PRIMARY DIAMOND SUBPOPULATIONS AT INDIVIDUAL LOCALITIES.

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"Primary diamond subpopulations" occurring within individual kimberlite and lamproite localities are defined based on diamond and mineral inclusion data. It is suggested that each of the defined subpopulations represents a distinct diamond crystallization environment which was present in the upper mantle and available for sampling at the time of kimberlite or lamproite emplacement.

Localities are considered separately. Individual diamonds from each locality are assigned to a particular subpopulation based on correlations between all available data, including mineral inclusion composition, host diamond carbon isotope composition and, when available, other diamond characteristics such as primary diamond morphology and size.

This multivariate approach is possible because a large database for relatively large numbers of diamonds from a number of individual localities is now available. The subpopulations defined conform generally to previous paragenetic classifications, which are based solely on inclusion composition. However, at many localities, diamonds, previously classified into the same paragenetic group are subdivided and, in a few cases, paragenetic groups are combined. Another result of this approach is that many diamonds which, in previous studies, could not be classified with respect to paragenesis because they lacked the appropriate mineral phases, can now be assigned to a group based on other data. This allows a better assessment of the proportions of each diamond type at each locality and affords a better definition of the paragenetic environments represented by the various diamond subpopulations.

Once each subpopulation has been defined, the potential source and petrogenesis are inferred. Thermobarometric data for the various subgroups at each locality allow inferences on their spatial relationships within the Earth's mantle and, in some cases, isotopic age information places constraints on their temporal relationships. Ultimately, comparisons of the subpopulations found at the various localities allows a stratigraphy of the upper mantle to be constructed which, when considered along with the tectonic setting of their kimberlite host, can provide new insights which are relevant to diamond genesis and to defining the structure and evolution of the lithosphere.