

DAILY PT POINTERS

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The Hindu-S&T(GSIII)-Page 12

In fight against Nipah, scientists find new way to generate virus-like particles in lab

C. Maya
THIRUVANANTHAPURAM

Scientists at the Institute of Advanced Virology (IAV) at Thonnakkal here have developed a novel way of generating non-infectious Nipah virus-like particles (VLPs) in the laboratory, which mimic the wild-type Nipah Virus (NiV).

This method offers a safe and effective alternative platform for developing neutralising antibodies against the NiV in a biosafety level-2 (BSL) laboratory. The IAV team has thus come one step closer to its mandate for developing monoclonal antibodies and anti-virals against the NiV and similar pathogens.

The zoonotic virus Nipah is a highly pathogenic paramyxovirus, with a fatality rate of up to 80% in affected humans. Yet, research studies have been limited because of the extreme level of biosafety precautions required for handling this BSL-4 pathogen.

Virus neutralisation assays are critical for the de-



This method by the scientists at the Institute of Advanced Virology offers an effective platform for developing neutralising antibodies.

velopment and evaluation of vaccines and immunotherapeutics, and for conducting basic research into the immune response and pathogenesis of NiV. These tests, which traditionally require to be done in high-security labs with the infectious organism, can now be done safely in BSL-2 labs in the country using the NiV-VLPs, Director of IAV E. Sreekumar says.

The laboratory studies by the team of researchers led by Mohanan Valiyaveetil have been detailed in the manuscript which appeared on May 24 in the in-

ternational journal *Heliyon* by Cell Press.

More sophisticated

The VLPs are molecules that closely resemble viruses, but are non-infectious. They have long been recognised as effective quantitative platforms for studying viral binding and entry kinetics of the virus. But the advent of NanoBIT technology and "HiBIT-tagged" VLP (HiBIT is an 11 amino acid peptide) makes it far more sophisticated. The genome of the NiV encodes six major proteins: glycoprotein (G), fusion protein (F), matrix (M), nucleocap-

sid (N), long polymerase (L) and phosphoprotein (P). IAV scientists generated "HiBIT-tagged" Nipah virus-like particles (NiV-VLPs) using plasmid-based expression systems, encoding the NiV structural proteins G, F, and M.

The VLPs thus produced were functionally identical to the native virus. The inclusion of a highly sensitive HiBIT tag on these VLPs accelerates their potential in antiviral drug screening and vaccine development.

The scientists say that the potential risks of using native viruses in virus-based assays could be alleviated with these HiBIT tagged VLPs.

This study is the first of its kind using HiBIT tagged NiV-VLPs, demonstrating their application in neutralisation assays.

However, extensive studies using multiple neutralising antibodies and antivirals that block entry of the virus are needed to conclusively show the efficacy of these VLPs, they added.

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- This method offers a safe and effective alternative platform for developing neutralising antibodies against the NiV in a biosafety level-2 (BSL) laboratory.
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Virus neutralisation assays are critical for the development and evaluation of vaccines and immunotherapeutics, and for conducting basic research into the immune response and pathogenesis of NiV.

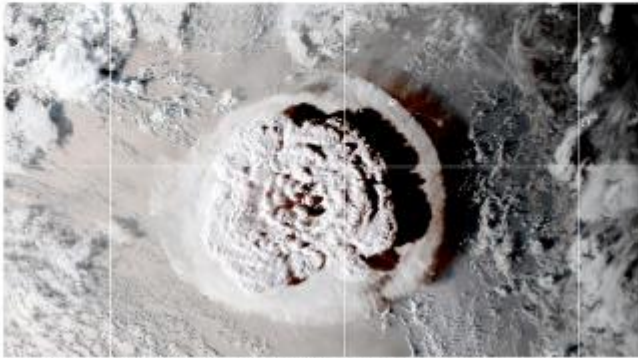
The Hindu-Geography(GSI)Page 18

Tonga volcano could cause unusual weather for rest of decade: study

Usually, the sulphur dioxide in the smoke of a volcano cools the earth's surface for a short period. Hunga Tonga was an underwater volcano, so it produced little smoke and a lot of water vapour, which shot into the stratosphere. And in the stratosphere, water vapour is a potent greenhouse gas.

