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समाचार पत्रों से चयित अंश
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DRDO News

DRDO Technology News

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Thu, 12 May 2022 5:36 PM

एसयू-30 एमकेआई लड़ाकू विमान से हवा में मार करने वाली ब्रह्मोस मिसाइल के विस्तारित दूरी के संस्करण को सफलता पूर्वक प्रक्षेपित किया गया

भारत ने आज एसयू-30 एमकेआई लड़ाकू विमान से हवा में मार करने वाले ब्रह्मोस मिसाइल के विस्तारित दूरी के संस्करण को सफलतापूर्वक प्रक्षेपित किया। विमान से प्रक्षेपण योजना के अनुसार था और मिसाइल ने बंगाल की खाड़ी में निर्दिष्ट लक्ष्य पर सीधा निशाना लगाया। यह एसयू-30 एमकेआई विमान से ब्रह्मोस मिसाइल के विस्तारित दूरी के संस्करण का पहला प्रक्षेपण था। इसके साथ, भारतीय वायु सेना ने बहुत अधिक लंबी दूरी पर ज़मीन / समुद्र में लक्ष्य के खिलाफ एसयू-30 एमकेआई लड़ाकू विमान से सटीक निशाना लगाने की क्षमता प्राप्त कर ली है।

भारतीय वायु सेना, भारतीय नौसेना, रक्षा अनुसंधान और विकास संगठन-डीआरडीओ, ब्रह्मोस एयरोस्पेस प्राइवेट लिमिटेड-बीएपीएल और हिंदुस्तान एयरोनॉटिक्स लिमिटेड-एचएएल के समर्पित तथा सहक्रियात्मक प्रयासों ने इस उपलब्धि को हासिल करने के लिए राष्ट्र की क्षमता को साबित किया है। एसयू-30 एमकेआई लड़ाकू विमान के उच्च प्रदर्शन के साथ संयोजित मिसाइल की विस्तारित दूरी की क्षमता भारतीय वायु सेना को एक रणनीतिक पहुंच और भविष्य के युद्ध क्षेत्रों में प्रभाव बनाने की क्षमता प्रदान करेगी।

https://pib.gov.in/PressReleasePage.aspx?PRID=1824847

Thu, 12 May 2022

India successfully test-fires extended range version of BrahMos supersonic Cruise Missile

India successfully test-fired an extended-range version of the BrahMos supersonic cruise missile from a Sukhoi fighter jet in the Bay of Bengal on Thursday, in a boost to the country's strategic strike capability, reported news agency PTI. In a statement, the Defence Ministry said that it was the first launch of the extended range version of the BrahMos missile from a Su-30MKI aircraft. It was reported that the range of the advanced version of the missile has been extended to around 350 km from the original 290 km.

"The launch from the aircraft was as planned and the missile achieved a direct hit on the designated target in the Bay of Bengal region," the ministry said in a statement. The statement further said that the extended-range capability of the missile along with the high performance of the Su-30MKI aircraft gives the Indian Air Force a strategic reach and allows it to dominate future battlefields. "With this (test-firing), the IAF has achieved the capability to carry out precision strikes from Su-30MKI aircraft against a land/ sea target over very long ranges," the ministry said.

The Indian Air Force, the Navy, the Defence Research and Development Organisation (DRDO), the Hindustan Aeronautics Limited (HAL) and the BrahMos Aerospace Private Limited (BAPL) were involved in the test firing. "The dedicated and synergetic efforts of the IAF, Indian Navy, DRDO, BAPL and HAL have proven the capability of the nation to achieve this feat," the ministry said. BrahMos Aerospace Pvt Ltd is an India-Russian joint venture that produces supersonic cruise missiles that can be launched from submarines, ships, aircraft, or land platforms. BrahMos missile flies at a speed of 2.8 Mach or almost three times the speed of sound. Earlier this year in April, the Indian Air Force had successfully test-fired a BrahMos supersonic cruise missile from a Sukhoi fighter jet on the eastern seaboard.

https://news.abplive.com/news/india/india-successfully-test-fires-extended-range-version-of-brahmos-supersonic-cruise-missile-1531313

THE ECONOMIC TIMES

Thu, 12 May 2022

India successfully test-fires extended-range version of BrahMos missile from Sukhoi

India on Thursday successfully test-fired an extended range version of the BrahMos supersonic cruise missile from a Sukhoi fighter jet, in a boost to the country's strategic strike capability. It was the first launch of the extended range version of the BrahMos missile from a Su-30MKI

aircraft and the weapon hit the designated target in the Bay of Bengal, the defence ministry said. The range of the advanced version of the missile is learnt to have been extended to over 350 km from the original 290 km. The ministry said the extended-range version of the missile coupled with the high performance of the Su-30MKI aircraft gives the Indian Air Force a "strategic reach" and allows it to dominate the "future battlefields".

