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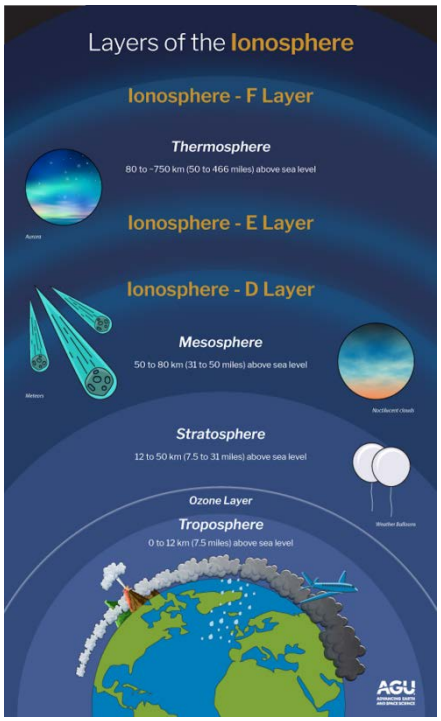
Current affairs summary for prelims

25 November, 2023

Reflection of Earthquake waves in Ionosphere

Context: Earthquakes, even small ones, affect the ionosphere, altering coseismic ionospheric perturbations (CIP) in amplitude and period, influenced by factors like geomagnetism and line-of-sight geometry, reveals a recent study.

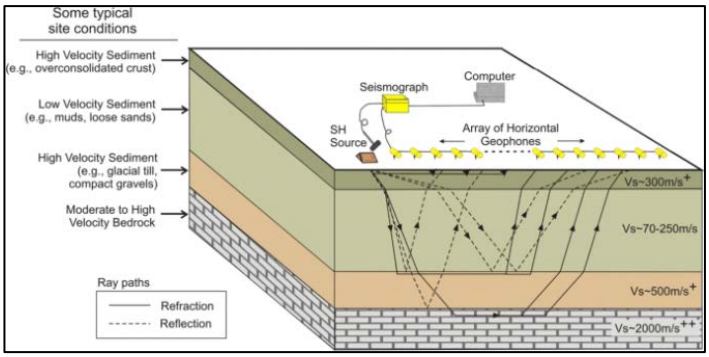
- **Coseismic Vertical Crustal Movements and Acoustic Waves:**
  - Earthquakes, even small ones, induce coseismic vertical crustal movements that generate acoustic waves (AWs) in the atmosphere.
  - These waves travel upward, reaching the ionosphere and causing disturbances in electron numbers along the line-of-sights connecting ground Global Navigation Satellite System (GNSS) receivers and satellites.
  - These disturbances are referred to as coseismic ionospheric perturbations (CIP), and near-field CIP typically occurs within 500–600 km of the earthquake source.
- **Challenges with Previous Assumptions:**
  - Past studies often assumed point sources and a single acoustic pulse for modeling near-field CIP, based on the maximum vertical displacements.
  - Large earthquakes, involving ruptures of multiple fault segments over hundreds of kilometers, challenge the appropriateness of the single-source assumption.
- **Verification through Analysis of 2023 Turkey Earthquakes:**
  - Scientists from the Indian Institute of Geomagnetism (IIG) analyzed the near-field CIP of the February 2023 Turkey Earthquakes, both smaller than 8 Mw.
  - The earthquakes included a devastating Mw 7.8 event (EQ1) near the Turkey-Syria border and a subsequent Mw 7.7 event (EQ2) to the north.



