Doppler Weather Radars

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Why in News

Recently, the Union Minister for Earth Sciences commissioned two of the ten indigenously built **X-Band Doppler Weather Radars (DWR)** which will closely monitor the **weather changes over the Himalayas.**

- A multi-mission meteorological data receiving and processing system developed in collaboration with **Indian Space Research Organisation (ISRO)** was also launched.
  - This new system will **capture, process and make available for use satellite data within seven minutes as opposed to 20 minutes taken by earlier systems.**

Key Points

- **Developed By :** The DWR has been designed and developed by **ISRO** and manufactured by **Bharat Electronics Limited (BEL)**, Bengaluru.
- **Significance:**
  - Covering the central and western Himalayas, these dual polarised radars will **gather atmospheric variations and pick signals of extreme weather events.**
  - Uttarakhand and Himachal Pradesh are **highly prone to cloud bursts, landslides, heavy rain and snowfall.** Timely weather forecasts and warnings would **ensure the governments make advance plans and initiate rescue measures.**

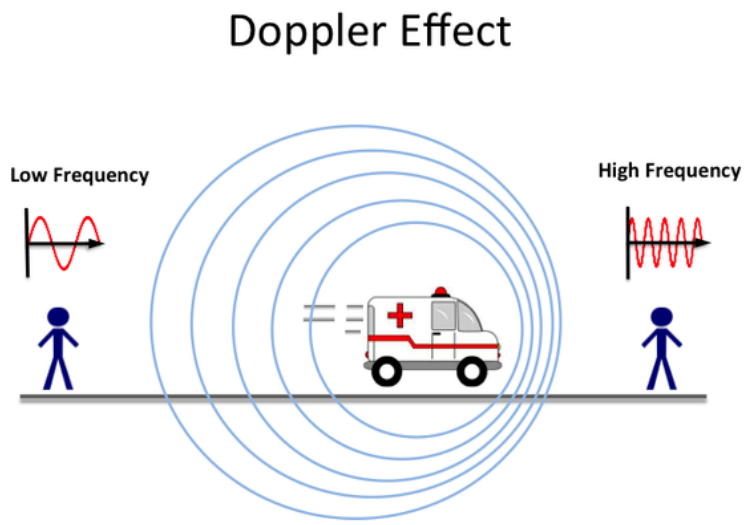
Radars

- **Radar (Radio Detection and Ranging):**
  - It is a device which **uses electromagnetic waves in the microwaves region** to detect location (range & direction), altitude, intensity and movement of moving and non-moving objects.

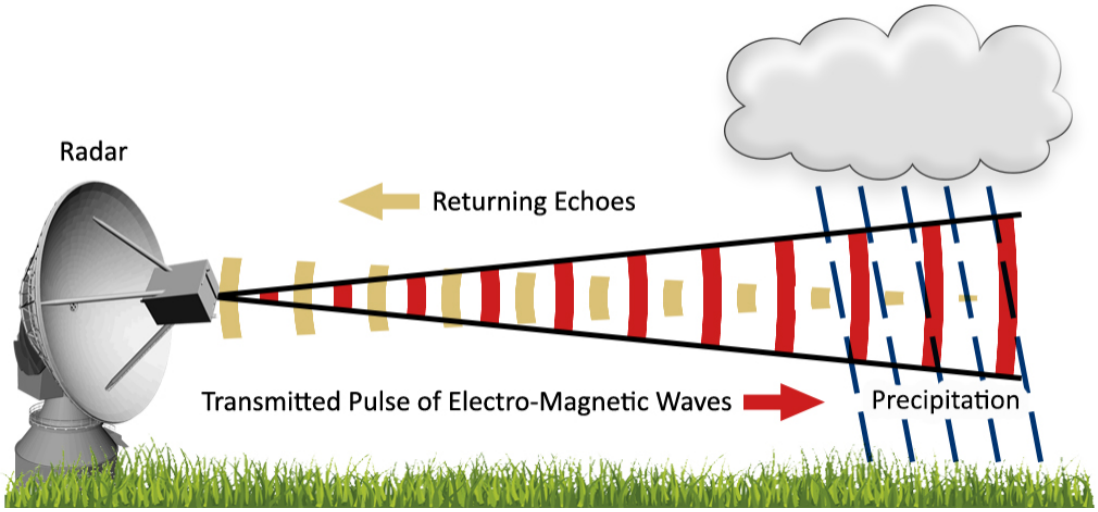
- **Doppler radar :**
  - It is a specialized radar that uses the **Doppler effect** to produce velocity data about objects at a distance

