

समाचार पत्रों से चयित अंश Newspapers Clippings

दैनिक सामयिक अभिज्ञता सेवा

A Daily Current Awareness Service



रक्षा विज्ञान पुस्तकालय
Defence Science Library
रक्षा वैज्ञानिक सूचना एवं प्रलेखन केन्द्र
Defence Scientific Information & Documentation Centre
मेटकॉफ हाऊस, दिल्ली 110054
Metcalf House, Delhi-110054

Mon, 22 May, 2017
(Online)

A Nano-satellite developed by university students! Yes you read that right

PSA university students, with the help of the DRDO develop a new satellite that is expected to start functioning by the end of this year

After having launched their first satellite successfully last year, PES University students are all set to develop another. RSAT, a nano size satellite is all set to be functional by the end of next year.

A group of over 50 students mentored by experts in the field have begun working on developing the project for the Defence Research and Development Organisation (DRDO).

Students here have a lot to cheer. For, not only is this a great learning experience but also adds value to their resume. College authorities explain that students who are keen on pursuing a career in the field get hands-on experience in the college. From students in the fourth semester to the alumni, several of them have been roped in for the project. The project is providing ground for students from across the engineering specialities to work. RSAT is a 3 axis stabilised agile nanosatellite that weighs 10 kilos and measures 300mm x 300 mm x 300mm. Built with deployable solar panels that generate 45 watts solar power. This will be the first satellite to be built in a state-of-the-art clean room that was inaugurated in the college a week ago. The clean room provides an atmosphere where temperature, RH and particle counts are controlled.

Dr V Sambasvia Rao, professor, Electronics and Communication Engineering says that the college has received a funding of close to 2.2 crores for the project besides which the DRDO would be providing them other equipment. Dr Rao explains that the satellite would help gather information from ships, supervise their movements and also help manage traffic flow into harbours, hence avoiding accidental collisions.

At present, the Vessels are being mostly monitored based on an Automatic Identification System. Information gathered through this is based on signals received by the antenna and hence depend on its height. Dr Rao explains that such limitations could be avoided with the launch of the satellite.

At present, the country is paying several other companies that are based out of India to avail the data. "We will need six to eight such satellites to monitor traffic at sea across the world. This indigenous satellite that we are designing will make the Navy independent on other companies to acquire data," says Rao. India is paying two cents for every message and the system receives no less than 4,000 messages a minute. The University had initially proposed the project to the Naval Research Board and the first phase of the project was nearing the completion phase while the DRDO offered to fund the project themselves according to Dr Rao.



Wed, 24 May, 2017

PM to talk defence, FTA in Germany

By Simran Sodhi

Prime Minister Narendra Modi will travel to Germany next week for the biannual inter-governmental consultancies (IGC). While a vast array of bilateral and global issues are likely to come up for discussion between Modi and German Chancellor Angela Merkel, the two topics that are likely to receive the most attention are increased cooperation in the defence sector and Germany's pitch for resuming negotiations for an EU-India free trade agreement (FTA).

At a press meet ahead of the PM's visit, German envoy to India Martin Ney today said Germany was ready to conclude a government-to-government (G2G) agreement with India in defence procurement, adding that it would be discussed by the two sides.

The German envoy also made a strong pitch for restarting negotiations on the India-EU FTA. In a detailed response, the envoy said following the expiry of the India-Germany bilateral investment protection treaties (BITs) in March, that while existing investments from India in Germany or vice-versa will be protected for the next 15 years under the old set of rules, all new investments will not have any protection until a new treaty is signed. Germany is among the countries with which India has terminated BITs following a new BIT model New Delhi released in December 2015.

Modi and Merkel will head the fourth round of IGC on May 29-30 in Berlin.



Wed, 24 May, 2017

Sukhoi jet with 2 pilots goes missing in Assam

A Sukhoi-30 MKI fighter jet of the Indian Air Force with two pilots on board went missing at 11 am today. The jet had taken off from Tezpur in Assam at 10:30 am on a routine training mission. It lost radar and radio contact approximately 60 kilometres north-west of Tezpur (that is towards Arunachal Pradesh).

