

UPSCprep Free Daily Answer Writing Initiative

Subject: GS 1

Syllabus: Geography

Questions

Q1. Write a note on the distribution of volcanoes across the world. Why does the distribution of volcanoes coincide with that of earthquakes? (150 words) 10

Q2. Discuss the importance of the cryosphere in global climate regulation. (150 words) 10

Model Structures

Q1. Write a note on the distribution of volcanoes across the world. Why does the distribution of volcanoes coincide with that of earthquakes? (150 words, 10 marks)

Introduction:

- Volcanism is the process of eruption of molten material or magma into the crust, which is poured out on its surface. Volcanic activity is closely associated with plate boundaries, crustal disturbances etc.
- Volcanoes around the world are located in a clearly-defined pattern. It is closely related to regions that have been intensely associated with plate tectonic activities.

Main Body:

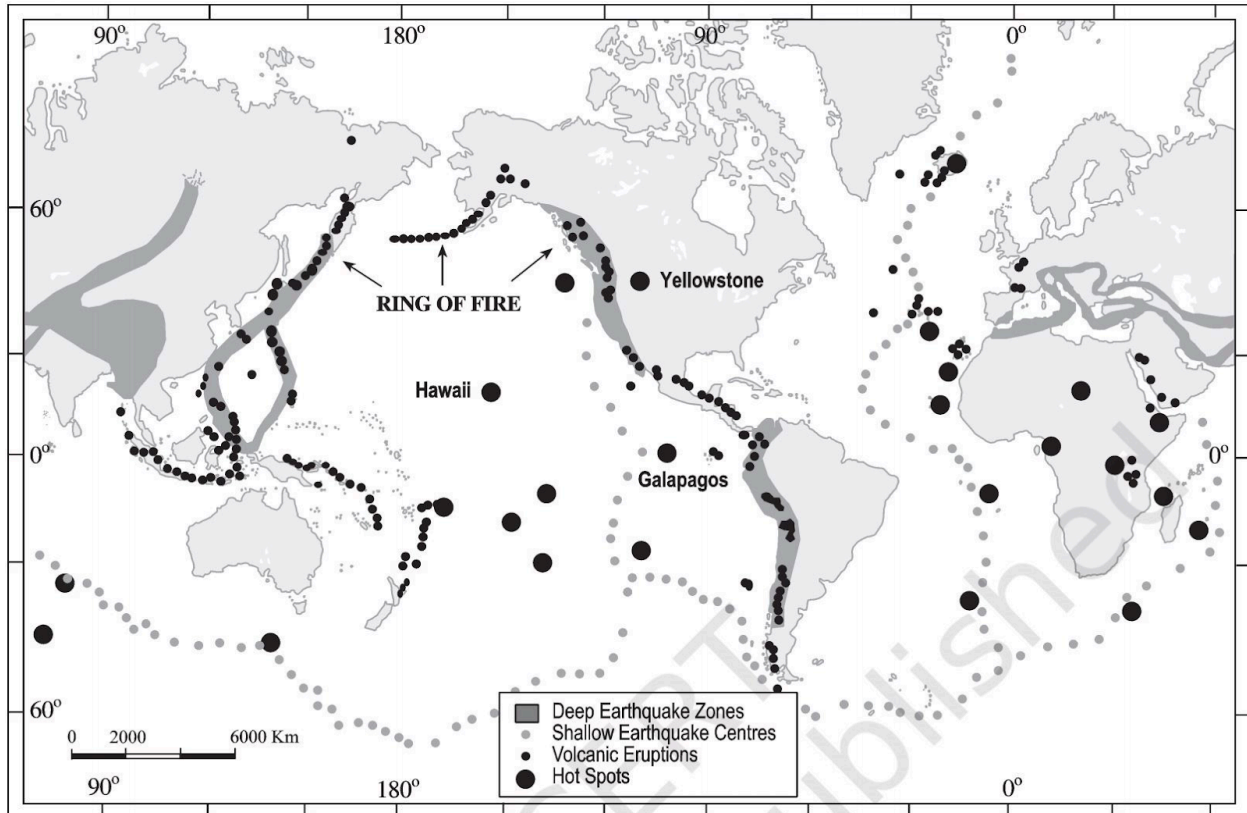
Distribution of volcanoes across the world:

- **Volcanoes at Convergent Plate boundary** – In such regions, one plate subducts under another plate.

- Circum-Pacific region (“Pacific Ring of Fire”). On the Western side of the Pacific Ocean, this chain extends from the Aleutian Islands, Japan, the Philippines, the southern Pacific Islands of Solomon and New Zealand and on the Eastern side of the Pacific Ocean, it extends from Alaska, Mexico to Central America, and the Andes.
- The Atlantic coast has few active volcanoes, but many are dormant or extinct, e.g. St. Helena, Canary Islands etc., but volcanoes in Iceland and Azores are active.
- In the Mediterranean region, volcanoes are mainly associated with the Alpine folds, e.g. Mt. Etna, Mt. Stromboli etc.
- **Volcanoes at Divergent Plate boundary** – When two plates are moving away from each other, along these boundaries, magma rises from deep within the Earth and erupts to form a new crust on the lithosphere.
 - Most of the active divergent plate boundary is present at mid-oceanic ridges, where constant sea-floor spreading and formation of new plate boundaries can be seen.
 - Some volcanoes are also located in Rift valley in Africa, such as Mt. Kilimanjaro, Mt. Kenya, and Mt. Cameroon.
 - Volcanoes due to hot spot activities – This occurs at the interior parts of the lithospheric plates rather than plate boundaries, e.g. Reunion hotspot in the Indian Ocean, Hawaiian hotspot in the Pacific Ocean and Yellowstone hotspot in North America.

