Geography · GS - I

Define mantle plume and explain its role in plate tectonics.

EXAM YEAR	PAPER	SUBJECT
2018	GS - I	Geography

MARKS	WORD LIMIT
10	~150 words

Answer Hint

Mantle plume; anomalous heat; buoyant mantle material; hotspots; volcanic activity; flood basalts; plate movement; geological evidence

Model Answer

Introduction

A mantle plume is a column of unusually hot, buoyant material rising from deep within the Earth’s mantle towards the lithosphere.

Role in Plate Tectonics

1. **Hotspot volcanism:** As a plume approaches the surface, decompression melting can generate magma and volcanic activity, as seen in Hawaii.
2. **Formation of volcanic chains:** Movement of a tectonic plate over a relatively stationary plume may create a chain of volcanoes recording the direction of plate movement.
3. **Flood basalt formation:** Extensive plume-related melting may produce large igneous provinces, such as the Deccan Traps.
4. **Continental breakup:** Plume-related heating and uplift may weaken the lithosphere and contribute to continental rifting.

5. **Crustal modification:** Plumes can influence magmatism, crustal structure and the thermal evolution of the lithosphere.

Conclusion

Mantle plumes provide an important explanation for hotspot volcanism and some large igneous provinces. However, their exact origins and their relative contribution to plate tectonics remain subjects of scientific investigation.

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