“The aircraft, which got airborne from the Tezpur airbase today morning was part of a two-aircraft formation”, an IAF spokesperson said. The other plane has landed back. “The aircraft was declared overdue and search and rescue operations have been activated to locate it and the pilots,” the IAF said.

The Sukhoi, a twin-engined aircraft, is of Russian origin. It is considered a stable aircraft. Since their induction in the late Nineties, six crashes have occurred with an inquiry into the plane accidents primarily indicating technical failure as the cause.

Meanwhile, Sonitpur Deputy Commissioner Manoj Kumar Deka told mediapersons that a search was on for the missing aircraft. He said all sub-divisions in his district and officials in Biswanath district, bordering Arunachal Pradesh, as well as village headmen had been alerted.



Wed, 24 May, 2017

Army destroys Pak bunkers across LoC in `punitive strikes`

By Rajat Pandit

Releases Video Showing Posts Being Blown Up

India has cranked up military pressure along the 778-km Line of Control with “punitive fire assaults” against Pakistan army posts and terror launch pads, which have become fiercer after the beheading of two Indian soldiers in the Krishna Ghati sector on May 1.

A short video clip of one such assault with weapons being used in “direct firing mode” in Nowshera sector on May 9, which ostensibly shows some forward observation posts of the Pakistan army being blown up across the LoC, was released by the Army's additional director-general of public information, Major General A K Narula. FULL COVERAGE: P 14 Govt on alert against stone-pelters during Amarnath yatra, P 14 Top LeT man trapped? P 14 The Army said on Tuesday that targeted fire assaults, with light field guns, anti-tank guided missiles, heavy mortars, rocket launchers and “infantry tanks”, are being conducted to “proactively dominate” the LOC and “destroy locations aiding infiltration of terrorists” as part of the overall counter-terrorism strategy .

Defence minister Arun Jait ley, on his part, said the government fully supported the Army's "actions across the LOC" for ensuring peace in J&K. "Indian Army is taking preemptive and measured actions to counter terrorism in the Valley and disengage Pakistan posts across the LOC which support infiltration," he added.



The Pakistan military spokesperson, Maj Gen Asif Ghafoor, however, dubbed the "Indian claims" as "false". He, too, late in the night released video footage of what he said were Indian posts being destroyed in Nowshera sector on May 13 in a "befitting response".

But it was brushed aside by the Indian security establishment. "There have been casualties in our bunker-busting assaults across the border, though it's tough to assess the extent of damage. If the Pakistan army and ISI have stepped up efforts to fuel trouble in the Kashmir Valley, we have decided to keep them hopping on the LOC. Pakistan army, of course, is adept at hiding its casualties," a top Army officer told TOI.

The Army's cross-border fire assaults and their public declarations, much like the "surgical strikes" of last September, are being seen as part of the unfolding Modi-

Doval doctrine of "offensive-defence" in dealing with Pakistan. There is, of course, also the need to burnish the government's tough-on-terror stance and assuage domestic sensitivities.

Pakistan is not keeping quiet, although its attention is slightly divided between its western and eastern borders. Apart from trying to push in as many militants as possible with the snow melting on mountain passes, as was seen during the killing of four terrorists in a major infiltration bid in the Naugam sector on Saturday, the Pakistan army is also targeting Indian posts located below their positions at different places along the LOC.

THE ECONOMIC TIMES

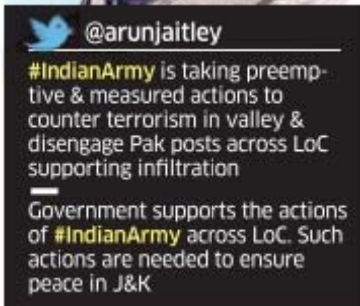
Wed, 24 May, 2017

Army Strikes across LoC Again to Stop Infiltration in J&K

By Manu Pubby

Action came days after two soldiers were beheaded by Pakistani forces

The Indian Army said on Tuesday it launched "fire assaults" across the Line of Control (LoC), specifically targeting Pakistan Army posts aiding infiltration into Jammu and Kashmir and ratcheting up the pressure on its neighbour.



