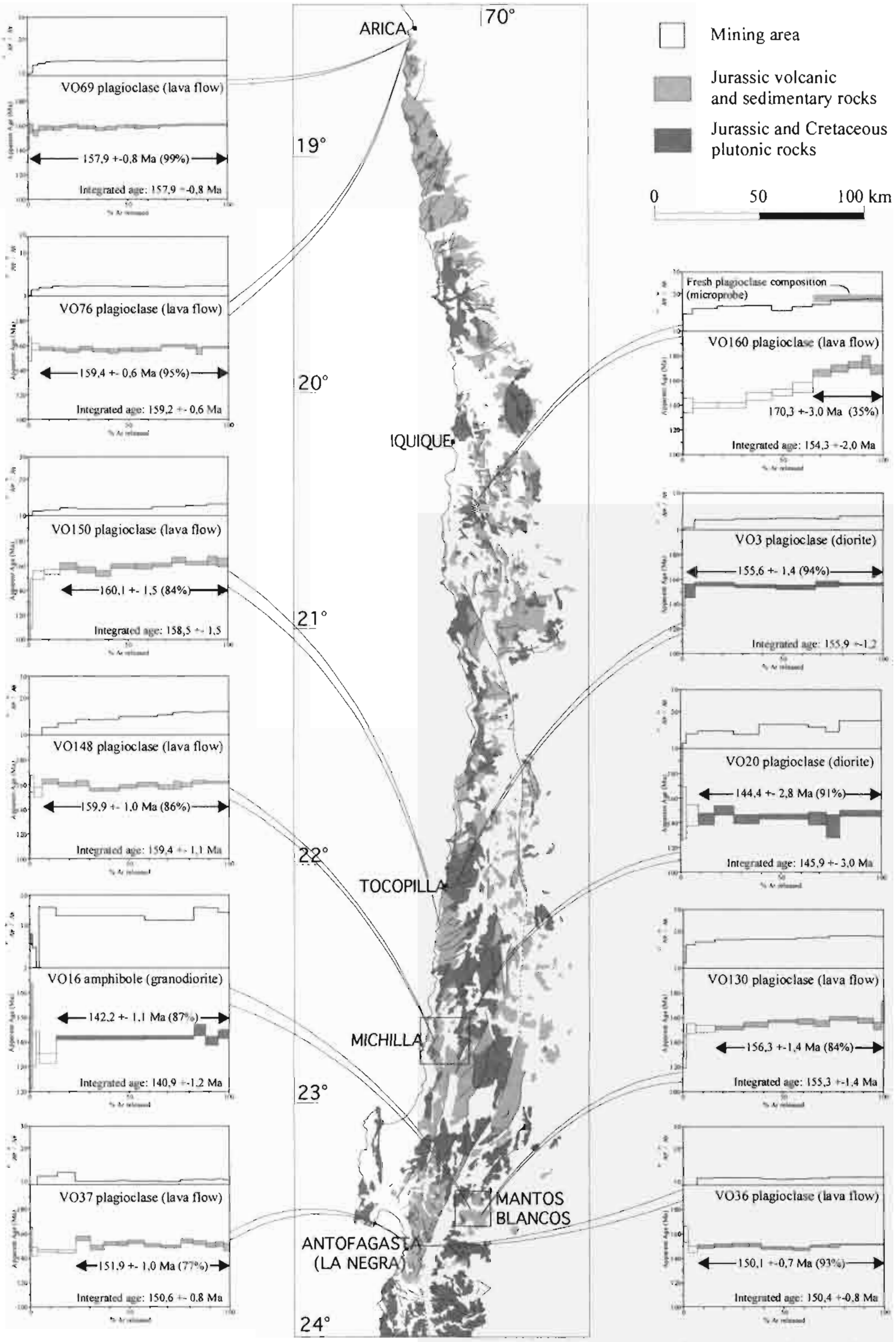

Figure 1: Simplified geologic map of the Coastal Cordillera, northern Chile. ^{40}Ar/^{39}Ar apparent ages and ^{37}Ar$_{Ca}$/^{39}Ar$_K$ ratio spectra for volcanic and plutonic rocks. Errors at 2-sigma confidence level.

2) Age of intrusions. Primary biotite, amphibole and plagioclase yielded ages at ca. 155.6 ± 1.4 in Tocopilla, 144.4 ± 2.8, 147.1 ± 2.2 and 154.1 ± 3.9 Ma in Michilla area and from 142.2 ± 1.1 to 148.2 ± 0.5 Ma in Mantos Blancos area (Figs. 1,2). These ages agree with previous radiometric data obtained for plutonic rocks in the Coastal Range (Rogers & Hawkesworth, 1989; Dallmeyer et al, 1996; Scheuber & González, 1999) and correspond to a Late Jurassic plutonic event.