(Note: It should not be confused with Reflection Seismology)

Reflection Seismology:

- Reflection seismology utilizes seismological principles to estimate subsurface properties through reflected seismic waves.
- The method involves a controlled seismic energy source, such as dynamite, Tovex blast, specialized air guns, or seismic vibrators.
- It draws parallels to sonar and echolocation.
- **Reflection Seismology Applications**
  - **Near-Surface Investigations**
    - **Depth**: Up to 1 km
    - **Purpose**: Engineering, environmental surveys, coal, mineral exploration
    - **Emerging Use**: Geothermal energy surveys (up to 2 km deep)
  - **Hydrocarbon Exploration**
    - **Depth**: Up to 10 km
    - **Purpose**: High-resolution mapping of acoustic impedance contrasts
    - **Integration**: Combined with seismic attribute analysis for geological modelling
  - **Mineral Exploration**
    - **Depth**: Traditionally near-surface, now expanding to hard-rock environments
    - **Role**: Complements geological mapping and other methods in greenfield exploration
  - **Crustal Studies**
    - **Depth**: Up to 100 km
    - **Objective**: Investigate Earth's crust structure and origin



Humanitarian Pause

Context: A temporary cease-fire between Israel and Hamas is currently in effect as of Friday, November 24, 2023, lasting for four days.

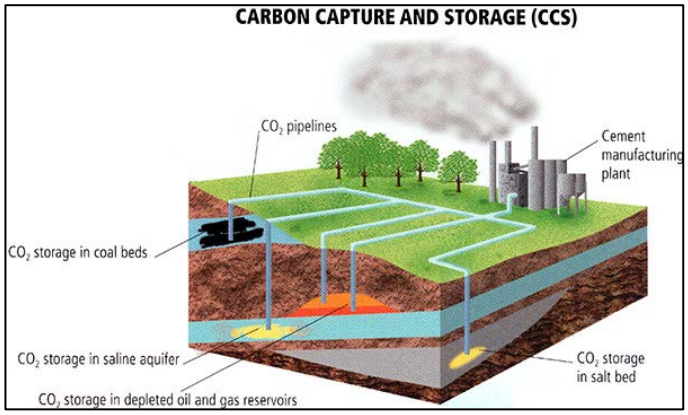
- A humanitarian pause is a temporary cessation of hostilities driven solely by humanitarian concerns.
- It is limited to a specific timeframe and designated area, focusing on immediate relief efforts.
- The primary objective is to facilitate humanitarian activities, such as aid delivery and relief efforts.
- Unlike a long-term arrangement, it provides short-term relief within the defined period.
- Negotiations may influence the duration, allowing for flexibility in the ceasefire period.
- Actions during the pause may include the release of hostages or detainees.
- Geographical specifics of the pause may not always be explicitly defined.

- In essence, it serves as a short-term intervention to address immediate humanitarian needs.
- A humanitarian pause differs from a ceasefire, which involves a more comprehensive suspension of fighting.
- The emphasis is on immediate relief rather than achieving a lasting political solution.
- **Other types of Pauses during a conflict:**
  - **Ceasefire**: A ceasefire is a long-term suspension of fighting mutually agreed upon by conflicting parties, typically encompassing the entire conflict zone. The primary objective is to facilitate political dialogue, aiming towards a permanent settlement.
  - **Cessation of Hostilities**: Cessation of hostilities refers to a temporary pause in active conflict, allowing involved parties to take a break from fighting. This cessation serves various purposes, including preparation for political dialogue and the potential establishment of a sustained ceasefire.
  - **Temporary Cessation of Hostilities**: A temporary cessation of hostilities is an agreed suspension of fighting for a specific period, often undertaken for humanitarian reasons. It includes clear specifications regarding the geographic area and the designated timeframe for conducting specific humanitarian activities.
  - **Humanitarian Corridor**: A humanitarian corridor involves agreed-upon routes and logistical methods to safely transport humanitarian goods and/or people within active conflict areas.
  - **Days of Tranquility**: Days of tranquility, primarily used by UNICEF in collaboration with WHO, enable access to healthcare during conflicts. The mechanism requires unanimous agreement from all parties to grant access and ensures non-interference with humanitarian activities on designated days.
  - **De-confliction Arrangements**: De-confliction arrangements involve the exchange of logistical information between humanitarian actors and parties in conflict. The coordination aims to ensure that relief activities' time and locations do not endanger lives, impede relief supply passage, or disrupt humanitarian efforts.