The Army went on to release a rare video of one such assault on May 9, a standoff attack from the Indian side of the boundary. The Army said the idea was to target posts that keep troops engaged in firefights, allowing infiltrators to sneak into Indian territory. The Pakistani side questioned the video's authenticity.

Welcoming the Army's strong action, defence minister Arun Jaitley said such moves were needed to ensure peace in the state that has been wracked by terror attacks and street protests.

"As part of our counter-terrorism operations, punitive fire assaults across the Line of Control are being undertaken by the Indian Army," said Major General Ashok Narula, speaking for the Army. "Pakistan Army has been providing support to infiltrators by engaging our forward troops from their weapon emplacements and pill-boxes closer to LoC."

While the Army did not give details of possible casualties on the Pakistani side and the exact provocation for the fire assault, a source said it was part of a series

of targeted actions against military posts on the LoC. “We have carried out several such attacks in the past few months and several Pakistani posts have been razed,” said an official with knowledge of the operations.

Jaitley, who travelled to the LoC and met forward troops last week, tweeted shortly after an Army briefing on the assault. “Government supports the actions of Indian Army across LoC. Such actions are needed to ensure peace in J&K,” the defence minister said in his tweet.

The Army also accused Pakistan of targeting civilians. “At times they have not even hesitated to target villages in the proximity of Line of Control,” Narula said.

The Army said infiltration is likely to increase as the snow melts with the onset of warmer weather and passes open up, indicating that such actions will continue, calling for “even more proactive counter-terrorism operations.”

The May 9 assault -days after two soldiers were beheaded by the Pakistani Border Action Team on the LoC - used heavy firepower including rocket launchers, anti-tank guided missiles and automatic grenade launchers. This is the second video to emerge of an Indian Army strike on Pakistani posts after one in April that also showed a position across the LoC being destroyed by tank fire and missiles.



Wed, 24 May, 2017

Target: Pak Posts; Aim: Raze Them; Judge: Army Units

By Manu Pubby

Message Of Strikes: Indian Army reserves right to take preemptive action & regular Pak army troops are legitimate targets if found supporting infiltrators

The publicised, punitive fire assault on Pakistani posts that aid infiltration are part of a new escalatory stand by the Indian Army on the Line of Control, aimed at sending a straight message that the cost of abetting militancy will have to be borne by regular Pakistani army troops.

The video of the May 9 incident in Noushera released by the Indian Army is indicative of what is fast becoming a new normal on the Line of Control: Swift, high intensity attacks on Pakistani army posts with the aim of razing them to the ground. The provocation: Providing cover to infiltrators. The judge: Local Army units that observe events firsthand.

In a change from the past, when such operations were executed with lesser frequency and more discretion, a series of fire assaults have been carried out on the LoC since last September's cross-border surgical strikes.

Defence establishment insiders refused to give a number, but said that several large Pakistani army posts have been targeted -even platoonlevel posts designed to hold 30-odd troops in a defensive role. At least three separate videos recording the assaults are now in public domain.

The message of these strikes borrows the logic of the surgical strikes: The Indian Army reserves the right to take preemptive action along the Line of Control and that regular Pakistani army troops are legitimate targets if found supporting infiltrators.

Defence minister Arun Jaitley's congratulatory message to the Army for the action also hinted to this approach. “Indian Army is taking preemptive and measured actions to counter terrorism in valley and disengage Pak posts across LoC supporting infiltration,” the minister tweeted.

While such intense fire assaults -the May 9 attack included the use of rocket propelled grenades, anti-tank missiles and heavy gun fire -would mean that the 2003 ceasefire agreement is more or less defunct, Army insiders pointed out that the situation is not close to the levels of cross-border duels seen in the past.

“Pakistan has given a muted response -first by denying that the surgical strikes took place and now by saying that the fire assault video was fake. They realise that on the LoC, we are now at an advantage when it comes to fire power and defences,” an officer said.

In his address on the fire assault, Maj Gen Ashok Narula, speaking on behalf of the Army, made it clear “locations aiding infiltration of terrorists are being targeted and destroyed to deny advantage to terrorists.” Making it clear that the Army will continue this new stand of sustained fire assaults -targeting Pak posts without crossing over -in all areas where it dominates the Line of Control.

