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On the manifestation of two types of granulite metamorphism during supercontinental cyclicity

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The results of studying the granulite belts of the Earth show the presence of two types of granulite metamorphism in them: high-pressure and high-temperature ones.

High-pressure granulites are characterized by P-T trends in the form of clockwise curves. According to widespread opinion, the granulite metamorphism with such trends characterizes the areas that were formed as a result of the tectonic thickening of the crust due to continent-continent collisions that correspond to the model of the Himalayan type.

High-temperature granulites are characterized by counterclockwise trends. For the formation of such granulites, researchers involve the mechanism of mantle underplating or the introduction of large volumes of intrusions under stretching. This model requires a mantle plume, which transports hot mantle material to the base of the crust.

Thus, granulites with contrasting P-T trends, "orogenic" and "anorogenic" may be present inside the same belt. High-temperature granulites are superimposed on the dominant high-pressure ones. The time interval between these discrete events is not clearly defined and can be estimated in several tens of millions of years.

Let's consider these two types of metamorphism against the background of the events of the supercontinental cycle (SC). Its structure consists of two stages: proper-continental (one continent-one ocean) and intercontinental (several continents-several oceans). In turn, the stages divide into phases. The first **agglomeration phase** of the proper-continental stage is characterized by compaction of already collected continental fragments. After the supercontinental culmination, the next, **destruction phase** begins, which precedes and prepares the break-up of the supercontinent. Its main content is continental rifting and the formation of the basic intrusions. The content of the first phase of the second stage consists of the **break-up** of the supercontinent, the formation of spreading zones and passive margins of young oceans. The next convergent phase of this stage is the **assembly** of the new supercontinent, the formation of subduction zones and the closure of young oceans as a result of numerous collisions.

Based on the collision model of high-pressure granulite metamorphism, it is obvious that its formation will occur in this convergent phase of the SC, when, as a result of continent-continent collisions, a new supercontinent is assembled.

Conditions for high-temperature granulite metamorphism in a tension environment arise in the phases of destruction and break-up of this supercontinent when plume processes are actively manifested as a result of the heat blanket effect.

The analysis of the modern world factual material on supercontinental cyclicity for 3 billion years of the Earth history, conducted by the author, generally confirms the above correlation of the evolution of metamorphism during the development of granulite belts with events of SC.

Thus, these two types of granulite metamorphism, which fit into the structure of the super continental cycle, are indicators of geodynamic conditions of the corresponding stages and phases of the SC **and show a complex interaction in the course of their manifestation of two geodynamic styles - the tectonics of lithospheric plates and mantle plumes.**