"The launch from the aircraft was as planned and the missile achieved a direct hit on the designated target in the Bay of Bengal region," the ministry said in a statement. “It was the first launch of the extended range version of BrahMos from Su-30MKI aircraft. With this, the IAF has achieved the capability to carry out precision strikes from Su-30MKI aircraft against a land/ sea target over very long ranges," the ministry said. BrahMos Aerospace Pvt Ltd, an India-Russian joint venture, produces supersonic cruise missiles that can be launched from submarines, ships, aircraft, or land platforms.

BrahMos missile flies at a speed of 2.8 Mach or almost three times the speed of sound. Last month, the Indian Air Force successfully test-fired a BrahMos supersonic cruise missile from a Sukhoi fighter jet on the Eastern seaboard. An anti-ship version of the BrahMos supersonic cruise missile was successfully test-fired jointly by the Indian Navy and the Andaman and Nicobar Command on April 27. India is also exporting the BrahMos missiles. In January, India sealed a USD 375 million deal with the Philippines for supplying three batteries of the missile.

https://economictimes.indiatimes.com/news/defence/india-test-fires-extended-range-version-of-brahmos-missile/articleshow/91521029.cms?from=mdr

The Indian EXPRESS

Wed, 11 May 2022

Visakhapatnam: Naval Science and Technological Laboratory observes National Technology Day

The Naval Science and Technological Laboratory (NTSL) in Visakhapatnam observed the National Technology Day by organising a talk on “Integrated approach in science and technology for a sustainable future” Wednesday. National Technology Day is observed on May 11 every year, to commemorate the successful nuclear test, Operation Shakti (Pokhran-II) conducted on May 11, 1998 in Pokhran, Rajasthan. On this occasion and in commemoration of Azadi Ka Amrit Mahotsav, the Naval Science and Technological Laboratory (NSTL), the premier naval research laboratory of Defence Research and Development Organisation (DRDO), Visakhapatnam organized a programme at Mohapatra Manasi Auditorium.

Dr Samir V Kamat, Distinguished Scientist and Director General (Naval Systems and Materials) delivered the talk. During his address, Dr Kamat asked the NSTL community to keep pace with state-of-the-art technologies and utilize them to the extent possible. He told the audience that in line with this idea, the DRDO has already established 10 Centres of Excellence in various academic institutes with participation of industry. He concluded his speech with the confidence that NSTL can face critical challenges in the existing geo-political scenario and play a crucial role in developing underwater warfare systems for the Indian Navy.

On this occasion, Titanium Medal and Director's Commendation Certificate was presented to Sunny Verma, Scientist 'D', for his oration on "A Monte Carlo based simulation scheme for failure studies of parachute assisted air drop of AUVs". Senior scientists PVS Ganesh Kumar, BVSS Krishna Kumar and Dr A Srinivas Kumar, among others, participated in the programme.

https://indianexpress.com/article/cities/hyderabad/visakhapatnam-naval-science-and-technological-laboratory-observes-national-technology-day-7912259/

DRDO On Twitter

Defence News

Defence Strategic: National/International

Press Information Bureau
Government of India

Ministry of Defence

Thu, 12 May 2022 5:18 PM

Indian Naval Placement agency and L&T sign MoU to explore opportunities for resettlement of Navy ex-servicemen

The Indian Naval Placement Agency (INPA) and L&T Shipbuilding (LTSB), L&T's shipbuilding arm, today signed an MoU to explore opportunities for the recruitment of naval Ex-Servicemen at LTSB. VAdm Suraj Berry, Controller of Personnel Services, Indian Navy and Mr Ashok Kumar Khetan, Head Shipbuilding Business L&T signed the MoU in the presence of Senior Officials from the Indian Navy and L&T. Through the MoU, INPA will identify a pool of technical Ex-Servicemen for relevant roles as per recruitment standards of L&T. The company will, in turn, enable these individuals to transition to the corporate sector through in-house assimilation and training programs.

