

ALMA Telescope

Why in News?

The Atacama Large Millimetre/submillimetre Array (ALMA) is a <u>radio telescope</u> located in the Atacama Desert of northern <u>Chile</u>. It is set to receive software and hardware upgrades.

The upgrades will enable ALMA to collect more data and produce sharper images.

What is ALMA?

- About:
 - ALMA is a state-of-the-art telescope that studies celestial objects at millimetre and submillimetre wavelengths — they can penetrate through dust clouds and help astronomers examine dim and distant galaxies and stars out there.
 - ALMA is an international partnership of the European Southern Observatory (ESO), the U.S. National Science Foundation (NSF) and the National Institutes of Natural Sciences (NINS) of Japan, together with NRC (Canada), MOST and ASIAA (Taiwan), and KASI (Republic of Korea), in cooperation with the Republic of Chile.
- Properties:
 - It also has extraordinary sensitivity, which allows it to detect even extremely faint radio signals.
 - Each of its **66 antennas is equipped with a set of receivers** that are designed to detect **specific ranges of wavelengths on the electromagnetic spectrum.**
 - To combine the data collected by each antenna into a single image, **ALMA uses a** correlator.
 - The correlator is a **powerful supercomputer** that processes the vast amounts of data collected by the antennas and creates detailed images of celestial objects with exceptional resolution.
 - This technology allows astronomers to study distant galaxies, stars, and other celestial bodies with a level of detail never before possible.
- Discoveries Made by ALMA:
 - In 2013, ALMA discovered <u>starburst galaxies</u> that existed earlier in the universe's history than previously thought.
 - ALMA also provided detailed images of a protoplanetary disc around a young star, HL Tauri, in 2014, which challenged existing theories about planetary formation.
 - In 2015, the telescope helped scientists observe the **Einstein ring phenomenon**, where light from a galaxy or star passes by a massive object on its way to Earth.

Why is ALMA located in Chile's Atacama Desert?

- It is situated at an altitude of 16,570 feet (5,050 metres) above sea level on the Chajnantor plateau in Chile's Atacama Desert as the millimetre and submillimetre waves observed by it are very susceptible to atmospheric water vapour absorption on Earth.
- Moreover, the desert is the driest place in the world, meaning most of the nights here are clear of clouds and free of light-distorting moisture — making it a perfect location for examining the universe.

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