UPSC Daily Current Affairs | Prelim Bits 20-04-2020

Research on Blazers

- Gamma-ray flux variability of luminous and high energy blazars: clues to blazar emission mechanisms
- At the center of most galaxies, there's a massive black hole that can have mass of millions or even billions of Suns that accrete gas, dust, and stellar debris around it.
- As these material falls towards the black hole, their gravitational energy gets converted to light forming active galactic nuclei (AGN).
- A minority of AGN (~15%) emit collimated charged particles called jets, travelling at speeds close to the speed of light.
- Blazars are AGN whose jets are aligned with the observer's line of sight.
- Some blazars are thought to host binary black holes in them and could be potential targets for future gravitational-wave searches.
- Blazars are the most luminous and energetic objects in the known universe were found to be emitters of gamma-rays in the 1990s.
- Researchers from the Indian Institute of Astrophysics (IIA), have conducted the first systematic study on the gamma-ray flux variability nature on different types of blazars.
- Their study could provide clues to the processes happening close to the black hole, not visible through direct imaging.
- The knowledge on the flux variability nature in the high energy gamma-rays on a month like timescales is limited.
- The results of this work will thus fill the gap on the knowledge of the high energy flux variability nature of blazars.
- One of the open problems in high energy astrophysics is to localize the site for the production of gamma-rays.
- Variability studies in the high energy gamma-ray band can help one to locate the high energy emission site and the high energy emission process.
- Therefore, the variability analysis in the gamma-ray band carried out in this work is significant.

Gamma Ray Band

- Gamma-ray band is one of the bands of the electromagnetic spectrum on which there is limited knowledge on the flux variability of blazars.
- But this band needs to be explored as this is the energy range where the high energy emission from blazars peaks.
- Exploring this band of the electromagnetic spectrum will provide key inputs to constrain the high energy production site as well as the high energy emission processes.
- The results obtained from IIA’s piece of work will provide key inputs to the problem of finding the high energy gamma-ray production site in blazars.
- Thus it will have direct relevance to the enhancement of the knowledge on blazars.
- The expertise of handling high energy data from celestial sources gained in this work will build capacity to interpret the gamma-ray data that will emerge from India's upcoming facility, the Major Atmospheric Cerenkov Experiment Telescope as well as from any X-ray missions by India in the future.

Major Atmospheric Cerenkov Experiment Telescope

- Major Atmospheric Cerenkov Experiment Telescope (MACE) is an Imaging Atmospheric Cerenkov telescope (IACT) located at Hanle, Ladakh, India.
- It is the highest (in altitude) Cerenkov telescope in the World and was built by Electronics Corporation of India, Hyderabad, for the Bhabha Atomic Research Centre.
- It was assembled at the campus of Indian Astronomical Observatory at Hanle.
- Operational since 2016, it is remotely operated and runs on solar power.
- The telescope is the second-largest gamma ray telescope in the world and will help the scientific community enhance its understanding in the fields of astrophysics, fundamental physics, and particle acceleration mechanisms.
- The largest telescope of the same class is the 28-metre-diameter High Energy Stereoscopic System (HESS) telescope being operated in Namibia.

X-Ray Polarimeter Satellite

- The X-ray Polarimeter Satellite (XPoSat) is a planned space observatory to study polarization of cosmic X-rays.
- It is planned to be launched in 2021, and to provide a service time of at least five years.
- The telescope is being developed by the Indian Space Research

Organization (ISRO) and the Raman Research Institute.
- Studying how radiation is polarized gives away the nature of its source, including the strength and distribution of its magnetic fields and the nature of other radiation around it.
- XPoSat will study the 50 brightest known sources in the universe, including pulsars, black hole X-ray binaries, active galactic nuclei, and non-thermal supernova remnants.

Indian Institute of Astrophysics

- The Indian Institute of Astrophysics (IIA), with its headquarters in Bengaluru is a National Research Institute of India.
- IIA conducts research primarily in the areas of astronomy, astrophysics and related subjects.
- It is widely recognized as a leading research center for astrophysics in India.
- IIA contributed to Astrosat, India's first dedicated multi-wavelength space observatory.
- The institute led the development of Ultra-Violet Imaging Telescope (UVIT).
- The institute has a network of laboratories and observatories in India, including

1. Kodaikanal - the Kodaikanal Solar Observatory
2. Kavalur - the Vainu Bappu Observatory,
3. Gauribidanur - the Gauribidanur Radio Observatory,
4. Hanle - the Indian Astronomical Observatory

