

STATISTICAL APPROACH ON U-Pb ZIRCON GEOCHRONOLOGY WITHIN THE HIGH - GRADE BASEMENT OF SRI LANKA

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Geochronology is the field of determining ages of rocks using precise mass spectrometric procedures. Sri Lanka represents a fundamental part of the center of East Gondwana, and hence is an important constituent of the world geochronology. Yet, the statistical approach on Geochronology in Precambrian basement of Sri Lanka is still elusive. The main objective of this study was to mark the initial step of statistical involvement in U-Pb zircon geochronology of meta-igneous meta-sedimentary rocks in Sri Lanka. Three lithotectonic units, namely, Highland, Vijayan and Wannu Complexes (HC, VC, WC) of Sri Lanka, have been compared using Welch's ANOVA and Welch's *t*-test. Games-Howell test was performed as a post hoc test for multiple pairwise comparisons. Geochronological features of the HC and WC showed possible correlations between previously adjoined Gondwana terranes in Southern India and East Antarctica. This study allowed a statistical comparison between Sri Lanka and adjacent parts of Southern India [Trivandrum Block (TB)] and Eastern Antarctica [Lützow-Holm Complex (LHC)]. Considering Welch's ANOVA test, results obtained between three complexes, the *p*-value was $2.2e^{-16}$, which is less than $\alpha = 0.001$. As the ANOVA test was significant, Games-Howell test was performed to examine the significantly different complexes. The *p*-values for HC - VC pair and HC - WC pair were less than the significance level, but the WC - VC pair was 0.0087. Hence, HC showed a significant difference from the other two complexes. This justifies the geochronological hypothesis, that HC consists of the oldest rock base in Sri Lanka. Welch's *t*-test conducted between igneous and sedimentary rocks for all three complexes indicated that the *p*-value for WC was 0.0516557, which is higher than $\alpha = 0.05$. This shows that igneous and sedimentary rock bases in WC are not significantly different. This explains the geochronological reading that, parent rock genesis of sedimentary rock type in WC may be igneous. The high-grade basement of Sri Lanka can be divided into three clusters according to their similar characteristics in age distribution. According to Welch's ANOVA test conducted between HC, TB and LHC, *p*-value was 0.913, which is higher than the significance level 0.001. As the result was not significant, it can be concluded that there is a statistical relationship between those three units. Therefore, it is conceivable that the three regions might have initiated under similar convergent tectonics. Metasedimentary constituents of LHC and the HC might be adjacent and continue to the Trivandrum Block. To conclude the results, it was observable that, adequate amount of geochronological results based on Precambrian high-grade basement of Sri Lanka can be confirmed through statistical explanations. Continuation of a statistical approach on geochronology will lead to a statistical involvement in geochronology of Sri Lanka.

Keywords: Cluster analysis, Geochronology, Gondwana terranes, Welch's ANOVA, Welch's *t*-test