Commenting on this occasion, Mr Jayant D Patil, Whole Time Director (Defence & Smart Technologies) and Member of L&T Board said, "We have been trusted partner to Naval indigenisation plans since the mid-eighties having designed and developed a bouquet of Weapon Systems, Engineering Equipment and Systems, range of Control systems such as IPMS, IBS, APMS, etc., and Life Support and Logistics systems. We are delighted to formalize our partnership with the Navy through the signing of this MOU with INPA. This would ease and facilitate the recruitment of some of the most experienced Navy professionals into L&T and enable L&T to serve the Navy better through a mutually beneficial relationship.

L&T under the aegis of its diversity inclusion initiative aims to offer ex-servicemen with a technical background, opportunities in line with their qualifications, experience and attributes acquired during their service period. This diverse set of experiences, perspectives and background are crucial to the innovation and development of new ideas. This initiative of LTSB stems from the company's vision of breaking new grounds to allow diversity and inclusion to take deeper roots across all its verticals. In his concluding remarks, Vice Admiral Suraj Berry said that "The INPA is committed to facilitating Ex-Servicemen, to find employment opportunities after their service to our Nation". He further stated that it was the endeavour of IN to work with the corporate sector to identify and develop programs that enable experienced

personnel to contribute to nation-building and become truly AatmaNirbhar in all sectors. We look forward to working with LTSB on this initiative".

https://pib.gov.in/PressReleasePage.aspx?PRID=1824784

INDIA TODAY

Thu, 12 May 2022

Rajnath Singh approves revised 'Scales of Accommodation' for armed forces

Defence minister Rajnath Singh approved the revised 'Scales of Accommodation 2022' (SoA) for defence services on Thursday. This will ensure contemporary specifications in future projects and better standards of living for the personnel of the armed forces. According to the defence ministry, the implementation of the revised scales of accommodation would facilitate improvement in facilities and infrastructure for the armed forces personnel. It will ensure better working and living conditions for defence personnel, including defence civilians. The new provision will provide amenities in all public buildings for persons with disabilities after ensuring gender commonality in all specifications.

The Scales of Accommodation (SoA) defines the authorisation for the construction of facilities for operational, functional, training, administrative, living and recreation facilities for defence services. These scales are applicable to all three defence services and the Indian Coast Guard. The previous SoA was approved by the government in October 2009.

The revision of the scales of accommodation will enhance infrastructure development, enable the usage of modern technology, give more flexibility to the executives and cater to users' aspirations. The enhanced scales will also be in line with the government programmes like Swachh Bharat, Sugamya Bharat and Digital India, which focus on sustainable development, renewable energy and reduction of carbon footprint. Rajnath Singh congratulated all the defence services and urged the Military Engineer Services (MES) to continue its contribution towards nation building by providing better infrastructure services to the armed forces. The MES is a construction agency which provides rear line engineering support to the armed forces and associated organisations of the Ministry of Defence (MoD).

https://www.indiatoday.in/defence/story/rajnath-singh-approves-revised-scale-of-accomodation-indian-armed-forces-1948811-2022-05-12

Hindustan Times

Fri, 13 May 2022

New ‘Scales of Accommodation’ for Defence personnel approved by Rajnath Singh

Armed forces personnel can look forward to contemporary and sustainable living and work spaces with green building standards, including energy efficiency, water conservation and handling waste, improved structural design, maintenance and fire safety, smart metering and multi-level parking; with defence minister Rajnath Singh on Thursday approving the much-needed revised “scales of accommodation 2022” for the defence services. “This will ensure contemporary specifications in future projects and better standards of living for the personnel of the armed forces. The revision of scales of accommodation (SoA) will enhance infrastructure development, enable usage of modern technology, give more flexibility and cater for users’ aspirations,” the defence ministry said.

The previous SoA was approved by the government in October 2009. SoA defines the authorisation for construction facilities for operational, functional, training, administrative, living and recreation facilities for the defence services.

The major changes in SoA will for the first time include car garages for junior commissioned officers (75%) and other ranks (50%). So far, only officers were authorised car garages, while JCOs and ORs were entitled only to scooter garages, officials said. Another change is 10% increase in plinth area of single accommodation for officers, JCOs and ORs, they added. There was an urgent need for revision of SoA with the induction of new units, technological facilities and equipment profile, requirements of operational readiness, increased threat perception, concept of sustainable development including contemporary industry standards and enhanced aspirations of users for improved living standards, defence ministry officials said.

