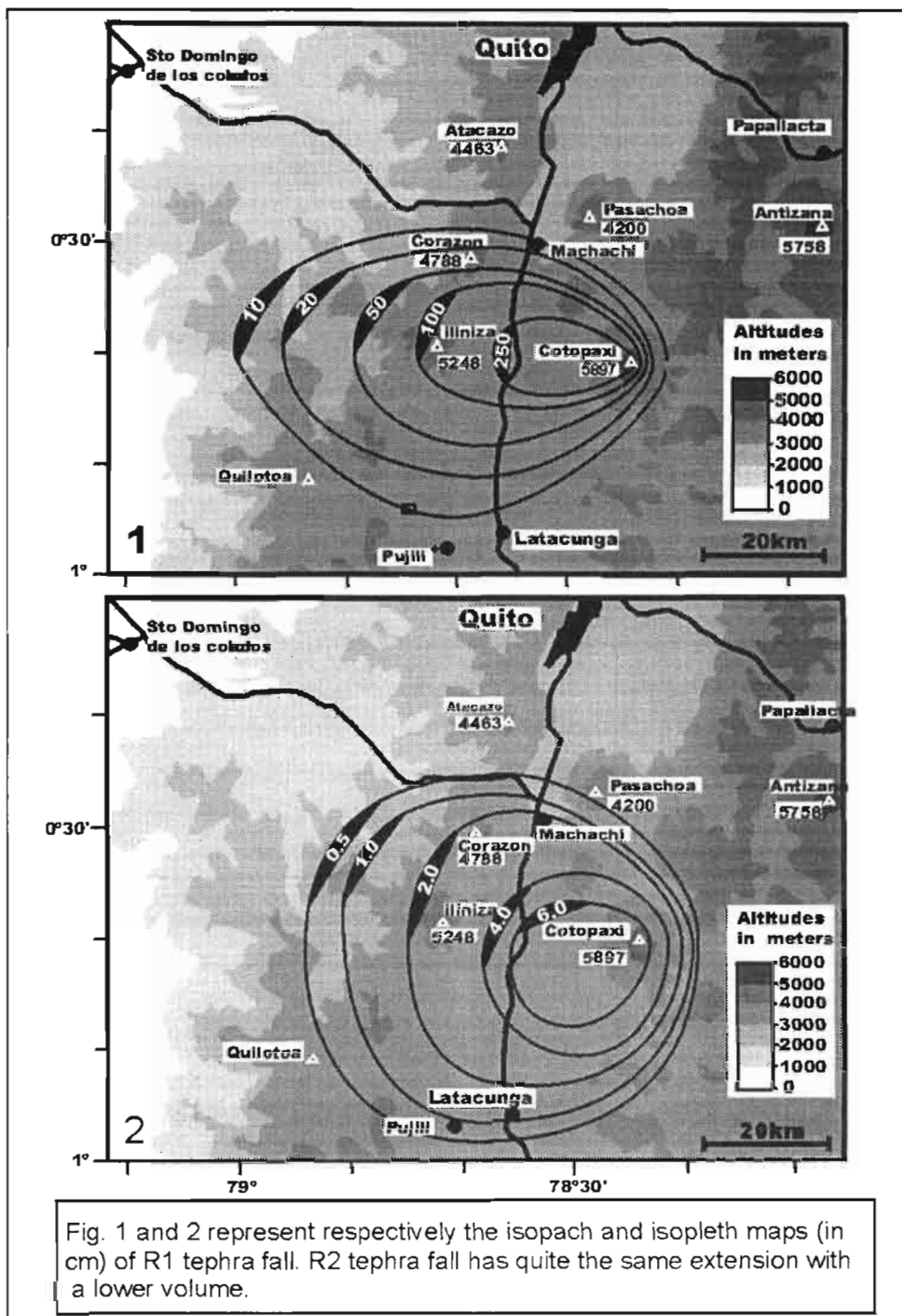


ash of the two other events were deposited towards the east. C14 datings show that these four major episodes occurred during a short time interval, i. e. at most over a few centuries. They represent the climatic eruptions of a discontinuous essentially acidic and explosive activity which started between 7000 and 9000 y BP and ended about 4500 y BP. Since 4500 y, Plinian fallout deposits at Cotopaxi are mainly andesitic in composition and are accompanied by andesitic lava and pyroclastic flows.

The good quality of outcrops allowed the recording of numerous key sections in the areas west of the volcano, as well as the elaboration of isopach and isopleth maps of each deposit (Fig. 1. and 2.). R1 and R2 layers are composite pumice and lithic lapilli deposits, several meters thick on proximal sections; They show a complex structure underlined by alternating beds more or less enriched in ash and/or lithics, as well successive normal and reverse grading.



Pyroclastic flows of rhyolitic composition (ash, pumice and obsidian blocks) were also emitted during the open-vent eruptions which occurred about 6000 y BP. These extended over the north, east and south-west sides of the volcano. Alternating with these large rhyolitic events, dome activity (rhyodacites) also occurred near or at the summit. During the whole period, from 9000 to 4500 y BP, very few products with an andesitic composition have apparently been erupted. This is demonstrated by subordinate andesitic ash and scoria layers within the thick sequence of rhyolitic fallout deposits that we studied (fig.3).