    Doppler effect:

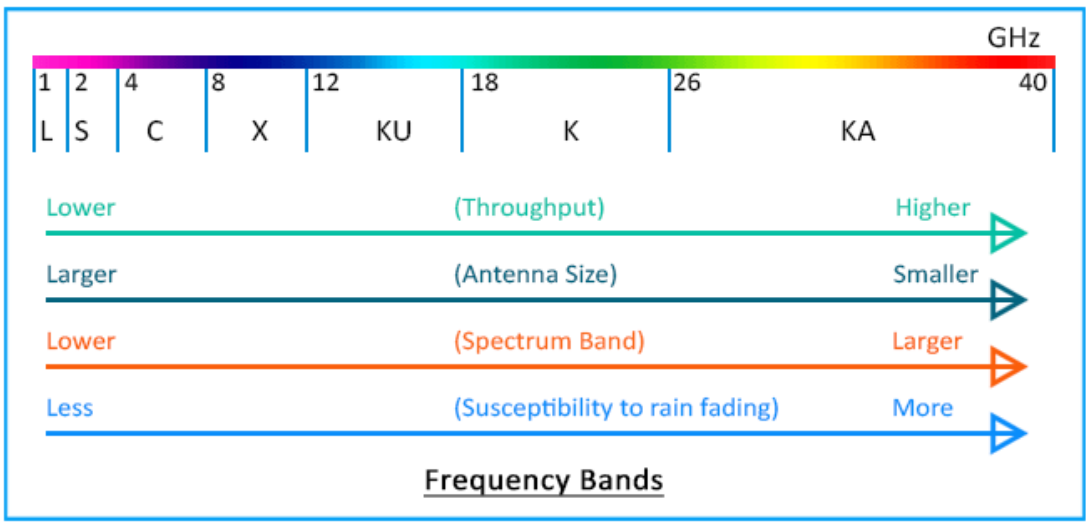
    When the **source and the signal are in relative motion to each other there is a change in the frequency** observed by the observer. If they are **moving closer frequency increases and vice versa.**



  - It does this by **bouncing a microwave signal off a desired target and analyzing how the object's motion has altered the frequency of the returned signal.**
  - This **variation gives direct and highly accurate measurements** of the radial component of a target's velocity relative to the radar.
- **Doppler Weather Radar:**
  - Based on Doppler principle the radar is **designed to improve precision in long-range weather forecasting and surveillance** using a parabolic dish antenna and a foam sandwich spherical radome.
  - DWR has the equipment to **measure rainfall intensity, wind shear and velocity and locate a storm centre and the direction of a tornado or gust front.**



Types Of Doppler Radars : Doppler radar can be divided into several different categories **according to the wavelength which are L,S,C,X,K.**



- **X band radars:** They operate on a wavelength of **2.5-4 cm** and a frequency of **8-12 GHz.** Because of the smaller wavelength, the X band radar is more sensitive and can detect smaller particles.
- **Application:**
  - These radars are used for studies on **cloud development** because they can detect the tiny water particles and also used to detect light **precipitation such as snow.**
  - X band radars also attenuate (become less effective) very easily, so they are used for only very **short range weather observation.**
  - Due to the small size of the radar, it can therefore be portable like the Doppler on Wheels (DOW). Most major **airplanes are equipped with an X band radar to pick up turbulence and other weather phenomena.**
  - This band is also shared with some **police speed radars and some space radars.**

Source:IE