NEWS AT A GLANCE

FORTHCOMING EVENTS

1) **Coastal Processes and Management**
01 Oct 2017 • Wallingford, United Kingdom

Topic: Marine Engineering
Event website: http://training.hrwallingford.com/training/introduction-to-coastal-processes-and-management

2) **The Early History of Planetary Systems and Habitable Planets**
08 Oct 2017 - 10 Oct 2017 • Tartu, Estonia

Topics: Planetary Sciences, Astrobiology, Geosciences, Atmospheric Sciences
Event website: https://sisu.ut.ee/eac/

3) **The Geological Society of America (GSA) 2017 Annual Meeting**
22 Oct 2017 - 25 Oct 2017 • Seattle, United States

Topic: The Geological Society of America (GSA) 2017 Annual Meeting
Event website: http://www.geosociety.org/meetings/

4) **BGS2017 — 9. Congress of the Balkan Geophysical Society**
05 Nov 2017 - 09 Nov 2017 • Antalya, Turkey

Topics: oil, gas, coal, mineral, thermal, land, offshore, airborne geophysics, marine geophysics, mining geophysics, hydrogeophysical applications, Exploration Geophysics, Engineering Geophysics, Seismology, Geophysical Methods
Event website: http://www.bgs2017.org

5) **2nd International Convention on Geosciences and Remote Sensing**
November 08- 09, 2017 Las Vegas, Nevada, USA

Theme: "Recent upsurge in Geosciences and Remote Sensing : International Prospective".
Event website: http://geosciences.conferenceseries.com/

6) **Annual Congress on Soil Sciences**
Dec 04-05, 2017 Madrid, Spain

Theme: "Awareness on Innovations in Soil Science and Soil Management Challenges"
Event website: http://geosciences.conferenceseries.com/

Email: soilscience@earthscienceconferences.org

AWARDS AND RECOGNITION

* Dr.K.S.Krishna Chief Scientist of NIO-Goa after serving for 33 years joined University of Hyderabad as Professor.

* Professor Supriyo Mitra was awarded the "National Geoscience Award (2016)" by Ministry of Mines in recognition of significant contribution to Applied Geology.

* Professor Supriyo Mitra has been selected as Member of the Research Advisory Committee, National Center for Seismology (NCS), Ministry of Earth Sciences (2016-2017).

SCIENCE NEWS

Volcanic Eruptions-series of unknown mysteries

Preamble:

India is affected by different types of natural hazards. It is, however, not directly affected in the recent past by any major volcanic eruptions. It witnessed 65 million years back Deccan Volcanism that wiped out dinosaurs, due to significant sudden climate change caused by huge volumes of gasses and molten lava spewed by the series of eruptions from number of vents present both on land and in the adjoining seas, covering a vast stretch of western India. Presently it has one known volcano in the Barren Island, northern part of Bay of Bengal. Barren island volcano which had started showing activity in 1992 after lying dormant for over 150 years has again started spewing ash, smoke and lava since January, 2017, the researchers of NIO, Goa have reported. They have told that during the daytime only ash clouds were observed. However, after sundown, the team observed red lava fountains spewing from the crater into the atmosphere and hot lava flows streaming down the slopes of the volcano. This activity assumes importance as this part of Bay of Bengal, located about 140 km north east of Port-Blair was aseismic when Andaman-Sumatra region was significantly active since 2004. Present volcanic activity may possibly lead to seismic activity, extending towards land part of Burma and India/Bangladesh.

Since major eruptions from many volcanoes present in different parts of the earth can harm us immensely as winds carry the pollutants from hundreds of km, this recent activity assumes significance. To brush up our knowledge about volcanic activity, which was not taken seriously by Indian volcanologists/ seismologists, results from some significant studies are given below to help young researchers carry out studies with focus on volcanic activity and volcano related seismic activity.

******How hazardous are massive volcanic eruptions?***

The Earth currently has 1,500 'active volcanoes' - meaning they have had at least one eruption during the past 10,000 years. This is aside from the continuous belt of volcanoes on the ocean floor, about 500 of which have erupted in historical time. However, not all eruptions are the same. As per experts one can broadly categorise eruptions into two different types. The first, effusive, produces lava flows and lots of gas. The second, explosive, produces ash and gas. The difference in activity is controlled mostly by the viscosity of the magma. The more viscous the magma, the more difficult it is to get gas out of the system and the more likely one has to have an explosion. Despite the type of eruptions differing massively, if all the world's volcanoes erupted at the same time, the results would be catastrophic in a number of ways.