Raman Research Institute

- Raman Research Institute (RRI) is an institute of scientific research located in Bangalore, India.
- It was founded by Nobel laureate C. V. Raman.
- Although it began as an institute privately owned by Sir C. V. Raman, it is now funded by the government of India.
- It is affiliated to Jawaharlal Nehru University
- The main areas of research are:

1. Astronomy and Astrophysics
2. Theoretical Physics
3. Light and Matter Physics
4. Soft Condensed matter physics

OIC

- The Organization of Islamic Cooperation is an international organization founded in 1969.
- It consists of 57 member states, with a collective population of over 1.8 billion as of 2015 with 53 countries being Muslim-majority countries.
- The organization states that it is "the collective voice of the Muslim world" and works to "safeguard and protect the interests of the Muslim world in the spirit of promoting international peace and harmony".
- The OIC has permanent delegations to the United Nations and the European Union.
- India is not a member of OIC
- Recently OIC urged India to stop the growing tide of Islamophobia in India and protect the rights of its persecuted Muslim minority as per its obligations under international Human Rights law.

U.S. Commission on International Religious Freedom (USCIRF)

- The United States Commission on International Religious Freedom (USCIRF) is a U.S. federal government commission created by the International Religious Freedom Act (IRFA) of 1998.
- USCIRF Commissioners are appointed by the President and the leadership of both political parties in the Senate and the House of Representatives.
- USCIRF's principal responsibilities are to review the facts and circumstances of violations of religious freedom internationally and to make policy recommendations to the President, the Secretary of State, and the Congress.

Green Zone State

- Union government announced the criteria for classifying districts into three zones depending on the level of outbreak in each district and relax restrictions post 20 April.
- According to this states will be demarcated into three zones

1. **Red Zones -** The districts which will have to be classified as red zones include the “highest case load districts contributing to more than 80 per cent of cases in India” or the “highest case load districts contributing to more than 80 per cent of cases for each state in India” or “districts with doubling rate less than 4 days (calculated every Monday for last 7 days, to be determined by the state government)”.
2. **Orange Zone -** The areas with limited number of cases in the past and

with no surge in positive cases recently would be included under the orange zone. Only restricted activities such as limited public transport and farm product harvesting is expected to be allowed in coronavirus

3. **Green Zone -** Any district which has not reported a new case for 28 days will be classified as "Green Zones".

- Goa recently became the first zero COVID-19 State in the country with the last seven positive cases also turning negative.
- This makes Goa the first green State in the country with no case of coronavirus being reported from April 3.

Remdesivir Drug

- Remdesivir is a drug with antiviral properties that was manufactured by US-based Biotechnology Company in 2014, to treat Ebola cases.
- Coronaviruses have a single-strand RNA as their genetic material. When the novel coronavirus SARS-CoV2 enters a human cell, an enzyme called RdRP helps the virus replicate. Remdesivir works by inhibiting the activity of RdRP.
- When the virus engulfs itself around a human cell, it injects its RNA inside the cell.
- The RdRp enzyme causes viral replication, Remdesivir inhibits the enzyme and stops further replication.
- It was also tried in patients of MERS and SARS, both caused by members of the coronavirus family, but experts said it did now show promising results back then.
- The drug remdesivir has been under the spotlight as a possible treatment for critical cases of novel coronavirus disease (COVID-19).
- Globally, it is one of the four possible lines of treatment being investigated in the Solidarity trials under the aegis of the World Health Organization (WHO).
- While the drug is yet to get approval in any country to treat COVID-19, recent studies have claimed they have found promising results.
- Remdesivir is currently not available in India, The ICMR plans to wait and watch for the results of WHO's Solidarity trials to make an assessment on the efficacy of remdesivir for COVID-19 treatment.

Other Drugs for COVID-19

- **Hydroxychloroquine**, an anti-malarial drug, is undergoing multiple trials to assess if it can be used to treat severe COVID-19 cases.

- It works by decreasing the acidity in parts of the cell where the virus is present, thereby inhibiting it.
- **Ritonavir and lopinavir** are two antiviral drugs used for treatment of HIV.
- These too work by inhibiting the virus's RNA, Specifically they target the enzyme that helps the virus split proteins.
- These two drugs are being used in India and several countries for seriously ill patients.
- In HIV patients, these two antiviral drugs work together to decrease the viral load in blood.
- Their use in COVID-19 patients seeks the same outcome, but so far it has not shown great success in viral suppression.

Source: PIB, Indian Express, the Hindu

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