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# Assessment of weathering grades for different chemical and geomechanical properties; A Sri Lankan case study

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Having a better understanding of the weathering grade of rock materials is highly beneficial in the perspective of civil engineering and geology. The classification of weathering grades can be performed based on the chemical, physical, mineralogical, textural and strength properties of rocks. Among those, the use of chemical components to classify weathering grades is not very promising for all types of rocks. Based on the mobility of elements various chemical indices for weathering grades have been formulated. Most of those indices are based on experiments of weathered acidic igneous rocks under humid and well drained environments. There are only a few indices formulated for sedimentary and metamorphic rocks, so the use of chemical weathering indices for the classification of weathered metamorphic rocks would not be convincing. However, the use of physical and strength properties for the assessment of weathering grades is comparatively convenient. A better variation of those properties with respect to weathering grades is resultant irrespective to rock type. Therefore, this study focuses on assessing weathering indices using physical, strength and chemical properties of a selected metamorphic rock and evaluating the correlation among the indices derived from those properties.

Fresh and weathered rocks of garnet-sillimanite gneiss were selected from the Samanalawewa Hydropower Project. Weathering grades were visually assessed initially, then confirmed with physical and strength properties using tests on dry density, water content, ignition loss, point load strength and slake durability. Whole rock geochemical data were used to calculate weathering indices.

Physical and strength properties show a marked difference with weathering grades. However, chemical indices are not very convincing. Silica-Titania, Product index and Ruxton ratio show a gradual variation with weathering grades. Mobiles index also shows an acceptable variation. However, the modified weathering potential index, which was formulated for metamorphic rocks, Parker index, which was formulated for all types of rocks, do not show a gradual variation with weathering grades. Chemical index of alteration and weathering (CIA and CIW) do not show a recognizable variation with weathering grades. Physical and strength properties show good correlation with most of chemical indices. In addition, most chemical weathering indices show good correlation with each other. The Lixiviation index is the one shows weak correlation with most of other chemical weathering indices. The failure of some indices in showing a good correlation can be accounted for the heterogeneity of garnet-sillimanite gneiss.

キーワード: Weathering grades, Rock weathering, Chemical weathering index
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