Firstly, the people in the firing line of the eruption would be affected, not only by the flow of magma from the volcano, but also from the huge ash clouds expelled. Pyroclastic flows are fast-moving clouds of rock, ash and gas that are very hot, with temperatures rising up to 1000°C. These would be impossible to outrun or even drive, as they can travel up to 450 miles per hour. As well as affecting people near the volcano itself, pyroclastic flows can cause destruction for up to 100 miles from the site. For number of people living near volcanoes, the destruction is massive. For example, around three million people live near Mount Vesuvius, while 130 million people live on the island of Java which alone has 45 active volcanoes. But the destruction close to the volcanoes would just be the beginning. The eruptions would send plumes of volcanic ash into the sky that could travel for thousands of miles. Ash is pretty unpleasant stuff. It comprises tiny fragments of glass, crystals and rock. When the mixture of this stuff reaches villages/towns/ cities it can devastate vast stretches of habitable locations, making millions lose everything. Fatalities also reach significant level. You may remember the worldwide flight cancellations caused by the 2010 eruption of Eyjafjallajökull in Iceland, in the fears of damage to airplane engines. Breathing in ash can cause massive problems to our lungs, including silicosis, and damage that sends our immune systems into overdrive, leading to a range of secondary problems. Essentially, there would be no buildings, no vehicles run by an engine, and you would not be able to go anywhere without a gas mask. To add to this, communication channels would be out of the question - ash can disrupt satellite dishes and block radio waves.

The volcanic eruptions would cause long-lasting changes to the Earth's climate. While we usually associate volcanoes with being hot, the huge amount of ash and gas released into the atmosphere would actually lower the temperature globally. The initial injection of sulphur dioxide, converted to small particles called aerosols in the presence of water, would reflect sunlight back out into space. This would cool the planet significantly, potentially even to get to ice-age like conditions.

However in the longer term, we could see a reverse effect with temperatures rising. 'Over hundreds of years, carbon dioxide released by volcanoes might heat the planet up. In 1815, Mount Tambora in Indonesia erupted. This one eruption can be seen in global climate records, lowering temperatures worldwide and causing heavy rain which ruined crops. If one eruption can have that effect, we can only begin to imagine what destruction would be caused if all 1500 active volcanoes went off simultaneously. Hypothetically, if every volcano on Earth erupted simultaneously, you could argue that all life might well be wiped out. In that sense it is a doomsday scenario. However, such an eventuality is very unlikely. (**Source:**http://www.dailymail.co.uk/sciencetech/article-3642494/What-happen-Earth-s-1-500-volcanoes-erupted-Experts-outline-terrifying-doomsday-scenario.html).

*****Crustal limestone platforms feed carbon to many of Earth's arc volcanoes**

A new analysis suggests that much of the carbon released from volcanic arcs, chains of volcanoes that arise along the tectonic plates of a subduction zone, comes from remobilizing limestone reservoirs in the Earth's crust. Previous research suggested carbon was sourced from the mantle as a result of the subduction process. The discovery ultimately impacts the amount of organic carbon scientists believe was buried in the past. Carbon cycling between surface reservoirs and the mantle over geologic history is important because the imbalance greatly influences the amount of total carbon at Earth's surface. However, the source for carbon from volcanic arc out-gassing remained uncertain. Emily Mason and colleagues compiled a global data set of carbon and helium isotopes to determine the origin of the carbon. The data reveal that many volcanic arcs mobilize carbon from large, crustal carbonate platforms -- particularly in Italy, the Central American Volcanic Arc, Indonesia, and Papua New Guinea. In contrast, arcs located in the northern Pacific, such as Japan and Kuril-Kamchatka, release carbon dioxide with an isotope signature indicative of a mantle source. The recognition of a large amount of crustal carbon in the overall carbon isotope signature requires, from a mass balance consideration, downward revision of how much organic carbon was buried in the past. (**Source:** Emily Mason, Marie Edmonds, Alexandra V. Turchyn. Remobilization of crustal carbon may dominate volcanic arc emissions. Science, 2017; 357 (6348): 290 DOI: 10.1126/science.aan5049).