Carbon Dioxide Removal

Context: According to the Emissions Gap report, delaying greenhouse gas (GHG) emissions reduction will further increase the future dependence on carbon dioxide removal (CDR) from the atmosphere.

- Carbon dioxide removal (CDR) is **defined by the IPCC** as, "Anthropogenic activities removing CO_2 from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products. It includes existing and potential anthropogenic enhancement of biological or geochemical sinks and direct air capture and storage, but excludes natural CO_2 uptake not directly caused by human activities."
- **UNEP's Climate Summit Statement**: Ahead of the 2023 Climate Summit, the United Nations Environment Programme (UNEP) emphasized the need for countries to surpass current pledges under the 2015 Paris Agreement to limit global warming to 1.5°C.
- **Emissions Gap Report Warning**: The Emissions Gap report indicates that delaying greenhouse gas (GHG) emissions reduction will heighten future reliance on carbon dioxide removal (CDR) technologies.
- **Definition of Carbon Dioxide Removal (CDR):** CDR involves intentional human actions to remove carbon dioxide from the atmosphere. It includes traditional methods like afforestation and advanced technologies such as direct air carbon capture and storage (DACCS).
- **CDR Methods:**
  - **Afforestation/Reforestation**: Converts degraded land into forests, contributing to negative emissions. Cost: under $240 per tonne of CO_2; storage time: decades to centuries.
  - **Biochar**: Produced by controlled burning of organic waste, providing stable carbon storage. Cost: $10-345 per tonne of CO_2.
  - **BECCS (Bioenergy with Carbon Capture and Storage):** Uses biomass for energy production, capturing and storing resulting CO_2 emissions underground. Cost: $50-200 per tonne of CO_2.
  - **DACCS (Direct Air Carbon Capture and Storage):** Extracts CO_2 directly from the atmosphere, with high costs ranging from $100-300 per tonne of CO_2.
  - **Enhanced Rock Weathering**: Involves pulverizing silicate rocks to accelerate carbon absorption. Cost: $50-200 per tonne of CO_2.



- **Ocean Alkalinity Enhancement**: Adds alkaline substances to seawater to enhance natural carbon absorption. Cost: $40-260 per tonne of CO_2.

➢ **Challenges and Risks**: CDR methods pose challenges, including land competition, dust emissions, increased GHG emissions, and potential adverse effects on biodiversity.

➢ **CDR as a Policy**: The IPCC emphasizes the need for appropriate governance and policies for CDR methods to address potential adverse side-effects. It calls for political commitment to integrate CDR into existing climate policy frameworks.

NEWS IN BETWEEN THE LINES

Intergovernmental Negotiating Committee

Recently, a study at the Intergovernmental Negotiating Committee in Nairobi revealed that Indian street food vendors switching to reusable materials could drastically cut plastic waste and generate multiple new jobs.

About Intergovernmental Negotiating Committee:

➢ The Intergovernmental Negotiating Committee was formed in February 2022 during UNEA-5.2.
➢ Its aim is to create a global legal framework for tackling plastic pollution.
➢ The INC's work began in the second half of 2022 and is expected to be completed by the end of 2024.
➢ It is tasked with developing an instrument that addresses the full life cycle of plastic, including its production, design and disposal.
➢ Resolution 5/14 was adopted at UNEA-5.2, which targets a legally binding instrument for plastic pollution, especially in marine environments.

Sessions:

➢ The first meeting of the Intergovernmental Negotiating Committee (INC-1) took place in hybrid format from 28 November to 2 December, in Punta del Este, Uruguay.
➢ The second session of the Intergovernmental Negotiating Committee to develop an international legally binding instrument on plastic pollution, including in the marine environment, took take place in Paris, France from 29 May to 2 June.
➢ The third session of the Intergovernmental Negotiating Committee to develop an international legally binding instrument on plastic pollution, including in the marine environment, is scheduled to take place from 13 to 19 November 2023, in Nairobi, Kenya.

Psyche Mission

Recently, a NASA experiment aboard the Psyche spacecraft transmitted test data via a near-infrared laser from a distance of nearly 16 million kilometers .