“The revision was long overdue. The new guidelines on SoA run into hundreds of pages. They cover everything from residential buildings, offices and schools to weapon holding structures, underground facilities and infrastructure in forward areas,” said a senior official, asking not to be named. The revision of SoA is in line with the government’s programmes like Swachh Bharat, Sugamya Bharat and Digital India as well as the green building movement and initiatives for sustainable development, renewable energy and reduction of carbon footprint, the defence ministry said. “Optimisation of defence land usage by using multi-storeyed construction and austerity measures by combining of common facilities has been emphasised. Amenities in all public buildings for persons with disabilities have been introduced and gender commonality in all specifications has been ensured,” it said.

The government’s Military Engineer Services (MES) is responsible for providing infrastructure to the defence services, and is an important part of the Corps of Engineers. Singh asked MES to continue its contribution towards nation building by providing better infrastructure services to the armed forces. The construction and maintenance agency of the armed forces has an annual budget of around Rs.13,000 crore. Two years ago, the defence minister announced the abolition of over 9,300 posts in MES. The abolition of the posts was one of the outcomes of the

recommendations made by the Lieutenant General DB Shekatkar committee report on enhancing the army's combat potential and trimming its expenditure.

https://www.hindustantimes.com/india-news/new-scales-of-accommodation-for-defence-personnel-approved-101652380857926.html

THE ECONOMIC TIMES

Thu, 12 May 2022

Army Chief Gen Manoj Pande begins 3-day visit to Ladakh region; reviews security scenario along LAC

Army Chief Gen Manoj Pande on Thursday carried out a comprehensive review of India's military preparedness along the Line of Actual Control (LAC) in eastern Ladakh as he began his first visit to the strategically key region nearly two weeks after taking the reins of the Indian Army. On the first day of his three-day visit, senior commanders briefed Gen Pande at the headquarters of the Fire and Fury Corps in Leh about the overall security situation in eastern Ladakh where Indian and Chinese troops are locked in a standoff at a number of friction points for over two years.

It is Gen Pande's first visit outside Delhi after taking charge as the Army Chief on April 30. "The Army Chief was briefed on the security situation along the borders with special focus on Eastern Ladakh. The high level of operational readiness being maintained by the forces while maintaining a high tempo of capability development was highlighted," the Army said in a statement. Later, Gen Pande, accompanied by General Officer Commanding-in-Chief of the Northern Command Lt Gen Upendra Dwivedi and Lt Gen A Sengupta, General Officer Commanding of the Fire and Fury Corps, called on Lt Governor RK Mathur.

"This was followed by a detailed discussion on issues related to civil-military cooperation and the role of Indian Army in developmental activities in the Union Territory of Ladakh," the Army said. It said Gen Pande will visit forward areas in eastern Ladakh and interact with troops deployed along the LAC in the most difficult and inhospitable terrain. The Fire and Fury Corps is responsible for guarding the Line of Actual Control (LAC) with China in the Ladakh region. The Fire and Fury Corps is responsible for guarding the Line of Actual Control (LAC) with China in the Ladakh region. Gen Pande's visit to Ladakh came three days after he said China's intention has been to keep "alive" the overall boundary question with India though it remains the "basic" issue between the two countries.

While referring to the eastern Ladakh border row, the Army Chief had said the Indian Army's aim is to re-establish the "trust and tranquillity" between the two sides but asserted that "it cannot be a one-way affair." He also asserted that the Indian Army's aim was to restore the status quo ante prior to April 2020 in eastern Ladakh. The eastern Ladakh faceoff began on May 4-5 in 2022. India has been insisting on the restoration of the status quo ante prior to the standoff. India and China have held 15 rounds of military talks so far to resolve the eastern Ladakh row. As a result of the talks, the two sides completed the disengagement process last year on the north and south banks of the Pangong lake and in the Gogra area. India has been consistently maintaining

that peace and tranquillity along the LAC were key for the overall development of the bilateral ties. Each side currently has around 50,000 to 60,000 troops along the LAC in the sensitive sector.

https://economictimes.indiatimes.com/news/defence/army-chief-gen-manoj-pande-begins-3-day-visit-to-ladakh-region-reviews-security-scenario-along-lac/articleshow/91524907.cms?from=mdr