Merita Jucker

Hunga Tonga-Hunga Ha'apai (Hunga Tonga for short) erupted on January 15, 2022, in the Pacific Kingdom of Tonga. It created a tsunami, which triggered warnings across the entire Pacific basin, and sent sound waves around the globe multiple times. A new study published in the journal of Climate captures the climate impacts of this eruption. Our findings show the volcano can explain, but not overestimate, the large cooling hole as well as the much warmer than expected summer of 2024. The eruption could have lingering effects on our winter weather for years to come.



The eruption of the underwater volcano Hunga Ha'apai of Hunga in 2022. The volcano has had weather altering impact across the globe. © NASA

THE GIST

A large ocean hole that developed from August to December 2023 was caused by Hunga Tonga. Simulations by researchers predicted the same hole almost two years in advance.

Hunga Tonga's impact on climate change was very small. It was calculated at only about 0.02 degrees Celsius. Consequently, the high temperatures that have been measured for about a year now cannot be attributed to the eruption.

Researchers' climate simulations predict that the northern half of Australia will be colder and wetter than usual winters as of 2026. In North America, it predicts warmer than usual winters, while for Scandinavia, it predicts colder than usual winters.

A cooling smoke cloud Usually, the smoke of a volcano – and in particular the sulphur dioxide contained inside the smoke cloud – ultimately leads to a cooling of the earth's surface for a short period. This is because the sulphur dioxide transforms into sulphate aerosols, which send sunlight back into space before it reaches the surface. This shading effect means the surface cools down for a while, until the sulphate falls back down to the surface or gets rained out.

This is not what happened to Hunga Tonga. Because it was an underwater volcano, Hunga Tonga produced little smoke, but a lot of water vapour (300-500 million tonnes, or the equivalent of 100,000 Olympic swimming pools). The enormous heat of the eruption pushed out huge amounts of sea water into steam, which then shot high into the atmosphere with the force of the eruption. All that water cooled off in the stratosphere, a layer of the atmosphere between about 15 and 50 kilometres above the surface, which produces neither clouds nor rain because it is too dry.

Water vapour in the stratosphere has two main effects. One, it helps in the chemical reactions that destroy the ozone layer, and two, it is a very potent greenhouse gas. There is no precedent in our observations of volcanic eruptions to know what all that water would do to our climate, and for how long. This is because the only way to measure water vapour in the entire stratosphere is with satellites. These have only existed since 1978, and there hasn't been an eruption similar to Hunga Tonga in that time.

Follow the vapour Experts in stratospheric science around

the world started examining satellite observations on the first day of the eruption. Some studies focused on the more traditional effects of volcanic eruptions, such as the amount of sulphate aerosols and their cooling effect on the atmosphere, some concentrated on the possible effects of the water vapour, and some included both.

But nobody really knew how the water vapour in the stratosphere would behave. How long will it remain in the atmosphere? Where will it go? And, more importantly, what does this mean for the climate while the water vapour is still there?

Those were exactly the questions we set out to answer.

We wanted to find out about the future, and unfortunately, it is impossible to measure that. This is why we turned to climate models, which are specifically made to look into the future.

What did we find out? The large ocean hole from August to December 2023 was at least in part due to Hunga Tonga. Our simulations predicted



The eruption created a tsunami which triggered warnings across the entire Pacific basin, and sent sound waves around the globe multiple times.

that ocean hole almost two years in advance.

Notably, this was the only year we would expect any influence from the volcanic eruption on the ozone hole. By then, the water vapour had just enough time to reach the polar stratosphere over Antarctica, and during any late years, there would not be enough water vapour left to enlarge the ozone hole.

As the ocean hole lasted until late December, with it came a positive phase of the Southern Annular Mode during the summer of 2024. In Australia, this meant a higher chance of a wet summer, which was exactly opposite what most people expected with the declared El Niño. Again, our model predicted these two years ahead.

In terms of global mean temperatures, which are a measure of how much climate change we are experiencing, the impact of Hunga Tonga is very small, only about 0.02 degrees Celsius. (This was independently confirmed by another study.) This means that the incredibly

high temperatures we have measured for about a year now cannot be attributed to the Hunga Tonga eruption.

information for the rest of the decade but there are some surprising, lasting impacts in some regions of the planet.

For the northern half of Australia, our model predicts colder and wetter than usual winters up to about 2026. For North America, it predicts warmer than usual winters, while for Scandinavia, it predicts colder than usual winters.