3) Alteration events. Plateau ages ranging between 101.6 ± 5.0 to 161.1 ± 0.9 Ma (Fig. 2) have been obtained on sericite in situ in plagioclase, K-feldspar and actinolite from veins and amygdales, which are supposed to be products of hydrothermal alteration or very low-grade metamorphic event(s) on a regional scale. Locally, differences in ages obtained for alteration minerals can be up to 40 Ma, like in Mantos Blancos and Iquique areas (Fig. 2), therefore, either several alteration events must have occurred during the Middle Jurassic - Early Cretaceous interval, or a single long-lasting process took place.

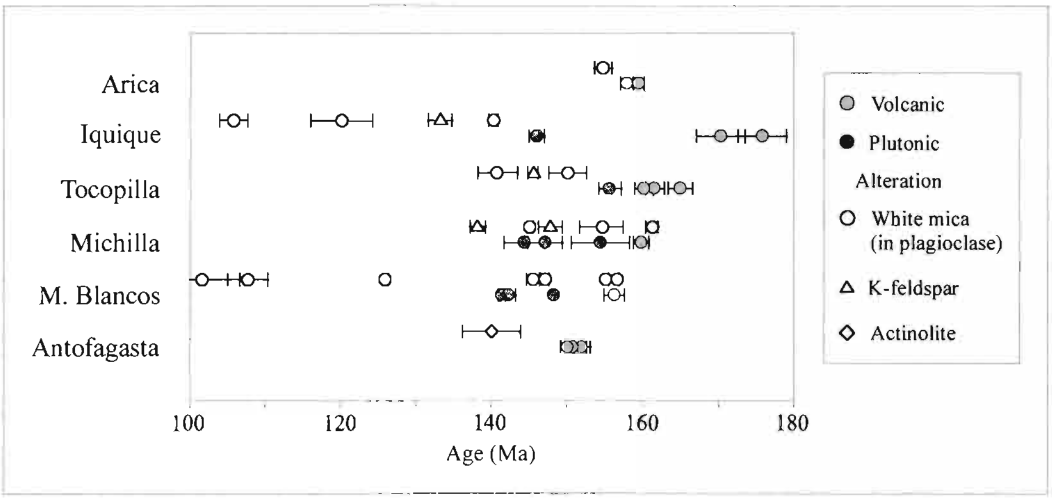

Figure 2. All ^{40}Ar/^{39}Ar plateau and miniplateau ages obtained on primary and secondary minerals.

GEOCHEMISTRY OF IGNEOUS ROCKS

The studied rocks correspond to calc-alkaline andesites and basaltic-andesites (based on major and trace elements contents and pyroxene composition). Trace elements and REE patterns indicate fractional crystallization from a mantle-derived parental magma as the mechanism of generation and differentiation of these rocks. Furthermore, isotopic data indicate that minor crustal contamination was involved in the magma genesis though the crustal component in the magmas seems to increase with time (Kramer et al. 2005). Analyzed plutonic rocks are mostly biotite-amphibole quartz diorites to granodiorites and show the same patterns as the volcanic rocks, suggesting they originated from the same magmas.

CHARACTERIZATION OF THE REGIONAL ALTERATION EVENT

A detailed sampling of a volcanic section about 7 km thick was carried out along Quebrada La Negra, close to Antofagasta city. Petrographic study and microprobe analysis of secondary minerals revealed a variation in the mineral assemblages with the stratigraphic depth from pumpellyite-bearing zeolite facies to prehnite-actinolite facies (with an age for actinolite of ca. 140 Ma, Fig. 2), suggesting that a burial metamorphic event would have affected the volcanic rocks. No similar continuous sections could be sampled in other places of the Coastal Range, nevertheless, the fact that, in some localities, e.g. Michilla and Mantos Blancos, most of the alteration minerals yielded ages younger but close to those obtained for the intrusions would imply that the influence of plutonic intrusion could be reflected in some alteration events.

PRELIMINARY CONCLUDING REMARKS

- Despite a general strong degree of alteration, plagioclase from most analyzed volcanic rocks gave high quality plateau ages. The ages of the volcanic rocks vary widely, with apparent oldest ages (ca. 170-175 Ma, no plateau age) in the region of Iquique and the youngest at Antofagasta (ca. 150-152 Ma).
- Plutonic rocks show a wide range of ages (interpreted as cooling ages below the closure temperature of amphibole, biotite and plagioclase). Some of them are concordant with lava flows ages. These ages are consistent with those obtained by other authors in the Coastal Range.
- Alteration mineral phases yielded plateau ages over a wide temporal range, e.g. up to 40 Ma for some localities such as Iquique. Whether the ages obtained from these alteration minerals represent a single long-lasting alteration process or several overprinted events has not been yet established. A very low-grade metamorphic event would have occurred in the Antofagasta region. Nevertheless, as shown in Figure 2, the alteration event(s) occurred mainly after the intrusion of the huge plutons, and in some areas very close to the extrusion of the volcanic rocks. A high temperature gradient in the arc, due to constant magmatic accretion (pulses of plutonic intrusions) or to an astenopheric upwelling as result of the extensional regime, would have generated appropriated conditions for the formation of secondary minerals from the Middle Jurassic to the Early Cretaceous.

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