THE ECONOMIC TIMES

Thu, 12 May 2022

Indian Army to buy 12 more Made-in-India 'Swathi' weapon-locating radars for China border

In a major boost for the Indian Army on the China front, the force has put up a proposal to the defence ministry for buying 12 Swathi weapon-locating radars developed by the Defence Research and Development Organisation (DRDO). The Indian Army has initiated this proposal worth around Rs 1,000 crore Swathi WLRs and it is planned to be put for consideration by a high-level Defence Ministry meeting, government sources told ANI. The weapon-locating radars developed by the DRDO and built by Bharat Electronics Limited had achieved major success and were supplied to Armenia as well.

Swathi weapon-locating radars provide fast, automatic, and accurate location of enemy weapons like mortars, shells and rockets within 50-kilometre range. The radars can simultaneously detect multiple projectiles fired from different weapons at different locations. The Indian Army has been using the radars for its operations along the Line of Control in Jammu and Kashmir. The system was given for trial in the Army in 2018. New Indian Army chief General Manoj Pande is a major supporter of indigenisation and orders for many types of equipment like self-propelled artillery guns are likely to go to Indian vendors only. A major push is also expected in small arms also as the planned orders for foreign assault rifles are now going to be given to Indian vendors who have made significant developments in this field.

https://economictimes.indiatimes.com/news/defence/indian-army-to-buy-12-more-made-in-india-swathi-weapon-locating-radars-for-china-border/articleshow/91517989.cms?from=mdr

DefenseNews

Fri, 13 May 2022

Finland’s top leaders press for rapid NATO membership

Nordic governments have set about deepening regional defense cooperation against the backdrop of the very real expectation that non-aligned Sweden and Finland will announce their decisions to join NATO as soon as May 16. Finland’s President Sauli Niinistö and Prime Minister Sanna Marin issued a joint announcement on Thursday backing NATO membership. “Now that the

moment of decision-making is near, we state our shared views. We believe NATO membership would strengthen Finland's security," the leaders said in a statement.

"As a member of NATO, Finland would strengthen the entire defense alliance. Finland must apply for NATO membership without delay. We hope that the steps at a national level that are still needed to make this decision possible will be taken rapidly over coming days," the joint statement continued. The joint statement by Finnish leaders, which is endorsed by the leaders of Finland's main parties in the Eduskunta, the country's national parliament, can be expected to have an influential impact on Sweden's own decision-making process regarding NATO membership, said Ann Linde, Sweden's Foreign Minister.

"The Prime Minister and President of Finland have sent a clear message. We have had close cooperation throughout the process on every level with Finland. I am clear about the position Sweden will take, even though I cannot reveal that position right now," Linde said. The decision-making process for Sweden and Finland has gained momentum in recent days as increased support emerges from major NATO states, such as the United States, France, Germany and Britain, urging the two Nordic states to join the alliance. That support was evident on May 11 when British Prime Minister Boris Johnson visited Stockholm and Helsinki to sign bilateral Joint Security Declarations (JSDs) with Sweden and Finland.

The JSDs are regarded as important, if somewhat symbolic, by Sweden and Finland given that they stand as political declarations and are not legally binding commitments under international law. Neither of the pacts require parliamentary approval. Johnson's presence in the two Nordic states came at the same time as a joint statement from Nordic defense ministers, including NATO members Denmark and Norway. The Nordic defense ministers promised new and concrete measures to bolster pan-Nordic defense collaboration, military readiness and more frequent joint exercises. "Our ability to cooperate during peacetime is a foundation for our ability to act during crisis and conflict. We are in the process of deepening our operational cooperation that will enable us to improve our interoperability, deterrence and territorial defense," the statement said. Britain's JSD with Sweden and Finland states that future cooperation with both countries, in the event of a potential future crisis, would include a broad range of assistance that "may also include military means."

However, the document makes it clear that the bilateral declaration is "intended to complement and not replace existing European and Euro-Atlantic cooperation" with Finland and Sweden. Finland's decision-making process on NATO membership is being informed by 10 separate parliamentary committees. These committees are primed to submit their opinions on NATO membership to the Government's Foreign Affairs Committee by May 15. The Finnish national parliament's Defense Committee has already declared in favor of NATO membership, describing the move as "offering the best solution for Finland's long-term security, a security protected by Article 5."

