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Geological history of the Guayana Shield, Venezuela, and its mineralogical resources: a tale of supercontinents and mantle plumes

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The Venezuelan Guayana Shield (GS) can be subdivided into the ***Imataca***, ***Pastora***, ***Cuchivero*** and ***Roraima*** geological provinces, whose histories involve the creation and destruction of four supercontinents since the early Archean. Rift, drift and collision are manifested in the geological evolution, being driven by both mantle convection and plume activity, all of which have played important roles in metallogenesis.

Imataca represents the oldest crustal segment and is composed of multiply sutured micro-terranes that built part the *Kenorian* supercontinent during the Guriense (3.7 - 3.4 Ga) and Aroensis (2.6-2.7 Ga) orogenies. Plume related submarine magmatic events during Kenoran crust production were responsible for the formation of Algoma-type BIF deposits such as El Pao (500 Mt high grade and a further 3 Mt low grade), Bolivar-San Isidro-Los Barrancos (1800 Mt high grade and 13000 Mt low grade itabirites) and Dos Carajas.

Further ocean floor spreading and plume activity at 2.5 - 2.4 Ga caused rifting of the Imatacan province, creating new oceanic crust of komatiitic and tholeiitic basalts (preserved in the **Pastora** province), followed by later island arc andesites and associated turbidites (Caballape terrane). Tectonic accretion of the Pastora and Caballape crustal segments with Imataca occurred at 2.1 - 2.0 Ga along the Marwari River and Guri Sutures, resulting in forming part of the *Atlantica* supercontinent. Important orogenic gold deposits (El Callao, Botanamo, Camorra, >5000 t Au) and porphyry Au-Cu deposits (Las Cristinas-Brisas, >2000 t Au) were formed during this period (2060 - 2095 Ma).

At 1.95 - 1.75 Ga further crustal accretion to the *Atlantica* supercontinent included the **Cuchivero** continental magmatic arcs (Parima-Tapajos at 1.95 Ga, Suapure-Mavaca at 1.8 - 1.7 Ga), calc-alkaline volcanics (Caicara) and granitoids (Santa Rosalia), thereby increasing the continental crust as part of the *Columbia* supercontinent. Subsequent rifting at 1.6 - 1.5 Ga lead to the emplacement of the Parguaza rapakivi granites are their associated Sn-Ta, Cu-Fe-U-Au-REE deposits.

Collisional orogenies associated with the assembly of *Columbia* were sourced during deposition of the fluviodeltaic - marine **Roraima** molassoid sediments, which overly the Imataca-Pastora-Cuchivero basement in the east (1.8-1.5 Ga) and in western Parguaza (1.5-1.3 Ga). Associated with the Roraima basin are placer Au, U basal unconformity conglomerates and diamonds from unknown kimberlitic sources.

At 1.3 - 1.0 Ga, further continental collision forming part of the Mesoproterozoic Grenville orogeny in North America assembled components of Imataca-Pastora-Cuchivero-Parguaza and the Garzon-Jari-Falsino-Mitu blocks, forming part of *Rodinia* supercontinent.

Rifting of *Rodinia* at 0.8 - 0.6 Ga is represented in Venezuela by the eclogitic diamond-bearing Guaniamo kimberlites (711 Ma) intruded along the Cabruta - Guri Zone Fault Zone.

Guayana Shield metallogenesis is thus a story of four ancient Precambrian supercontinental cycles (Kenora=Imataca, Atlantica=Pastora, Columbia=Cuchivero, Rodinia), involving orogenic construction preceded and followed by destruction by mantle convection and plume activity. Such an overview can prove to be crucial in the identification and characterisation of metallogenic epochs (eg. Lowe, 2013), and other ore deposit models for the Guyana Shield as a whole.

Reference:

Lowe, S. 2013. West Indian Journal of Engineering 35(2): 83-88.