About Psyche Mission:

➢ The NASA Psyche mission aims to explore the 140-mile-wide metallic asteroid named 16 Psyche, slated to enter its orbit in 2029.
➢ Over a two-year span, the spacecraft intends to meticulously map the asteroid's surface, capture imagery, and study its topography.
➢ Its primary goal is to unravel details about its composition, formation and the intriguing nature of metal core asteroids and planets.
➢ The mission presents an unprecedented opportunity to understand iron-core formations, marking a significant departure from conventional rocky or icy celestial bodies.

About 16 Psyche:

➢ It currently orbits the Sun in the space realm nestled between Mars and Jupiter.
➢ It was discovered in 1852 by astronomer Annibale de Gasparis, the asteroid comprises gold, silver, and nickel elements, rendering it rich in metallic content.
➢ NASA estimates its worth could potentially surpass the cumulative value of Earth's entire economy.

A23a Iceberg

Recently, it has been observed that A23a, the world's largest iceberg, has begun moving after being stationary for 30 years."

About A23a Iceberg:

➢ A23a refers to a large iceberg that broke off from the Filchner–Ronne Ice Shelf in 1986.
➢ It spans approximately 4,000 sq km, making it roughly twice the size of Greater London.
➢ This colossal iceberg measures about 400 meters (1,312 feet) thick, comparable to Europe's tallest skyscraper.
➢ It is expected to enter the Antarctic Circumpolar Current, potentially reaching beyond Antarctic waters along the path known as "iceberg alley."
➢ It began showing signs of movement in 2020 after being immobile since 1986.
➢ Melting icebergs like A23a release mineral nutrients into the ocean, contributing to the ecosystem's biological activity.

Place in News

Lebnon

Recently, tranquility prevails along Lebanon's borders as a ceasefire comes into effect, marking a period of calm in the region.

Lebnon (Capital: Beirut)

Location: Lebanon is a Levantine country in the northern Arabian Peninsula, located on the eastern shore of the Mediterranean Sea. It is the second smallest country in continental Asia.

Boundaries: It shares its borders with Syria to the north and east, Israel to the south, and is bounded by the Mediterranean Sea to the west.

Physical Features:

- The Anti-Lebanon Mountains run in parallel to the east of the Lebanon Mountains.
- The Beqaa Valley serves as a central highland situated between the Lebanon and Anti-Lebanon Mountains.

Personality in News

Lachit Borphukan

Recently, the Prime Minister of India has paid tributes to Lachit Borphukan on Lachit Diwas.

Lachit Borphukan (24th November 1622-25th April 1622)

- Lachit Borphukan was a revered military leader, known for his leadership and strategic acumen in the Ahom Kingdom of Assam, India.
- The Lachit Borphukan gold medal, instituted in 1999, honors his valor and is awarded to the top cadet at the National Defence Academy.

Contributions:

- He led Ahom forces in the Battle of Saraighati in 1671, halting the Mughal advance and safeguarding Assam's independence.
- He showcased strategic brilliance in naval warfare, inspiring the development of India's naval forces.
- He advocated and promoted inland water transport, revitalizing infrastructure associated with river navigation.
- He inspired the institution of the Lachit Borphukan gold medal at the National Defence Academy, honoring bravery and leadership.

Ahom Kingdom:

- The Ahom Kingdom was founded in 1228 in Assam's Brahmaputra valley by Chaolung Sukapha.
- It remained independent for six centuries until it was annexed by British India in 1826 through the Treaty of Yandaboo.

POINTS TO PONDER

- Where was India's first 3D-printed post office created? **- Bengaluru**
- What does OSHWCC stand for? **- Occupational Safety, Health and Working Conditions Code**
- How many DPIs from different countries are currently featured in the Global Digital Public Infrastructure Repository (GDPIR)? **- 54 DPIs from 16 countries**
- Where is the maiden Kambala festival scheduled to be hosted? **- Bengaluru**
- Under which schedule of the Wild Life (Protection) Act, 1972, is the Sangai Deer listed? **- Schedule I**