



Weathered profiles in tropical volcanic islands by combined geochemical and geophysical approaches

Sétareh Rad, Jacques Deparis, Alain Gadalia, F. Chabaux, C. J. Allègre

► To cite this version:

Sétareh Rad, Jacques Deparis, Alain Gadalia, F. Chabaux, C. J. Allègre. Weathered profiles in tropical volcanic islands by combined geochemical and geophysical approaches. Goldschmidt 2017, Aug 2017, Paris, France. hal-01537616

HAL Id: hal-01537616

<https://brgm.hal.science/hal-01537616>

Submitted on 12 Jun 2017

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Weathered profiles in tropical volcanic islands by combined geochemical and geophysical approaches.

S. RAD¹, J. DEPARIS¹, A. GADALIA¹, F. CHABAUX² AND
C. J. ALLÈGRE³

¹BRGM, French Geological Survey, Orleans, France.
s.rad@brgm.fr

²Université de Strasbourg, Laboratoire LHyGeS, France.

³IPGP, Université Paris Diderot, Sorbonne Paris Cité, France.

Tropical volcanic islands commonly have pronounced relief and high runoff rates, and consist of easily weathered volcanic material. Intense mechanical and chemical weathering in volcanic terrains has been recognized as being an important component in the transport of the global dissolved load to the oceans [1]. High chemical weathering rates are mainly due to the impact of hydrothermalism inputs with subsurface water circulations [2].

A helicopter-borne TDEM (Time Domain ElectroMagnetism) and magnetic survey was conducted by BRGM (French Geological Survey) over 3 islands of Guadeloupe, Martinique and Reunion in 2012 and 2013 for a total of 20,000 km of flightlines. TDEM method uses the diffusion of a transient EM field to determine the electrical resistivity versus depth. Erosion timescales were calculated from U-series analyses of river sediments. Our results show a broad range: 0 to 150 ka in Martinique, 0 to 60 ka in Guadeloupe and 55 to 90 ky for Piton de la Fournaise (Réunion). At watershed scale, the estimated weathered profile (WP) depth obtain by using U-series method are consistent with TDEM helicopter-borne geophysical imagery method, ranging from 0 to 70 m. WP are locally impacted by hydrothermal circulations with associated secondary minerals (halloysite, tridymite...). Among the combined impact of all parameters (climate, runoff, slopes, hydrothermalism inputs, vegetation etc.), basin age seems to be the key control parameter: the younger the basin, the higher the weathering rate is.

[1]Rad, et al., 2007. Hidden erosion on volcanic islands. *EPSL* 262, 109-124.

[2]Rad et al., 2013. Chemical weathering and erosion rates in Lesser Antilles: an overview in Guadeloupe, Martinique and Dominica. *Journal of S. A. Earth Sciences*.45, 331-344.