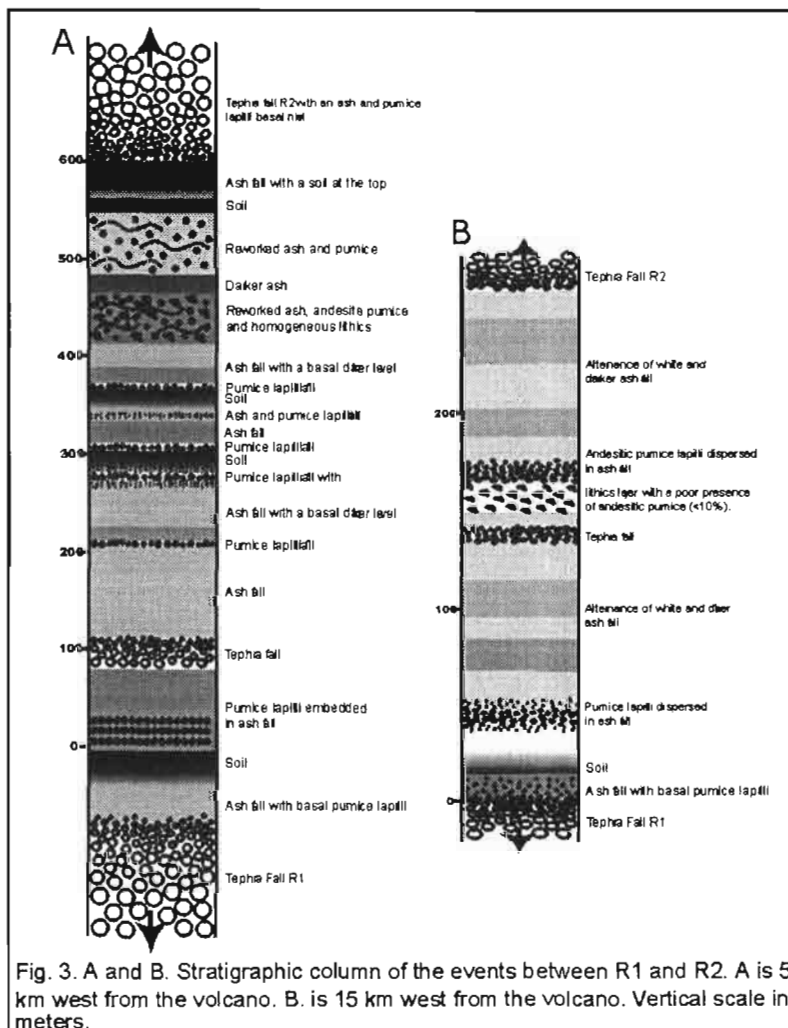


Fig. 3. A and B. Stratigraphic column of the events between R1 and R2. A is 5 km west from the volcano. B. is 15 km west from the volcano. Vertical scale in meters.

References :

- Barberi, F., Coltelli, M., Frullani, A., Rosi, M., Almaeida, E., 1995. Chronology and dispersal of recently (last 5000 years) erupted tephra of Cotopaxi (Ecuador): implications for long-term forecasting. *J. Volcanol Geotherm Res* 69: 217-239
- Hall, M., L., Mothes, P., A., 1995. Bimodal nature of the eruptive history of Cotopaxi Volcano, Ecuador. Abstract IUGG XXI, General assembly, Boulder, Colorado, A452.
- Mothes, P., A., Hall, M., L., Janda, R., J., 1998. The enormous Chillos Valley Lahar. An ash-flow generated debris flow from the Cotopaxi Volcano, Ecuador. *Bull. Volcanol.*, 59: 233-244

Interrelations between the products of dome destruction and the related open-vent eruptions are observed in valleys at the base of the cone. On the contrary, distal tephra deposits (up to 40 km) only consist of fine ash.

Volumes for the R1 and R2 pumice lapilli layers are calculated to be 3.2 and 1.2 km³ respectively (no DRE). Whereas an estimation of the total volume of tephra erupted during the 9000-4500 y BP period is around 14.3 km³ (without considering the volume of pyroclastic flows). These values emphasize the large volume of fine ash produced, a striking characteristic of the rhyolitic sequence as a whole, which in turn indicates a high degree of magma fragmentation during the explosions.

CONCLUSION :

Cotopaxi Lower to Middle Holocene history is dominated by very explosive (Plinian) eruptions which produced large volumes of rhyolitic ash and pumice mainly deposited to the west of the volcano. The climactic phase of this activity occurred about 6000 y BP. A study of the deposits is in progress. It will allow an improved knowledge of the dynamic of this type of event, rare in andesitic stratocones. This study will be of great importance for increasing the knowledge of the hazards represented by Cotopaxi volcano, especially in the formation of large debris flows and tephra fallouts whose extension threatens cities in the Interandean Valley (Lasso, Latacunga and the urbanized zones south-east of Quito).