Pak Video Claims Attack on Indian Side on May 13

New Delhi: Stung by the release of a video by the Indian Army, Pak released a counter video claiming it too had carried out a fire assault. The Pak army video, posted on the social media late on Tuesday evening, claimed: “On May 13, India targeted innocent civilians. In befitting response Pak Army destroyed Indian posts in Nowshera Sec.



Wed, 24 May, 2017

Man tied to jeep was instigating mob: Maj

Major Leetul Gogoi, who trussed up a civilian, Farooq Ahmad Dar, on his jeep's bonnet as a shield to prevent mobs from attacking Election Commission staff in J&K's Budgam last month, told TV channels on Tuesday that he had caught Dar on realising he was instigating a group of stone-pelters and could have been their leader.

Defending his action, the Army Major told the media, “I have not fired a bullet, not beaten up anyone... there was no collateral damage. From my point of view I have not violated anything... We are here to help the people. The Army is here for common people, against those with weapons and those who fight against nation.” Major Gogoi said that Dar, whom he had tied to the fender of his jeep as a shield against a mob during the J&K bypolls, was initially standing about 30 metres from the jeep among the group of stone-pelters. “I immediately told my boys (colleagues) to catch hold of him. He was instigating the crowd and might have been the ringleader,” Gogoi said. “When he saw us, he started running towards the crowd and got on his bike. Somehow, we caught him,” the Major recalled.

Gogoi, who was awarded on Monday the Army Chief Commendation Card for sustained efforts in counter-insurgency operations, had been criticised on April 14 when the video of his “action” went viral.

It was a “do-or-die situation”, he said and his spur-of-the-moment decision was “not wrong for me, my organisation or my country”. “If I hadn't done that, at least 12 or more lives could have been lost... Had I fired, there would have been casualties,” Gogoi said.

The Major described an extremely fraught situation outside the polling booth. “Over 1,200 people had surrounded the polling station and were trying to burn it down with petrol bombs. People were pelting stones from all sides, even women and children, and even people from roof tops,” Gogoi recalled.



Wed, 24 May, 2017

Leetul Gogoi's Journey from Hotbed of ULFA Terrorism to the Valley of Insurgency

By Bikash Singh

Major Leetul Gogoi Awarded Army Chief Commendation Card

The son of a humble production hand from Assam's rust belt is now a national figure for his ‘human shield action’ in Kashmir. Major Leetul Gogoi, from Namrup in eastern Assam and belonging to the 53 Rashtriya Rifles, received the Indian Army chief's ‘commendation card’ for his ‘sustained efforts’ in counter-insurgency

operations in Jammu and Kashmir. Major Gogoi's hometown, located about 80 kilometers from Dibrugarh amid forests in the Patkai Hills, has itself been in the past the hotbed of insurgency movements. Namrup was a stronghold of ULFA terrorists.

Major Gogoi's father Dharmeswar Gogoi retired from Namrup's public sector unit, Brahmaputra Valley fertiliser Corporation. He worked in the production department of the unit.

“I am staying in Namrup with my wife and a son. I came to know about Leetul's achievement through the media. I am eager to see him and talk to him,” Dharmeswar Gogoi said.

Namrup currently has three large industrial units -Brahmaputra Valley Fertilizer Corporation Ltd, Assam Petrochemicals Ltd, and Namrup Thermal Power Station. Leetul studied in Dibrugarh and Shillong, and later graduated from the Indian Military Academy. Sources in the Army said that Leetul became a part of the Services at 18 and served as a jawan in the 3rd Battalion of Assam Regiment for nearly nine years, before joining the Dehradun-based Army Cadet College (ACC) to become an officer. Gogoi was commissioned as a lieutenant in December 2008.

“Leetul always wanted to join the Army and he ultimately did it. I am happy for whatever he is doing. It is good that he is doing well,” Dharmeswar Gogoi said.

Major Leetul Gogoi started a national debate after a video surfaced showing a Kashmiri local tied to an Army vehicle during the polling for the Srinagar Lok Sabha byelection on April 9. The local youth was used as a shield against stone-pelters.

“I do not know much about any controversy relating to Leetul's work in Kashmir. What I know is that he has received an award for his work. I wish I will get to talk to him at length and spend time with him. It has been long time and I have not seen him lately ,” said his father.



