GEOTECTONIC SETTING OF SASKATCHEWAN KIMBERLITES (CANADA) AND OTHER OBSERVATIONS: WHAT IS LEFT FROM THE CLIFFORD'S RULE?

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While the core of the Clifford's rule retains its essence, structural definition of diamond potential, as commonly perceived from its original version and also as suggested by its more elaborate derivates, became obsolete in offering substantially ***incomplete scrutiny*** by: 1 - proposing seemingly unchallenged potential of entire "archons" without elaborating on a definition of their possibly sizable barren segments, and, on the other hand, by 2 - flatly negating the potential in regions which are condemned by a broad definition and simplistic perception of "protons"

Two major perplexities of the ruler(s) require attention: 1 - In the past, on - craton marginal locations were proven productive regardless of their proximity to the "prohibitive" mobile belts. Within such examples, the Guaniamo kimberlites and the Arkhangelsk Province recently joined these complex ***near-to-margin*** positions, while some of the favored fully on - craton interior expanses appear to be yet elusive to eager prospectors. 2 - Still more intriguing are the productive sites ***within*** the mobile belts. The Venetia kimberlites and the Argyle lamproites convincingly showed that highly diamondiferous sites could be confined to such settings. Productivity of the Venetia site may not rest with the sole fact that the hosting belt is Archean (and therefore being an "archon"). Anyway, the Limpopo belt (and number of other of Archean age as well) actually display distinct ***Early Proterozoic structural traits.*** Why, therefore, the Proterozoic belts should be condemned as prohibitive protons? The Venetia (Limpopo) diamonds could be ultimately related to its ***minor and older segments*** which retain 3.4 Ga signature within the ***prevailing and younger*** (2.6 Ga) late Archean envelope.

Within the larger regions, prospective and structurally similar to the older blocks ***within*** a single belt (Limpopo) are the blocks ***among*** belts. In Sakha-Yakutia, relatively small (Archean?) blocks float within a complex grid of Proterozoic mobile belts between the Aldan and the Anabar shields. Such a buried basement collage, covered by a gigantic Phanerozoic basin, resembles general setting of the Western Canada Sedimentary Basin (WCSB).

In the central Saskatchewan portion of the WCSB the possibly largest field of diamondiferous kimberlites and most of its approximately 80 targets have been outlined by author of this abstract in 1988. The discovery of the Fort a la Corne field (FALC) has been accomplished by a combination of two leads: 1 - interpretation of specific magnetic anomalies as kimberlite targets from the 20-years-old (!) government ***airborne magnetics survey,*** and 2- a deep-crustral interpretation of the sub-Phanerozoic basement host unit, the Glennie Lake Domain (GLD), as a crucial deep-seated "autochtonous" ***archean block*** anchored within the mobile belt.

Both interpretations were as unique or rare as exceptionally inexpensive and productive. In that time, the old airborne survey was not particularly acceptable approach among the diamond-focused exploration as predominantly applied in Canada. The GLD still amazingly retains its non - Archean perception in most simpler presentations. The same set

of perfect anomalies, which for years keep yielding new diamondiferous kimberlites with unusual easiness, were "re-assessed" (March 1989) by reputable sources as "out-off-consideration, non-kimberlitic and negative "just months prior to their confirmation by drilling. In addition, in contrast to author's view, and most characteristically according to adherents to the Clifford's rule, anomalies were found and feared as being located within a juvenile, arc-related Reindeer Zone of the Early Proterozoic Trans-Hudson orogen, i.e. apparently in the prohibitive proton.

The FALC includes about 80 kimberlite sills resting within the first hundred meters of Upper Cretaceous shales and buried under hundred meters of glacial drift. This configuration provides six-times better waste/ore ratio than kimberlite pipes contemplated for mining in the N.W.T. Some low grade kimberlites tend to contain higher incidence of relatively larger diamonds. The integral volume of FALC kimberlites approximates 800 million m^3 and might contain at least ***100 million carats*** of diamonds.

Given this characteristics, and following the author's early suggestion at the St. Petersburg's Conference in 1990, and elsewhere, the ***FALC is proposed as a type-region for the Lower Proterozoic diamondiferous mobile belts s.l.***. Beyond this contribution , Saskatchewan settings became essential for some refining of kimberlite geology itself. By now, kimberlite bodies suddenly "allowed" themselves to attain shapes earlier notoriously claimed for lamproites only, and kimberlites in sills do not anymore yield to petrographic-textural meaning and rules established for pipes. Maar geometries (ring ejecta, steeper footwall boundaries etc.) recently advanced by others for FALC, and other similar visions (sizable feeders, extensive aprons etc.) failed to be drill-proven. Given the regional nature of earlier degassing, the posterior low-energy emplacement of sill sinto the sea-bottom sediments precludes the presence of other kimberlite geometries (of the same age) than those of sills. As far as for prospection, none of G-10 and other indicators were used in the discovery of the FALC since their nearest presence at the surface starts to appear 500 km (!) down-ice.

As far as for Archean cratons, for example in Sakha-Yakutia, the confinement of producing fields was suggested to support the Clifford's rule. However, there is commonly little explanation available for ***distinct behaviour*** of individual cratonic blocks. From a number of these, only two produce diamondiferous kimberlites and the large one carries five fields of barren kimberlites only. In addition, two outcropping shields are essentially barren as well.

Obviously, there is a severe ***restriction*** in productivity of Archean cratons and, on the other hand, there is also an ***extension*** of potential into the mobile belts. Instead of two major units outlined by Clifford's rule and its derivates, we have actually more categories to contemplate. Cratons, though undoubtedly with the best economic record, in geological principle, share with mobile belts the same major obstacle, an ordinary and therefore insufficient ***lithospheric thickness*** in major part of their extensions. Potential enhances with its thicker development and the productivity likely with the thickest portion of the lithosphere. The latter condition could be achieved in both, the ancient cratonic domains (ACD) and newly cratonized domains, mobile belts. Allochtonous mobile belts may conceal three ACD sub-types: 1 - buried lateral extensions of cratons (EC) functioning as a prevailing autochtone, 2 - buried cratons (BC), squeezed between higher-positioned, cratons shields, and 3 - fragments of cratonic provenance (FC), fully separated from cratons (shields) and now in a role of a local autochtone. Within-the-belt all cratonic subtypes might be largely hidden beneath a veneer of allochtonous Proterozoic where a 3-D deep-crustal interpretation would indicate proper gravimetric, magnetic and decollement tectonic pattern.

Ultimately, the final productivity within the overriding plate, and in addition to its ***lithospheric thickness (LT)*** of a particular cratonic block, could be dictated by a triggering mechanism confined to the presence and geometry of localized structure, ***transform fault (TF)***, within the sub-lithospheric domain (subducting plate). For example, the Tiung cratonic block (Sakha-Yakutia) apparently did travel above the sub-lithospheric triggering system and therefore it produced kimberlites, however most of its area grossly occupied by kimberlites was bottomed by a shallower LT incapable to intersect diamond stability region and therefore kimberlites remained primarily barren.

Other combinations of the interaction between the upper and the lower plates (LT and TF respectively) are possible and these generate a ***larger*** (though a definite) ***variety of diamond potential or restrictions*** than those suggested by overly simplistic rules.