

## 1. Electromagnetic Ion Cyclotron (EMIC) Waves

### Why in News?

- Scientists have recently identified Electromagnetic Ion Cyclotron (EMIC) waves, a form of plasma waves in the Indian Antarctic station, Maitri.

### Highlights

- The EMIC waves are the discreet electromagnetic emissions observed in the Earth's magnetosphere.
- These waves are generated in the equatorial latitudes and propagate along magnetic field lines to its footprint in the high latitude ionosphere.
- Their signatures can be recorded in both space as well as ground-based magnetometers.
- These waves play an important role in precipitation of killer electrons (electrons having speed close to speed of light, which form the radiation belt of planet Earth), which are hazardous to space-borne technology/instruments.
- The study can help understand the impact of energetic particles in the radiation belts on the low orbiting satellites.
- Plasma waves are a type of electromagnetic wave that propagates through plasma, which is a state of matter.
- Plasma is formed when a gas is heated to high temperatures or subjected to strong electric fields, causing its atoms to become ionised, meaning they lose or gain electrons and become charged particles.
- More than 99% of the matter in the visible universe consists of plasma.
- Our Sun, solar wind, the interplanetary medium, near-Earth region, magnetosphere, and the upper part of our atmosphere all consist of plasma.
- Plasma waves have significant applications in various fields, including astrophysics, space science, plasma physics, and communication technology.
- **For example:** they are involved in the generation of auroras
- The study of plasma waves also provides us with information on regions inaccessible to us, transport mass and energy across different regions, how they interact with charged particles and control the overall dynamics of the Earth's magnetosphere.