*****Cold plates and hot melts: New data on history of Pacific Ring of Fire**

About 2000 km east of the Philippine Islands lies one of the most famous topographical peculiarities of the oceans: the Mariana trench. Reaching depths of up to 11,000 meters below sea level, it holds the record as the deepest point of the world's ocean. This 4000-kilometer-long trench extends from the Mariana Islands in the south through the Izu-Bonin Islands to Japan in the north. Here, the Pacific Plate is subducted beneath the Philippine Sea Plate, resulting in intense volcanic activity and a high number of earthquakes. The entire area is part of the "Pacific Ring of Fire."But when and how exactly did the subduction of the Pacific Plate begin? This is a controversial topic among scientists. An international team led by the GEOMAR Helmholtz Centre for Ocean Research, Kiel, the Japan Agency for Marine Earth Science and Technology (JAMSTEC) and the Australian National University investigated this early phase of subduction along the Izu-Bonin-Mariana trench.

The study is based on a drill core that was obtained by the International Ocean Discovery Program (IODP) in 2014 with the US research drilling vessel 600 km west of the current Izu-Bonin Trench. "For the first time, we were able to obtain samples of rocks that originate from the first stages of subduction," says Dr. Philipp Brandl from GEOMAR. "It is known that the active subduction zone has been moving eastwards throughout its history and has left important geological traces on the seabed during its migration. We have now drilled where the process has begun."The team of the JOIDES RESOLUTION was able to drill more than 1600 meters deep on the seabed. Based on analysis of this drill core, the researchers were able to trace the history of the subduction zone layer by layer up to the approximately 50 million year-old rocks at the bottom of the core, which are typical for the birth of a subduction zone. Brandl and his colleagues were now able to acquire and analyze microscopic inclusions of cooled magma from the rocks. The data obtained provide the scientists with insights into the history of volcanic activity at the Pacific Ring of Fire 30-40 million years ago. The researchers found evidence that volcanism was only beginning to gain momentum. The volcanic activity intensified with the rollback of the subduction zone towards the east and the huge explosive strato volcanoes formed, similar to those present nowadays, for example along the western rim of the Pacific Ring of Fire. However, further drilling is necessary to test the validity of these observations. The question of how subduction zones develop is not only interesting to understand the history of the earth. Subduction zones are the drivers for the chemical exchange between the earth's surface and the earth's interior. (**Source:** Philipp A. Brandl, et al. The arc arises: The links between volcanic output, arc evolution and melt composition, Science Letters, 2017; 461: 73 DOI: 10.1016/j.epsl.2016.12.027).

*****Can Water Vapour Help Forecast When a Volcano Will Blow?**

The magma that bursts out of volcanoes is propelled upward largely by dissolved gases, which are released into the atmosphere once the molten rock approaches the surface. The most abundant of these gases is water vapour, and scientists have long searched for a way to accurately measure volcanic water vapour emission rates. Recently Kern et al. present a possible new method to do just that based on research conducted at the 6000-meter-high Sabancaya Volcano in Peru. Six months prior to the onset of the volcano's current eruptive crisis, which began in November 2016, the team measured the volcanic water vapour output using a method called passive visible-light differential optical absorption spectroscopy (DOAS). DOAS instruments measure the absorption of sunlight by gases in the atmosphere and the volcanic plume above them. The technique is widely used to measure sulfur dioxide emissions, but these were the first successful DOAS measurements of volcanic water vapour.

The team found that prior to the current eruptive phase, the Sabancaya plume contained an exceptionally high, 1000:1 ratio of water vapour to sulfur dioxide, about an order of magnitude higher than typically found in volcanic gases. They hypothesize that as Sabancaya's buoyant magma rose to shallower depths, it likely began to boil off water stored in the volcano's underground network of fluid-filled cracks and fissures, called its hydrothermal system.

This commonly happens prior to volcanic eruptions. The team suggests that visible-light DOAS stations be set up around the world to detect when other active volcanoes are getting steamier. (**Source:** Journal of Geophysical Research: Solid Earth, https://doi.org/10.1002/2017JB014020, 2017).

*****How do volcanoes affect world climate?**

In 1784, Benjamin Franklin made what may have been the first connection between volcanoes and global climate while stationed in Paris as the first diplomatic representative of the United States of America. He observed that during the summer of 1783, the climate was abnormally cold, both in Europe and back in the U.S. The ground froze early, the first snow stayed on the ground without melting, the winter was more severe than usual, and there seemed to be "a constant fog over all Europe, and a great part of North America.