Wed, 24 May, 2017

The Army has hurt itself and its own image

By commending Major Gogoi, the armed forces have lost more than just 'the human shield's' heart and mind

On a recent visit to the Valley, I learnt – through confidential conversations with various state actors – that Major NL Gogoi, the army officer who infamously tied Farooq Ahmed Dar, a Kashmiri shawl weaver, to a jeep, had been called by his bosses and asked to explain the circumstances that led him to use a civilian as a human shield. The conversations revealed another important fact: Gogoi had not reported his ‘innovative’ prowess to his immediate senior for three days.

The fact that Gogoi had stripped a civilian of his right to life and liberty came unmasked only after a video showing the shawl weaver strapped to a jeep bonnet was made public on social media. Was Gogoi aware – within himself – that he had perhaps crossed the line? Was that the reason he had not revealed his actions to his superiors?

The same action – justified as one taken under grave circumstances, so lives could be saved – has now won Gogoi a commendation from the Chief of Army Staff, Gen Bipin Rawat. The chief, and everyone down the hierarchical chain in the army, has endorsed the view that Gogoi deserves to be honoured, but in the tenuous relationship between the common Kashmiri and the men in olive fatigues, what message have the army and the government (to whom the army reports in India, unlike in Pakistan) sent to an entire population that is already alienated because they feel a deep denial of justice?

“Was I an animal?” the ‘human shield’ asked my colleague, soon after he learnt of the honour bestowed on Gogoi, wondering which provision of the law permitted him being driven across villages for over 20 minutes.

The law is an ass but its practitioners will tell you that it will be judged as an illegal act and is of course, a harsh and inhuman step no army can – or should – be proud of.

General Rawat has commended the Major for counter-insurgency operations but the army is fooling nobody for Gogoi is a household name for the human shield operation and there is no other action against his name that stands out for 'commendation.'

Dar has been condemned as a 'stone pelter', though there is no evidence to support that. What we do know, for a fact, is that Dar was one of the few who came out to vote on April 9 for the by polls being held for the Srinagar parliamentary constituency. The election was violent: eight civilians were killed and only 7.4% turned out to risk getting the ink mark on their finger.

The commendation for Gogoi adds another layer to the already complex reality of Kashmir: Dar now stands identified as one of the minuscule few who risked their life by walking to a polling booth. Given the current mood in the Valley, where even mainstream political parties are getting marginalised, the shawl weaver suffers social humiliation for favouring democracy and is of course, a victim of army excesses because human shields are a complete no-no, as per the Geneva convention, even in a non-combative situation.

Attention is being focused on Gogoi's actions – and less on Dar, who has already been painted as a 'stone pelter' who, according to the growing breed of 'nationalists', deserves what he got.

Given the culture of commendations within the army – particularly in a conflict zone like Kashmir – where battalions are honoured for the number of militants arrested and killed – where is the guarantee that copycat human shield actions will not be repeated? The honour, after all, has been bestowed by none other than Gen Rawat himself. Which young captain or major, would not want to catch the eye of the chief? Remember the 'ketchup colonel' who faked 'slain militants' by smearing them with tomato sauce – all for gallantry medals.

In the end, the army has only harmed itself and its own image. In the intricate security apparatus comprising local police and paramilitary forces, the army stood out for its WHAM approach: 'win hearts and minds'.

By honouring Gogoi, it has lost more than just Dar's heart and mind.



Wed, 24 May, 2017

No Reason for Major Action against Gogoi

General Bipin Rawat Chief of Army Staff

Army chief says COAS award to retain confidence of troops working in tense atmosphere; 'there is no permanent solution to Pak's cross-border offensive'

Major Leetul Gogoi made the "right call" in the Budgam incident, Army Chief Bipin Rawat has said. In an exclusive interview to Shaurya Karanbir Gurung, the General said that the Major was given a commendation to retain the confidence level of troops working in a tense environment. Excerpts:

By awarding Major Leetul Gogoi what is the message sent to the forces and public in J&K?