This view of regional security is shared by Peter Hultqvist, Sweden's Defense Minister, who believes that having all Nordic states in NATO would enhance the joint military capabilities of Nordic countries and better serve peace and stability in the neighboring High North and Baltic Sea regions. "Being members of NATO, Sweden and Finland would benefit from joint defense planning within the framework of NATO. Membership would offer a completely different strategic depth. We could utilize each other's strengths and advantages and complement each

other fully while conducting operational planning that would make us stronger. These are some of the benefits of NATO membership if we decide to join," said Hultqvist.

https://www.defensenews.com/global/europe/2022/05/12/finlands-top-leaders-press-for-rapid-nato-membership/

Science & Technology News

Thu, 12 May 2022

Quantum one-way street in topological insulator Nanowires

Very thin wires made of a topological insulator could enable highly stable qubits, the building blocks of future quantum computers. Scientists see a new result in topological insulator devices as an important step towards realizing the technology's potential. An international group of scientists have demonstrated that wires more than 100 times thinner than a human hair can act like a quantum one-way street for electrons when made of a peculiar material known as a topological insulator. The discovery opens the pathway for new technological applications of devices made from topological insulators and demonstrates a significant step on the road to achieving so-called topological qubits, which it has been predicted can robustly encode information for a quantum computer.

To achieve this result, the groups of Professor Dr. Jelena Klinovaja and Professor Dr. Daniel Loss at the University of Basel closely collaborated with experimental physicists at the University of Cologne in the group of Professor Dr. Yoichi Ando. Their study has now been published in *Nature Nanotechnology*. Topological insulators are materials in which a combination of quantum mechanics and the mathematical concept of topology produce conductive surfaces and insulating interiors. Topological insulators are highly promising candidates for future technologies and as potential platforms for quantum computing. The researchers were able to show that, under the right circumstances, electric currents can flow more easily in one direction compared to the other, a process known as rectification. Rectification offers a wide range of applications and forms the basis of most wireless technologies.

Rectifiers found in smartphones, for example, are now made of semiconductor diodes. However, the current rectification effect discovered in topological insulator nanowires arises as a result of quantum mechanics and is extremely controllable. Usually, quantum rectification effects arise as a result of something known as spin-orbit coupling, which is a mix of quantum mechanics and Einstein's theory of relativity. As one might expect, that strange mix normally results in tiny rectification effects. "What's great about the topological insulator nanowires is that we can artificially produce essentially the same physics but with a much larger magnitude," says Dr. Henry Legg, Georg H. Endress postdoctoral fellow at the University of Basel and first author of

the paper. "This leads to a rectification effect that's really huge compared to other materials. It's also one of the aspects that makes topological insulators so exciting for applications in quantum computing."

Beyond Ohm's law

Ohm's law states that the current flowing through a device is governed by the voltage drop across it and a quantity known as resistance. However, when quantum mechanics is at play, Ohm's law sometimes needs to be corrected. In particular, if a material or a device does not look the same when all its spatial properties are mirrored—so-called broken spatial inversion symmetry—applying a magnetic field means the quantum version of Ohm's law allows current to flow more easily in one direction compared to the other. The size of the current rectification is determined by the difference between the resistances in each direction.

The high degree of control possible in topological insulator devices allowed the team of researchers to achieve a truly gigantic rectification effect compared to what had previously been observed.

Robust quantum information

Quantum computers promise unprecedented computing power, but are very susceptible to the influence of the external environment. One proposed solution to the fragility of quantum units of information—so-called qubits—are topological qubits, which it is predicted will be far more stable against the influences of the external environment. This protection also arises as a result of the mathematics of topology that underlies the properties of topological insulators. Topological insulators have long been considered as good candidates to be the basis for topological quantum computers. However, good control over topological insulator devices is essential to be able to produce topological qubits.

"Our study not only discovered a unique and very large quantum effect, but it also shows that we have an excellent degree of understanding what is happening in these systems. It seems like all the key properties of topological insulators are there to move forward on the path to making topological qubits," says Professor Dr. Jelena Klinovaja from the University of Basel.

https://phys.org/news/2022-05-quantum-one-way-street-topological-insulator.html

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Astronomers map the movement of white dwarfs of the Milky Way

White dwarfs were once normal stars similar to the Sun but then collapsed after exhausting all their fuel. Historically, these interstellar remnants have been difficult to study. A recent study from astronomers at Sweden’s Lund University, however, reveals new information about the movement patterns of these perplexing stars. White dwarfs have a radius of about 1 percent that

of the Sun's. They have roughly the same mass, which means they have an astonishing density of about 1,000 kg (2,200 pounds) per cubic centimeter. After billions of years, white dwarfs will cool down to a point where they no longer emit visible light, and transform into so-called black dwarfs.

