difficult to account for the formation of secondary silica in the basalts, which are not oversaturated with silica.

Similar basalts have been reported from the western portion of the Deccan Trap country, in which various forms of silica are seen as secondary constituents, and during a regional study of the Deccan Traps the author has observed that the secondary minerals are found more abundantly in the weathered zones of the lavas, and this feature has led him to think of the effectiveness of meteoric waters in their formation. Walker (1960) and Nashar and Davies (1960) have shown that secondary minerals may form by the action of meteoric waters, long after the eruption of the lavas. Nashar and Davies considered that the secondary constituents were deposited from cold solutions derived from the basalts during the process of weathering. It is, therefore, suggested that meteoric waters may well have been potent agents in the formation of secondary minerals in the Deccan Traps, though not necessarily to the exclusion of late magmatic fluids.

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Computer programmes for the recalculation of rock and mineral analyses

HEY *et al.* (1966) have described a computer programme which recalculates rock and mineral analyses containing up to 33 elements. The approach of the present writer has been different. With a view to processing large numbers of chemical analyses for statistical or regional studies, the number of elements dealt with has been reduced to 14 (SiO_2, TiO_2, Al_2O_3, Fe_2O_3, FeO, MnO, MgO, CaO, Na_2O, K_2O, H_2O+, P_2O_5, CO_2, S), although corrections for other elements may be simply performed manually before processing, if desired. Whereas the reduction

in number of elements handled will lead to slight loss in accuracy in norm calculations, particularly in special cases, the benefits for the large majority of analyses are simplification of data tapes (resulting in quicker coding and an increase in capacity), rapidity in computer execution, and reduction of all analyses to a standard form for comparative purposes (this is important since a majority of rock analyses consist of few, if any, more elements than those designated).

For convenience in handling, two separate programmes have been written in Mercury Autocode, both utilizing the same data tape, and further compatible programmes are planned. The first programme calculates C.I.P.W. Norms (also summed to 100 %) with constituents identified by number, for programming simplicity and speed. In addition the C.I.P.W. classification ratios, Albite Ratio, Crystallization Index, Indicator Ratio, and Barth's Basalt Boundary Surface Equation are calculated. All these are fully annotated in the print-out, as are also the seven sets of trilinear coordinates calculated for a variety of triangular diagrams in common use, such as the 'Residua System', Coombs' diagram, etc. There is no limit to the number of analyses processed and the execution time, which is largely conditioned by the specific output printer, is of the order of $40(3+N)$ seconds per analysis, where N = number of analyses in batch.

The second programme calculates atomic proportions (including oxygen), atomic percentages, and Barth's standard cell. In addition, parameters such as the Larsen–Nockolds value, Solidification Index, Linkage Factor, Rittmann's Suite Index, Felsic and Mafic Indices, and some twelve atomic ratios in common use are calculated. Finally, the trilinear coordinates of eleven triangular diagrams (e.g. Ca–Na–K, Ca–Mg–(Fe″+Mn), etc.) are presented. Some of the data are identified but most are read with a key. Execution time is of the order of $20(2+N)$ seconds per analysis.

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