The message is to the rank and file of the Army operating in a difficult environment in the Valley. The Army has a responsibility to ensure violence comes down and peace prevails. This officer acted in a particular manner, where only someone on site could have taken a call. Under the circumstances, he took the right call. To ensure the confidence level of the officer and others operating in similar environment, he was, therefore, conferred with the award. The message is not for the people. I am concerned with my rank and file. When they are motivated they will take action and will not let the situation spiral out of control.

Based on reports that Major Gogoi saved lives of security personnel during Srinagar by-poll, did he deserve a gallantry award?

A gallantry award is normally given on August 15 or January 26, after a process. Such incidents should get immediate recognition. Armed forces personnel go through such incidents every day. A gallantry award is given during a firefight. Normally, this incident won't come under gallantry. But the commendation card has

been given for his recognition keeping in mind the requirement of an earlier timeframe. And a lot of people operate in a similar environment who need to be encouraged.

What about the Army court of inquiry against Major Gogoi?

A court of inquiry is for fact finding. It finds a person guilty not guilty. The present court of inquiry will come to its conclusion but what I have learnt is that he has not committed an offence that will necessitate disciplinary action. On the face of it, even if he is found guilty of some lapse, no major action will be taken against him. I find no reason for major action to be taken against him.

Is there a permanent solution to Pakistan's cross-border offensive?

There is no permanent solution because we are guarding a Line of Control that is not demarcated. We have unsettled borders. The only way to prevent infiltration is to remain alert, use technology and rehearse drills to counter such action. Never can you allow your guard down. We need to remain prepared and alert. A video (released by the Army of the fire assault it conducted on Pakistan army posts) is our counter to Pakistan's Border Action Teams. It is to put the fear for life on the other side.

What should be the strategy in Jammu and Kashmir?

I won't reveal the strategy because we don't want the other side to know what we are doing. But basically we will carry out strong measures along the LoC to curb infiltration. That is our main charter.

How is the Army planning to deal with stone-pelters in J&K?

As I said in the past, stone-pelters will be treated as anti-nationals. Their parents must tell them to shun violence, which is creating turmoil, affecting peace, jobs and the economy. If they don't shun violence, then they should not interfere in our operations, because we will take action.

What is the status of the Cyber Command in the context of major ransomware attack across the world?

The Cyber Command is too big a thing. While cyber security mechanism exist in the three services, we are trying to work with the civilian government, which has agencies dealing with cyber security. It is like raising units before raising a command and also getting your act together to stop cyber attacks. Cyber Command and the other triservice commands will come up later. First we need to integrate the respective agencies at our own level and do the groundwork, before looking at all of this.



Wed, 24 May, 2017

Did water come from comets?

Separation of a heavy' component of the liquid is found to happen instantaneously on the surface of such celestial objects

One way to explain how Earth has so much water has been that the water came with comets. The content of water whose molecules have the “heavy” version of hydrogen atoms, however, was found to be much higher in the water vapour surrounding the comet, 67P, than what is found on Earth. This discovery persuaded a view that water on Earth may not have come from the 67P class of comets.

Yunxi Yao and Konstantinos P Giapis, researchers at the California Institute of Technology, Pasadena report in The Astrophysical Journal of The American Astronomical Society that processes on the surface of the comet could increase the content of the “heavy” form of hydrogen in water vapour when the comet approaches the sun. This could be the reason for the feature of the vapour cloud that surrounds 67P, and the class of comets to which it belongs could hence still be the real source of the water content of Earth. Like many other elements, the nucleus of the hydrogen atom can have more than one stable form.

The normal hydrogen atom has a nucleus with only one proton, which is positively charged, and an electron — a comparatively light particle that is negatively charged — is in orbit around the nucleus. Another form of

hydrogen, called deuterium, occurs when a neutron — a neutral particle — is added to the nucleus. As the particle is neutral, the number of electrons remains the same as before. As it is on the number and distribution of electrons that chemical properties of an atom depend, the two forms of hydrogen are almost identical.