The volcano seems to change the very same waves that flow through the atmosphere. And atmospheric waves are responsible for highs and lows, which directly influence our weather.

It is important here to clarify that this is only one study, and one particular way of investigating what impact the Hunga Tonga eruption might have on our weather and climate. Like any other climate model, ours is not perfect.

We also didn't include any other effects, such as the El Niño-La Niña cycle. But we hope that our study will encourage scientists to try and understand what such a large amount of water vapour in the stratosphere might mean for our climate.

Whether it is to confirm or contradict our findings, that remains to be seen – we welcome other outcomes.

Merita Jucker is lecturer in atmospheric dynamics, UNSW Sydney. This article is republished from The Conversation.

- The volcanic island of Hunga Tonga-Hunga Ha'apai was built by undersea eruptions.
- The Kingdom of Tonga is a Polynesian country that lies to the south of Samoa, southeast of Fiji and north east of New Zealand. The Tongan archipelago is comprised of 176 islands, 36 of which are inhabited by a population of approximately 106,000. The islands are divided into four main groups – Tongatapu, Ha'apai, Vava'u and the Niuaus.



The Hindu : _GS 3-Defense

India to participate in Red Flag, RIMPAC exercises

Dinakar Peri
NEW DELHI

The Indian Air Force (IAF) and Indian Navy are taking part in two mega multinational war games hosted by their U.S. counterparts. The IAF has deployed Rafale fighter jets for the two-week multinational air exercise Red Flag which commenced in Alaska on May 30. On the other hand, the Indian Navy is deploying the indigenous stealth frigate *INS Shivalik* for Ex RIMPAC (Rim of the Pacific) scheduled to be held in Hawaii from June 25 to August 2.

"An IAF contingent arrived today at the Eielson AF Base of the U.S. Air Force, in Alaska, U.S., to participate in the upcoming edition of the multinational exercise Red Flag 24. Ably supported by its IL-78 air to air refuellers and the C-17 transport aircraft, the IAF Rafale fighters took a transatlantic flight with staging halts at Greece and Portugal," the IAF said on X. This is a two-week ad-



Unified front: Indian naval officers aboard *INS Shivalik*; the naval warship departed from Singapore to Yokosuka, Japan. PTI

vanced aerial combat training exercise, it added. For this, the IAF has deployed eight Rafale fighters, three C-17 transport aircraft and two IL-78 mid-air refuelling aircraft, officials confirmed. India has taken part in Ex Red Flag, which even saw the deployment of Russian SU-30MKI fighter jets.

According to the U.S. Air Force, Red Flag-Alaska is designed to provide realistic training in a simulated combat environment. "Approximately 3,100 service members are expected to fly, maintain and support more than 100 aircraft

from 4 nations scheduled to participate in Red Flag-Alaska 24-2," it said.

Indian Navy said on Saturday that *INS Shivalik*, mission deployed to the South China Sea and Pacific Ocean, departed Singapore for onward passage to Yokosuka, Japan to participate in Japan-India maritime exercise JIMEX-24 and then onward to RIMPAC-24. "This deployment is aimed at enhancing the degree of interoperability with the JMSDF, U.S. Navy and other partner navies participating in RIMPAC 24," the Navy said in a statement.

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- On the other hand, the Indian Navy is deploying the indigenous stealth frigate *INS Shivalik* for Ex RIMPAC (Rim of the Pacific) scheduled to be held in Hawaii from June 25 to August 2.
- RIMPAC is the largest multilateral naval exercise in the world and is held biennially in the Western Pacific Ocean

Indian Express : GS 3-Space

China lands on Moon's far side in historic sample-retrieval bid

REUTERS
BEIJING, JUNE 2

CHINA LANDED an uncrewed spacecraft on the far side of the moon on Sunday, overcoming a key hurdle in its landmark mission to retrieve the world's first rock and soil samples from the dark lunar hemisphere.

The landing elevates China's space power status in a global rush to the moon, where countries including the United States are hoping to exploit lunar minerals to sustain long-term astronaut missions and moon bases within the next decade.

The Chang'e-6 craft, equipped with an array of tools and its own launcher, touched



Long March-5 Y8 rocket that took the Chang'e-6 lunar probe before the launch. *File*

down in a gigantic impact crater called the South Pole-Aitken Basin on the moon's space-fac-

ing side at 6:23 a.m. Beijing time (2223 GMT), the China National Space Administration said.

