Geochemistry and petrogenesis of the Tamuteh leucogranites in SW Saqqez, northwestern Iran

A. A. SEPAHI[1], S. F. ATHARI[2] AND M. MOAZZEN[3]

[1]Department of Geology, Bu Ali Sina University, Hamadan, Iran (sepahi@basu.ac.ir)
[2]Department of Mining, University of Kurdistan, Sanandaj & Young Researchers Club of Kurdistan, Iran (sfathari@gmail.com)
[3]Department of Geology, University of Tabriz, Iran (moazzen@tabrizu.ac.ir)

The Tamuteh area is located in the southwest of Saqqez in the north of the Kurdistan Province, western Iran. The Tamuteh leucogranites are situated in the Sanandaj-Sirjan Metamorphic Belt, Zagros Orogen and are composed of various granitic rocks including syenogranite, monzogranite, granodiorite, tonalite and microtonalite. They are cut by lamprophyric dykes and silicic veins. Geochemically, these leucogranites are subalkaline (calc-alkaline), metaluminous and weakly peraluminous and their characteristics resmble the I-type granites. According to the geochemical classification scheme of Frost's *et al*. (2001), Tamuteh leucogranites are magnesian to weakly ferroan and calc-alkalic to calcic. They contain low concentartions of Rb, Y, Zr, Th, U, Ce, FeO^{tot}+MgO and high concentrations of SiO_2, Ba and high Sr/Y and Ba/Rb ratios. They show general trends of decreasing contents of Al_2O_3, Fe_2O_3, MgO, P_2O_5 and TiO_2 with increasing SiO_2 but CaO, Na_2O and K_2O amounts show no regular patterns. According to tectonic discrimination diagrams of Pearce *et al*. (1984), Tamuteh leucogranites were generated in a volcanic arc setting. Behaviour of trace elements in the Tamuteh leucogranites is similar to those of well-known volcanic arc granites from Chile and Jamaica. Normalized trace element patterns show enrichment in LILEs (Rb, Ba, K, Th and Ce) relative to HFSEs (Nb, Zr and Y) and similar to calc-alkaline subduction related rocks from orogenic belts, including that they have had much interaction with crustal materials. The Tamuteh leucogranites also have high Sr and low Y and Rb contents, therefore can be related to mantle-derived magmas. The calc-alkaline, I-type leucogranite or syenogranitic to tonalitic composition and the presence of lamprophyric dykes indicate the formation of two magmas experiencing subsequent mixing/mingling precesses. Therefore, these leucogranites may have resulted from contamination of mantle-derived magmas by continental crust during an ancient subduction event.

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Large ^{14}C age offsets between fine aragonite fraction and coexisting planktonic foraminifera in shallow Caribbean sediments

S. SEPULCRE, K. TACHIKAWA, L. VIDAL AND E. BARD

CEREGE, UPCAM3, CNRS, Collège de France, Europôle de l'Arbois, 13545 Aix-en-Provence, France (sepulcre@cerege.fr)

^{14}C is a widespread dating tool in paleoceanography. Age models are usually derived from coarse fraction planktonic foraminifera (>150 µm), but many proxies used in paleoclimatic research such as fine aragonite or organic components belong to the fine fraction (<63µm). Several studies have shown time-lags between records from various granulometric fractions (Paull *et al*., 1991; Thomson *et al*., 1995; Mollenhauer *et al*., 2005) due to different processes such as changes in sediment sources or abundances, sedimentation rates, bioturbation, reworking...

We studied the temporal phasing between the coarse and the fine fractions from sediments retrieved in the Northern Caribbean Sea. Detailed stratigraphies over the past 40 kyr of $\delta^{18}O$ and ^{14}C of aragonite fine fraction and planktonic foraminifer *Globigerinoides ruber*, and their respective abundances were performed on core MD032628 (Walton Basin, 17°21N, 77°42W, 846m water depth).

$\delta^{18}O$ records are nearly in phase for both fractions, with a slight lead of the fine fraction during the last deglaciation. ^{14}C ages are identical within errors over the past last 5 kyr. The age difference increases through time with a fine fraction being younger than *G. ruber.* The discrepancies range between 1.33 kyr at the end of the last deglaciation up to 5 kyr during the LGM.

Bioturbation and variations in accumulation rates are likely causes for the observed discrepancies (Bard *et al*., 1987; Wheatcroft, 1992; Bard, 2001). Indeed, *G. ruber* abundance is highest during the LGM and decreases over the last deglaciation. Inversely, the fine fraction is minimum during the LGM and reaches its maximum during the Holocene. Bioturbation has probably mixed a "lighter $\delta^{18}O$-younger ^{14}C" fine fraction of the last deglaciation downward with "heavier $\delta^{18}O$-older ^{14}C" *G. ruber*. The relative influence of various mechanisms (size-dependant bioturbation, sedimentation rates, abundances) has been tested by using a numerical model (Bard *et al*., 1987).

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