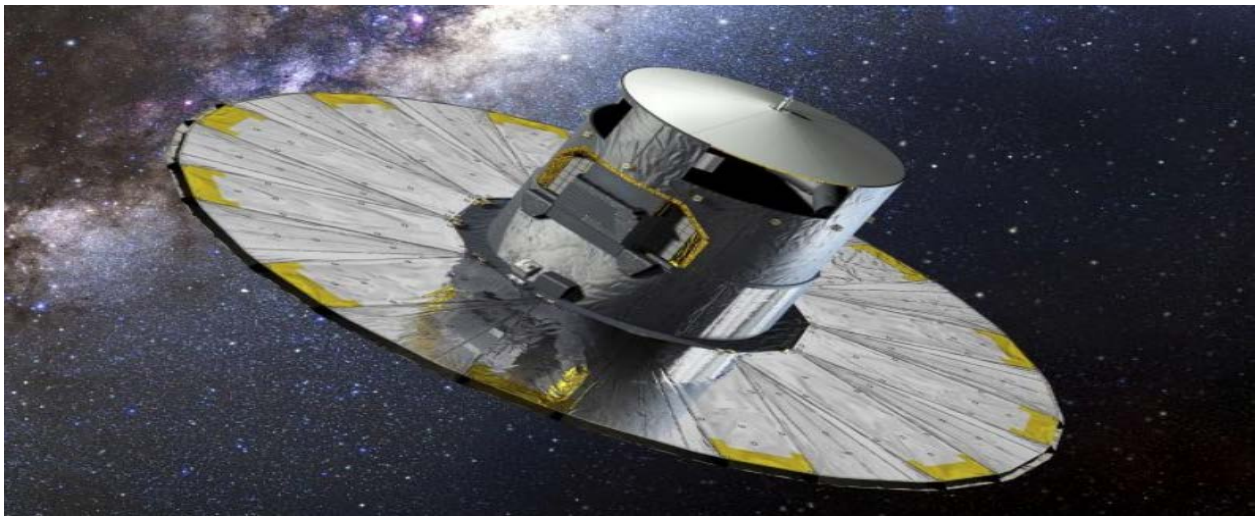

Illustration of Gaia with the Milky Way in the background. Gaia is an ambitious mission to chart a three-dimensional map of our Galaxy, the Milky Way, in the process revealing the composition, formation and evolution of the Galaxy. Credit: ESA–D. Ducros, 2013

40 Eridani A was the first white dwarf discovered. It is a bright celestial body 16.2 light-years away from Earth, surrounded by a binary system consisting of the white dwarf 40 Eridani B and the red dwarf 40 Eridani C. Ever since it was discovered in 1783, astronomers have tried to learn more about white dwarfs in order to gain a deeper understanding of the evolutionary history of our home galaxy. In a study published in the journal *Monthly Notices of the Royal Astronomical Society*, a research team can present new findings of how the collapsed stars move. "Thanks to observations from the Gaia space telescope, we have for the first time managed to reveal the three-dimensional velocity distribution for the largest catalog of white dwarfs to date. This gives us a detailed picture of their velocity structure with unparalleled detail," says Daniel Mikkola, doctoral student in astronomy at Lund University.

Thanks to Gaia, researchers have measured positions and velocities for about 1.5 billion stars. But only recently have they been able to completely focus on the white dwarfs in the Solar neighborhood. "We have managed to map the white dwarfs' velocities and movement patterns. Gaia revealed that there are two parallel sequences of white dwarfs when looking at their temperature and brightness. If we study these separately, we can see that they move in different ways, probably as a consequence of them having different masses and lifetimes," says Daniel Mikkola. The results can be used to develop new simulations and models to continue to map the history and development of the Milky Way. Through an increased knowledge of the white dwarfs, the researchers hope to be able to straighten out a number of question marks surrounding the birth of the Milky Way.