Coincidence of distribution of volcanoes and earthquakes:

- Both phenomena are associated with tectonic activities, and energy released from one phenomenon gives rise to another.
- Earthquakes are found along all types of plate margins (constructive, destructive and transform). However, Volcanoes occur at constructive and destructive plate margins only.



Reason for coincidence:

- **Subduction zone:** In these subduction zones, overlapping plates cause slip between them and rupture within plates, leading to earthquakes.
 - Also, the consumption of oceanic plates in the mantle gives rise to volcanoes.
- **Movement of magma:** Compression of plates forces the magma beneath them to move, but this movement is difficult for a newly compressed crust.
 - This causes the magma to pool in magma chambers beneath the surface and between the converging plates.
 - With the movement of plates, this magma is forced to move in or out of these chambers and thus causing Volcano-tectonic earthquakes.
- **Injection of magma and cracking of rocks:** Injection of magma into surrounding rocks causes them to break, and every time the rock cracks, it causes small earthquakes.
- **Diverging plates:** At diverging plate boundaries, along with the volcanic activity due to the rise of magma, the creation of new crust pushes other crust.

- Cracking of the crust and formation of faults causes earthquakes in these regions.

Conclusion:

- Thus, plate tectonic activities are important in volcanic activities and earthquake events. The concentration of volcanic activities and earthquakes in a particular belt affects the life of people in these regions significantly.
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Q2. Discuss the importance of the cryosphere in global climate regulation.

(150 Words, 10 Marks)

Introduction:

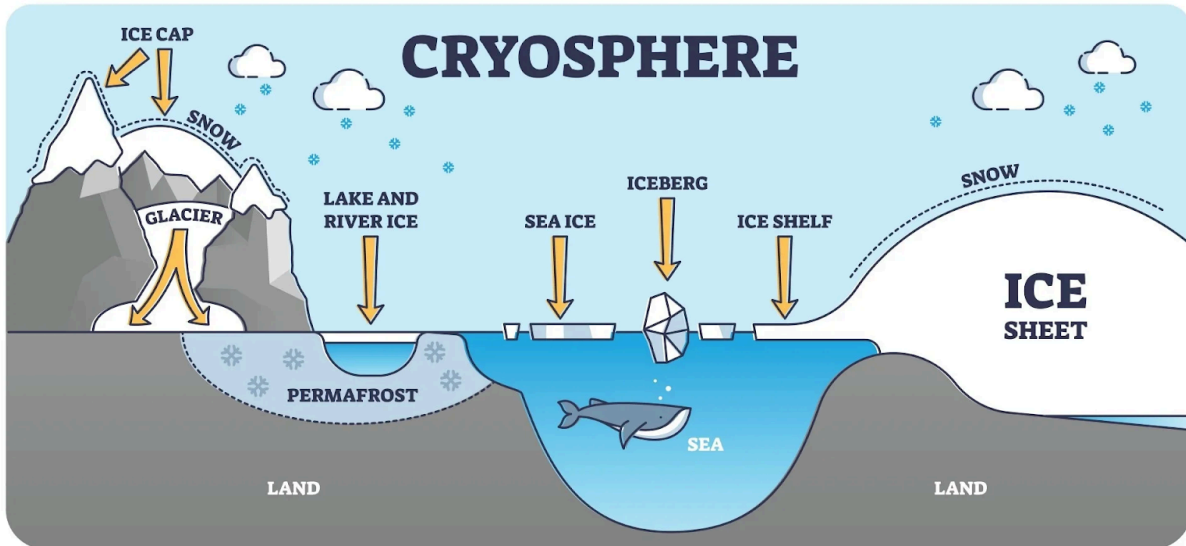
- The cryosphere is an umbrella term used to depict the portion of earth where water exists in solid form. It includes regions like Antarctica, and Greenland, icebergs in the sea, and also higher mountain ranges like the Himalayas. OR
- According to the recently released IPCC (Intergovernmental Panel on Climate Change) report, the global temperature will increase by more than 2 degrees by the end of the millennium. This has the highest level of impact on fragile regions like the cryosphere.

Main Body:

Importance of cryosphere in climate regulation:

- **Albedo effect:** Albedo denotes reflecting capabilities; the cryosphere has higher albedo, which in turn cools the earth.
- **Carbon sink:** Cryosphere is also a major carbon sink and has trapped carbon and methane within itself and the soil beneath.
 - Reduction in the area of the cryosphere would release more greenhouse gases.
- **Regulation of ocean currents:** Any changes in the cryosphere tend to alter the rate of the thermohaline circulation, thus affecting the microclimates.
 - The incidents of El Nino and La Nina are examples of this.

- **Natural disaster:** Excessive melting of the cryosphere could trigger global catastrophic events like rising sea levels, tsunamis, and avalanches.



Conclusion:

- India has 7500km of coastline; any changes in the sea level would impact the social and economic aspects of the coastal community.
 - India needs to raise its voice against the climate change that is affecting the cryosphere region. The Himalayas also hosts the largest ice apart from the poles; this also depicts concern related to North East and Himalayan states.
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