With two particles in the nucleus, however, the atom of deuterium has twice the mass of normal hydrogen. Deuterium occurs in traces as gas and is found in the form of “heavy water”, or D₂O, whose molecules contain deuterium atoms in place of hydrogen. The heavy water molecule, which is about 10 per cent heavier than molecules of normal water, has a number special properties and applications. Introducing an additional particle into the nucleus of the hydrogen atom, however, takes energy, and deuterium atoms arose only at the violent time of the Big Bang. Their incidence in the universe is hence rare, to the extent of just 26 parts per million. Except that in many astronomical bodies, because of different concentrating processes, the content is a lot higher. In giant gas planets, like Jupiter, it is the same 0.000026 per cent as the rest of the universe, but in Earth’s oceans, it is six times as much, at 156 parts per million.

This is very close to the content in certain groups of comets, and it has been the view that it is comets that brought much of the water that we find on Earth. The implicated comets, in fact, are the Jupiter-family comets, or comets, which the gravitational forces of Jupiter have drawn into closer orbits around the sun. The source of most comets is in the Oort Belt, or the distant cloud of icy remnants of the formation of the solar system. But in these comets, the ratio of deuterium to hydrogen was twice that on Earth. It was only in the case of the Jupiterfamily comets that the ratio matched and they were considered an important source of terrestrial water.

The problem arose with the detailed study carried out by Rosetta mission, of 2014, which sent Philae, an observation station, down to the surface of 67P — a four km-wide Jupiter-family comet. The study showed that the content of heavy water in the vapour around the comet was more than three times higher than what was found on Earth. This disturbed the notion that water came to Earth from this class of comets. The team of researchers from Caltech, Pasadena have been working on the interaction of high speed ions, or bits of molecules that carry a charge, and the atoms at the surface of materials. Given the high energy of the projectiles and the high charges in the region very close to surface atoms, molecules can be split and reassembled in ways that are normally not possible or possible only very slowly.

As the coma — or the gas cloud that forms around a comet as it nears the sun — is rich in water vapour, the impact of water ions, which get accelerated by radiation from the sun, on the surface of comets, is of interest. And during this study, the researchers found that water ions impinging on the surface tend to pick up atoms of deuterium, and transform into heavy water.

Heavy water has industrial use, particularly in nuclear reactors, where it helps slow down high energy neutrons and promote the nuclear fission chain reaction. This calls for 99.99 per cent pure heavy water and the extraction, from ordinary, fresh water takes elaborate and energy-intensive processing. What the Caltech researchers have published, in contrast, is a painless method where water ions are speeded up and thrown against a deuterium-rich surface, to transform to heavy water.

That such a process is possible has implications in understanding the discovery of high deuterium content in the coma of the comet, 67P. The researchers observe that the surface of the comet consists of minerals that are rich in deuterium and the energy of the ionised water molecules would bring about the hydrogen-deuterium exchange. There would hence be transfer of deuterium content from the surface of the comet to the water vapour in the coma, and hence the detection of high levels of heavy water.

The journal paper works it out that the deuterium to hydrogen ratio should increase as the comet approaches the sun. The actual relationship of how this ratio changes with distance was one of the objectives of the Rosetta mission but has not been reported, the paper says. But the paper has shown that the high ratio on 67P is because of this water ion-surface interaction.

It would hence be hasty to conclude, from the higher ratio on 67P, compared to the level on the waters of Earth, that Jupiter-family comets were not the source of water on the earth. The evidence of the water on these comets being comparable, in deuterium/hydrogen ratio, to sea water is still valid.

From the heavens

All the metallic iron on the Earth got converted to oxides and ore long before humans evolved. As early civilisations did not have coal fires, the first metals extracted from ores were copper, silver and gold, which can be worked with wood fires. Copper was alloyed with tin and formed the basis of the Bronze Age, which started in 3300 BCE. Smelting of iron became possible only after 1200 BC. Discovery of iron artefacts in pre-Iron Age archaeological sites was hence mysterious.

The sites, in fact, predate even the Bronze Age. Analyses of these artefacts have revealed that they were fashioned out of meteorites, which fell on Earth, where the high temperature of entry would have allowed skeins of metal to form. The samples were found to be rich in nickel, cobalt, phosphorus and germanium, which marked them as being of a meteoric origin. The iron beads appear along with gold and gemstones, suggesting they had value. This must have been so, as any iron would be rare and may have been seen to have “fallen from the heavens”.