The mission "involves many engineering innovations, high risks and great difficulty", the agency said in a statement on its website.

"The payloads carried by the Chang'e-6 lander will work as planned and carry out scientific exploration missions."


The successful mission is China's second on the far side of the moon, a region no other country has reached.

The side of the moon perpetually facing away from the Earth is dotted with deep and dark craters, making communications and robotic landing operations more challenging.

- A Chinese spacecraft landed on the far side of the moon on Sunday to collect soil and rock samples that could provide insights into differences between the less-explored region and the better-known near side.
- **The mission** is the sixth in the Chang'e moon exploration programme, which is named after a Chinese moon goddess. It is the second designed to bring back samples, following the Chang'e 5, which did so from the near side in 2020.

Indian Express GS 3 –Space-Page 12

JWST SPOTS EARLIEST-KNOWN GALAXY: WHAT A NEW STUDY SAYS



An infrared image of the JADES-GS-z14-0 (shown in the pullout) galaxy from James Webb Space Telescope. NASA

NASA'S JAMES Webb Space Telescope (JWST) has spotted the earliest-known galaxy, one that is surprisingly bright and big considering it formed during the universe's infancy — at only 2% its current age.

JWST, which by peering across vast cosmic distances is looking way back in time, observed the galaxy as it existed about 290 million years after the Big Bang event that initiated the universe roughly 13.8 billion years ago, the researchers said. This period spanning the universe's first few hundred million years is called cosmic dawn.

The discovery was made by an international team of astronomers, who used JWST to observe galaxies as part of the JWST Advanced Deep Extragalactic Survey (JADES) program. The study was

galaxies that the JADES team has measured at these distances, and it's going to be challenging to understand just how something this large could form in only a few hundred million years," Hainline said.

"The fact that it's so bright is also fascinating, given that galaxies tend to grow larger as the universe evolves, implying that it would potentially get significantly brighter in the next many hundred million years," Hainline said.

The JADES team in the same study disclosed the discovery of the second oldest-known galaxy, from about 303 million years post-Big Bang.

This one, JADES-GS-z14-1, is smaller — with a mass equal to about 100 million sun-sized stars, measuring roughly 1,000 light years across and forming about two

- NASA's James Webb Space Telescope has spotted the earliest-known galaxy, one that is surprisingly bright and big considering it formed during the universe's infancy— at only 2% its current age.
- This galaxy, called JADES-GS-z14-0, measures about 1,700-light years across.

Do you know?

- The James Webb Space Telescope (sometimes called JWST or Webb) is a large infrared telescope with an approximately 6.5 meter primary mirror.
- Webb is an international collaboration between NASA, the European Space Agency (ESA), and the Canadian Space Agency (CSA).

Indian Express :GS 2-IR

Uncertain times: what end of ANC's dominance means for South Africa

ARJUN SENGUPTA
NEW DELHI, JUNE 2

THE AFRICAN National Congress (ANC) has lost its 30-year parliamentary majority in South Africa, winning just over 40% of the national vote in the May 29 election.

The main opposition Democratic Alliance got almost 22% of the vote. Former South African President Jacob Zuma's uMkhonto we Sizwe (MK) received almost 15%, and the Marxist-Leninist Economic Freedom Fighters (EFF) was able to secure more than 9% of the votes.

ANC's decline

In 1994, the ANC under anti-apartheid leader Nelson Mandela won South Africa's

first 'all-race' election with 62.65% of the national vote. It has since dominated South African politics, so much so that its vote share in national elections never dropped below 50%.

The party that led the struggle against apartheid enjoyed the same popularity as the Congress in India in the first two decades after independence.

But in recent years, the ANC has declined steadily, even if slowly. "Many young voters did not live through apartheid... The criteria by which they evaluate a government does not rely on liberation movements... [but] on their results in areas of health, employment, economic development..." political scientist Abdelhak Bassou wrote in a policy brief for the Policy Centre for the New South.

Coalition complications

For the first time, the ANC will have to seek out coalition partners to form the government. South Africans do not directly elect their President. Their votes determine the constitution of the National Assembly (NA) by proportional representation; the NA in turn elects the President by a simple majority of 201 in the 400-member chamber.

