

Radiological indices determination and correlation between radioactivity



and stable elements in ornamental rocks

T. M. El Hajj¹, P. S. C. Silva², G. A. S. A. Dantas³, A. Santos² and H. Delboni Jr.³

¹University of Alfenas, Rodovia José Aurélio Vilela, 11999, Poços de Caldas, Brasil

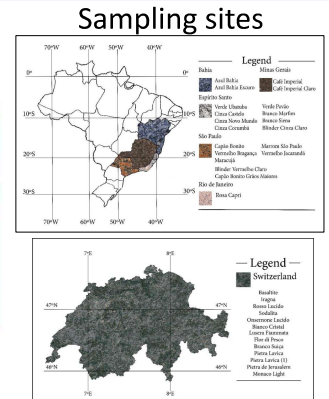
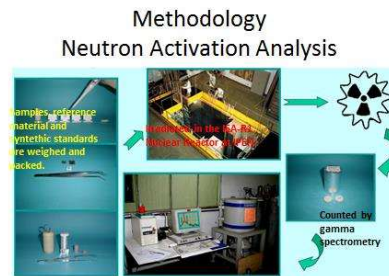
²Institute of Nuclear and Energetic Research, Av. Prof. Lineu Prestes, 2242, São Paulo, Brasil

³University of São Paulo, Rua Professor Melo Moraes, 2373, São Paulo, Brasil



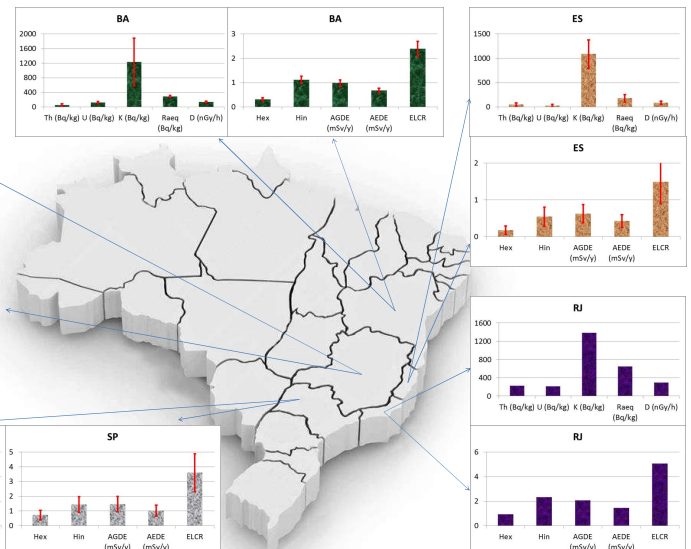
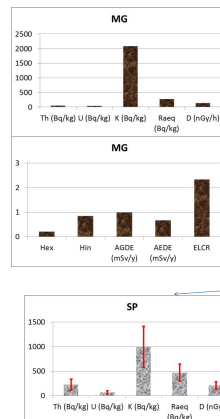
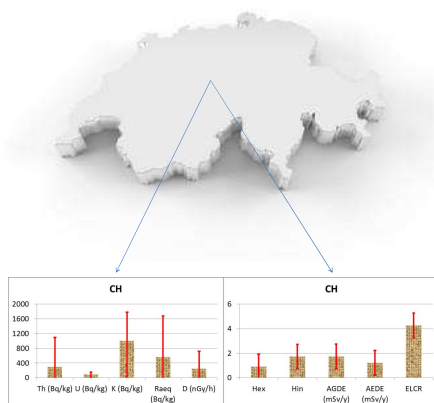
Introduction – Igneous rocks contain naturally occurring radioactive elements like uranium and thorium, due to its concentration in some of the lightest residual magmas causing the heaviest atoms to accumulate in the upper levels of the silicate crust. Natural radioactivity of rocks used as building materials has been increasingly studied due to the rising number of homes coated with it.

Objective – To evaluate the radiological risk indices of ornamental rocks collected in Brazil and Europe and to correlate its radioactive content with their chemical composition. Samples were chosen according to the best sellers in the market.

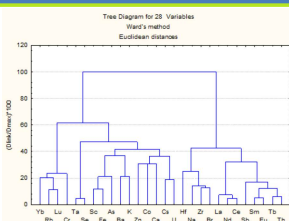


Results and Discussion

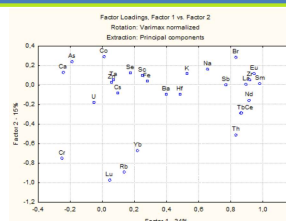
Activity concentration and radiological hazard indices for the samples from Switzerland and Brazil



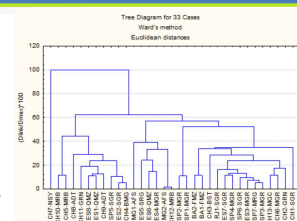
Dendrogram for all the variables measured in the ornamental rocks analysed.



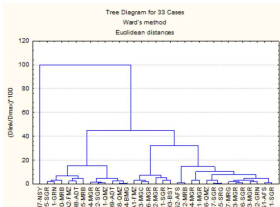
Factor analysis graph with the loading factors for factor 1 and 2, with the explained variance of each factor.



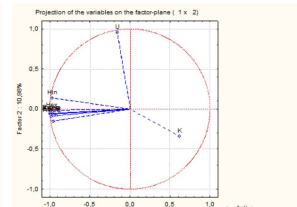
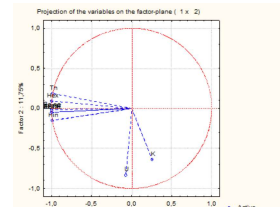
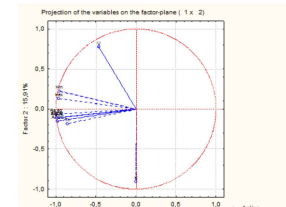
Dendrogram obtained in the cluster analysis according to the rock classification.



Dendrogram obtained in cluster analysis considering the activity concentrations of the radionuclides and radiological risk indices.



Principal component analysis results with the loading factor for the first and second component for group 1, 2 and 3 of the dendrogram showed on the left.



Conclusions: Results indicated that samples CH4, CH5, CH8, CH9, CH10, CH11, SP5, ES1, ES2, ES4, ES8 and BA2 are the safest ones considering gamma exposition. All the other samples should be used with care when applied as construction material.