



# Indian Equatorial Electrojet Model

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## Why in News?

Recently, scientists from the [Indian Institute of Geomagnetism \(IIG\), Navi Mumbai](#) have developed the **Indian Equatorial Electrojet (IEEJ) Model** to accurately predict the **Equatorial Electrojet** over the Indian sector.

- Ground-based magnetometers at **Tirunelveli station**, near India's southern tip, are used for regular EEJ measurements.

## What are the Key Facts About Equatorial Ionospheric Processes?

- **Equatorial Electrojet:** It is a **concentrated, intense electric current** flowing within the **Earth's ionosphere** at the **geomagnetic equator** at a height of around **105-110 km**.
  - India's **southern tip** is close to the Earth's geomagnetic equator where a **strong current exists**.
- **IEEJ Model Capabilities:** It has a **web interface** that allows simulations of EEJ for different dates and **solar activity conditions**.
- **Applications:** The model helps in understanding **equatorial ionospheric processes** and has practical applications in several ways:
  - **Satellite** orbital dynamics
  - [Global Navigation Satellite Systems \(GNSS\)](#)-based navigation/positioning
  - Satellite communication links
  - Electrical power grids
  - Transmission lines
  - Oil and gas industry pipelines

## Note:

- **The geomagnetic equator** is the **midpoint** between the **magnetic north and south poles**, running around the Earth.
- Unlike the geographic equator, it can **shift and change position** due to variations in the [Earth's magnetic field](#).

## Ionosphere

- It is **not a distinct layer** like the Troposphere or Stratosphere. Instead, the ionosphere **overlaps** the [mesosphere, thermosphere, and exosphere](#).
- It's a very active part of the atmosphere, and it **grows and shrinks** depending on the energy it absorbs from the sun.
  - It is an electrically conducting region capable of **reflecting radio signals** back to Earth.
- The **electrically charged atoms and molecules** that are formed in this way are called **ions**, giving the ionosphere its name.

## What is the Division of Atmosphere Based on Thermal and Chemical Composition?

- Thermal Composition of Atmosphere:

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# ATMOSPHERE AND ITS LAYERS

## ATMOSPHERE

- One of the main components of Earth's interdependent physical system
- It is composed of about 78% nitrogen, 21% oxygen, and 1% other gases

## LAYERS

### Troposphere:

- Extends from Earth's surface upto 12 kilometers
- The **lowest part of the atmosphere**- the part we live in
- Temperature in the troposphere decreases with height
  - The top of the troposphere is called **tropopause**
- Densest atmospheric layer
- Contains about **75% of all of the air in the atmosphere**, and 99% of water vapour (which forms clouds and rain)

### Stratosphere:

- Located between 12 and 50 kilometers above Earth's surface
- Contains much of the **ozone** in the atmosphere
  - Ozone molecules in this layer **absorb ultraviolet (UV) radiation** from the Sun, resulting in an increase in temperature
- It is **nearly cloud- and weather-free**
- It's the **highest part of the atmosphere that jet planes can reach**

### Mesosphere:

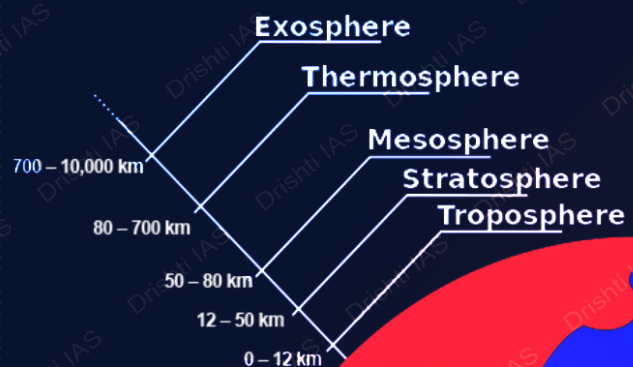
- Located between about 50 and 80 kilometers above Earth's surface
- The top of this layer is the **coldest place found within the Earth system**
- It forms **noctilucent clouds**, the highest clouds in Earth's atmosphere
- Most **meteors burn up in this atmospheric layer**
- Sounding rockets and rocket-powered aircraft** can reach the mesosphere

### Thermosphere:

- Located between about 80 and 700 kilometers above Earth's surface
- Its lowest part contains the **ionosphere**
- The **temperature of the thermosphere varies between night and day and between the seasons**
- The **aurora borealis (northern) and aurora australis (southern)** are sometimes seen here

### Exosphere:

- Located between 700 and 10,000 kilometers above Earth's surface.
- The **highest layer of Earth's atmosphere**.
- There's **no weather at all** in this layer.
- Most Earth **satellites orbit in this layer**.
- At the bottom of the exosphere is a transition layer called the **thermopause**.



- **Chemical Composition of Atmosphere:** On the basis of **chemical composition**, the atmosphere is divided into **two broad zones**.
  - **Homosphere:** Homosphere can be defined as the **lowest part** of the Earth's atmosphere. It lies between the heterosphere and the surface of the earth.
    - It is the earth's atmosphere below the altitude of **roughly 90 kms** where there is an **almost-homogenous** composition of **nitrogen (78%), oxygen (21%), argon (10%), carbon dioxide** as well as traces of constituents like **dust particles, aerosols and cloud droplets**.
    - It is divided into the Troposphere, Stratosphere and Mesosphere.
  - **Heterosphere:** The **atmosphere laying beyond the homosphere** is termed as heterosphere. It extends from **90 km to 10,000 km**.
    - The air is **rare** and the **molecules** are **wide apart**. The mixing of the gases is not possible as the **turbulence is not happening there**.
    - It is divided into two main spheres i.e., **thermosphere and exosphere**.

## UPSC Civil Services Examination, Previous Year Question (PYQ)

### Prelims

**Q. Consider the following: (2013)**

1. Electromagnetic radiation
2. Geothermal energy
3. Gravitational force
4. Plate movements
5. Rotation of the earth
6. Revolution of the earth

**Which of the above are responsible for bringing dynamic changes on the surface of the earth?**

- (a) 1, 2, 3 and 4 only
- (b) 1, 3, 5 and 6 only
- (c) 2, 4, 5 and 6 only
- (d) 1, 2, 3, 4, 5 and 6

**Ans: (d)**

**Q. A layer in the Earth's atmosphere called Ionosphere facilitates radio communication. Why? (2011)**

1. The presence of ozone cause the reflection of radio waves to Earth.
2. Radio waves have a very long wavelength.

**Which of the statements given above is/are correct?**

- (a) 1 only
- (b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

**Ans: (d)**

PDF Reference URL: <https://www.drishtiias.com/printpdf/indian-equatorial-electrojet-model>