Incumbent President Cyril Ramaphosa, 71, will want to serve a second term, but the ANC, which is almost 10% short of majority, will need the support of at least one among the DA, MK, or EFF to form the government. Former President Jacob Zuma's MK party, which was founded only in December 2023, has said it will not enter a

coalition with the ANC under Ramaphosa. MK is set to take power in Zuma's home province of KwaZulu Natal, where the ANC has not lost in 30 years.

Zuma, a stalwart of the anti-apartheid movement who was President from 2009-18, was removed from office following allegations of corruption, and was barred from standing in last month's election. But he has a loyal base among poor Black South Africans, and he made campaign promises to end unemployment and poverty while describing Ramaphosa as "an agent of capital".

A potential ANC ally is the EFF, which was formed by the expelled ANC youth leader Julius Malema in 2013. Malema has promised to nationalise the country's gold

and platinum mines, and to seize land from White farmers. As part of the ruling coalition, the EFF will push the centrist ANC to the left, which is worrying South Africa's small, largely White, capital-owning minority, as well as foreign investors.

For this group, the business-friendly centre-right DA will be the ANC's ideal coalition partner. DA leader John Steenhuisen has not ruled out a coalition with the ANC, and said he wants to save South Africa from a leftwing "doomsday coalition" of the ANC, MK and EFF.

Challenges ahead

According to South Africa's constitution, the President needs to be elected within 14 days of the result declaration. Serious challenges await the new coalition government.

According to the World Bank, 55% of South Africa's population lives in poverty. Unemployment currently stands at 33%, and the country faces water, housing, and energy crises. Crime is common, and the homicide rate of 45 per 100,000 people is among the world's highest.

Many people believe that "the death of ANC dominance" was necessary for the country to move in the right direction. The ANC, when it came to power in 1994, promised to uplift South Africa's poor, Black masses. It has not only failed to do so, but has refused to acknowledge its failings. Being a part of a coalition might change that.

"I think it is good... it will open new avenues for change and new avenues for accountability," political analyst Sizwe Mpofo-Walsh told AJazeera.

EXPLAINED
GLOBAL

- The ANC is a national liberation movement. It was formed in 1912 to unite the African people and spearhead the struggle for fundamental political, social and economic change.
- For ten decades the ANC has led the struggle against racism and oppression, organising mass resistance, mobilising the international community and taking up the armed struggle against apartheid.
- Membership of the ANC is open to all South Africans above the age of 18 years, irrespective of race, colour and creed, who accept its principles, policies and programmes.

Indian Express :GS 2-IR/GS3/Economy

OPEC+ extends deep oil output cuts into 2025

REUTERS

LONDON/DUBAI, JUNE 2

OPEC+ AGREED on Sunday to extend most of its deep oil output cuts well into 2025, exceeding expectations, as the group seeks to shore up the market amid tepid demand growth, high interest rates and rising rival US production.

Oil prices trade near \$80 per barrel, below what many OPEC+ members need to balance their



OPEC headquarters in Vienna, Austria. Reuters File

budget. Worries over slow demand growth in top oil importer

China have weighed on prices alongside rising oil stocks in developed economies.

The Organization of the Petroleum Exporting Countries and allies led by Russia, together known as OPEC+, have made a series of deep output cuts since late 2022. OPEC+ members are currently cutting output by a total of 5.86 million barrels per day (bpd), or about 5.7 per cent of global demand.

Those include 3.66 million bpd of cuts, which were due to

expire at the end of 2024, and voluntary cuts by eight members of 2.2 million bpd, expiring at the end of June 2024.

On Sunday, OPEC+ agreed to extend the cuts of 3.66 million bpd by a year until the end of 2025 and prolong the cuts of 2.2 million bpd by three months until the end of September 2024.

OPEC will spend one year on gradually phasing out cuts of 2.2 million bpd starting from October 2024 until the end of September 2025.

- OPEC+ agreed on Sunday to extend most of its deep oil output cuts for 2024 but to start phasing them out in 2025,
 - The Organization of the Petroleum Exporting Countries and allies led by Russia, together known as OPEC+, have made a series of deep output cuts since late 2022.
- The Organization of the Petroleum Exporting Countries (OPEC) is a permanent, intergovernmental Organization, created at the Baghdad Conference on September 10–14, 1960, by Iran, Iraq, Kuwait, Saudi Arabia and Venezuela.