https://scitechdaily.com/astronomers-map-the-movement-of-white-dwarfs-of-the-milky-way/amp/

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Thu, 12 May 2022

Massive eruption of Tongan volcano provides an explosion of data on atmospheric waves

The Hunga volcano ushered in 2022 with a bang, devastating the island nation of Tonga and sending aid agencies, and Earth scientists, into a flurry of activity. It had been nearly 140 years since an eruption of this scale shook the Earth. UC Santa Barbara's Robin Matoza led a team of 76 scientists, from 17 nations, to characterize the eruption's atmospheric waves, the strongest recorded from a volcano since the 1883 Krakatau eruption. The team's work, compiled in an unusually short amount of time, details the size of the waves originating from the eruption, which the authors found were on par with those from Krakatau. The data also provides exceptional resolution of the evolving wavefield compared to what was available from the historic event. The paper, published in the journal *Science*, is the first comprehensive account of the eruption's atmospheric waves.

Early evidence suggests that an eruption Jan. 14 sunk the volcano's main vent below sea level, priming the massive explosion the following day. The Jan. 15 eruption generated a variety of different atmospheric waves, including booms heard 6,200 miles away in Alaska. It also created a pulse that caused the unusual occurrence of a tsunami-like disturbance an hour before the actual seismically driven tsunami began. "This atmospheric waves event was unprecedented in the modern geophysical record," said lead author Matoza, an associate professor at UC Santa Barbara's Department of Earth Science. The Hunga volcanic eruption has provided unprecedented insight into the behavior of a variety of atmospheric wave types. "The atmospheric waves were recorded globally across a wide frequency band," said co-author David Fee at the University of Alaska Fairbanks Geophysical Institute. "And by studying this remarkable dataset we will better understand acoustic and atmospheric wave generation, propagation and recording.

"This has implications for monitoring nuclear explosions, volcanoes, earthquakes and a variety of other phenomena," Fee continued. "Our hope is that we will be better able to monitor volcanic eruptions and tsunamis by understanding the atmospheric waves from this eruption." The researchers were most interested in the behavior of an atmospheric wave known as a Lamb wave, which is the dominant pressure wave produced by the eruption. These are longitudinal pressure waves, much like sound waves, but of particularly low frequency. Such low frequency, in fact, that the effects of gravity must be taken into account. Lamb waves are associated with the largest atmospheric explosions, such as large eruptions and nuclear detonations, though the wave characteristics differ between these two sources. They can last from minutes to several hours. After the eruption, the waves traveled along Earth's surface and circled the planet in one direction four times and in the opposite direction three times, the authors recorded. This was the same as scientists observed in the 1883 Krakatau eruption. The Lamb wave also reached into Earth's ionosphere, rising at 700 mph to an altitude of about 280 miles.

"Lamb waves are rare. We have very few high-quality observations of them," Fee said. "By understanding the Lamb wave, we can better understand the source and eruption. It is linked to the tsunami and volcanic plume generation and is also likely related to the higher-frequency infrasound and acoustic waves from the eruption."

The Lamb wave consisted of at least two pulses near the volcano. The first had a 7- to 10-minute pressure increase followed by a second and larger compression and subsequent long pressure decrease. A major difference between the accounts of Hunga's Lamb waves versus Krakatau's is the amount and quality of data scientists were able to gather. "We have more than a century of advances in instrumentation technology and global sensor density," Matoza said. "So the 2022 Hunga event provided an unparalleled global dataset for an explosion event of this size." Scientists noted other findings about atmospheric waves associated with the eruption, including remarkable long-range infrasound—sounds too low in frequency to be heard by humans. Infrasound arrived after the Lamb wave and was followed by audible sounds in some regions.

Audible sounds reached Alaska, about 6,200 miles from the volcano, where they were heard around the state as repeated booms. "I heard the sounds," Fee recalled, "but at the time definitely did not think it was from a volcanic eruption in the South Pacific." The scientists believe the sounds heard in Alaska couldn't have originated in Hunga. While there's still much to learn, it's clear that standard sound models cannot explain how audible sounds propagated over such extreme distances. "We interpreted that they were generated somewhere along the path by nonlinear effects," Matoza explained. "There is a long list of possible follow-up studies examining the many different aspects of these signals in more detail," he said. "As a community, we will be working further on this event for years."

https://phys.org/news/2022-05-massive-eruption-tongan-volcano-explosion.html

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