What Benjamin Franklin observed was indeed the result of volcanic activity. An enormous eruption of the Laki fissure system (a chain of volcanoes in which the lava erupts through a crack in the ground instead of from a single point) in Iceland caused the disruptions. The Laki eruptions produced about 14 cubic km of basalt (thin, black, fluid lava) during more than eight months of activity. More importantly in terms of global climate, however, the Laki event also produced an ash cloud that may have reached up into the stratosphere. This cloud caused a dense haze across Europe that dimmed the sun, perhaps as far west as Siberia. In addition to ash, the eruptive cloud consisted primarily of vast quantities of sulfur dioxide (SO_2), hydrogen chloride (HCl), and hydrogen fluoride gases (HF). The gases combined with water in the atmosphere to produce acid rain, destroying crops and killing livestock. The effects, of course, were most severe in Iceland; ultimately, more than 75% of Iceland`s livestock and 25% of its human population died from famine or the toxic impact of the Laki eruption clouds. Consequences were also felt far beyond Iceland. Temperature data from the U.S. indicate that record lows occurred during the winter of 1783-1784. In fact, the temperature decreased about one degree Celsius in the Northern Hemisphere overall. That may not sound like much, but it had enormous effects in terms of food supplies and the survival of people across the Northern Hemisphere. For comparison, the global temperature of the most recent Ice Age was only about five degrees C below the current average.

There are many reasons that large volcanic eruptions have such far-reaching effects on global climate. First, volcanic eruptions produce major quantities of carbon dioxide (CO_2), a gas known to contribute to the greenhouse effect. Such greenhouse gases trap heat radiated off of the surface of the earth forming a type of insulation around the planet. The greenhouse effect is essential for our survival because it maintains the temperature of our planet within a habitable range. Nevertheless, there is growing concern that our production of gases such as CO_2 from the burning of fossil fuels may be pushing the system a little too far, resulting in excessive warming on a global scale. There is no doubt that volcanic eruptions add CO_2 to the atmosphere, but compared to the quantity produced by human activities, their impact is virtually trivial: volcanic eruptions produce about 110 million tons of CO_2 each year, whereas human activities contribute almost 10,000 times that quantity.

By far the more substantive climatic effect from volcanoes results from the production of atmospheric haze. Large eruption columns inject ash particles and sulfur-rich gases into the troposphere and stratosphere and these clouds can circle the globe within weeks of the volcanic activity. The small ash particles decrease the amount of sunlight reaching the surface of the earth and lower average global temperatures. The sulfurous gases combine with water in the atmosphere to form acidic aerosols that also absorb incoming solar radiation and scatter it back out into space. The ash and aerosol clouds from large volcanic eruptions spread quickly through the atmosphere. On August 26 and 27, 1883, the volcano Krakatau erupted in a catastrophic event that ejected about 20 cubic km of material in an eruption column almost 40 km high. Darkness immediately enveloped the neighbouring Indonesian islands of Java and Sumatra. Fine particles, however, rode atmospheric currents westward. By the afternoon of August 28th, haze from the Krakatau eruption had reached South Africa and by September 9th it had circled the globe, only to do so several more times before settling out of the atmosphere. Initially, scientists believed that it was volcanoes' stratospheric ash clouds that had the dominant effect on global temperatures. The 1982 eruption of El Chichin in Mexico, however, altered that view. Only two years earlier, the major Mt. St. Helens eruption had lowered global temperatures by about 0.1 C. The much smaller eruption of El Chichin, in contrast, had three to five times the global cooling effect worldwide. Despite its smaller ash cloud, El Chichin emitted more than 40 times the volume of sulfur-rich gases produced by Mt. St. Helens, which revealed that the formation of atmospheric sulfur aerosols has a more substantial effect on global temperatures than simply the volume of ash produced during an eruption. Sulfate aerosols appear to take several years to settle out of the atmosphere, which is one of the reasons their effects are so widespread and long lasting.

The atmospheric effects of volcanic eruptions were confirmed by the 1991 eruption of Mount Pinatubo, in the Philippines. Pinatubo`s eruption cloud reached over 40 km into the atmosphere and ejected about 17 million tons of SO_2, just over two times that of El Chichin in 1982. The sulfur-rich aerosols circled the globe within three weeks and produced a global cooling effect approximately twice that of El Chichin. The Northern Hemisphere cooled by up to 0.6 °C during 1992 and 1993. Moreover, the aerosol particles may have contributed to an accelerated rate of ozone depletion during that same period. Interestingly, some scientists argue that without the cooling effect of major volcanic eruptions such as El Chichin and Mount Pinatubo, global warming effects caused by human activities would have been far more substantial. Major volcanic eruptions have additional climatic effects beyond global temperature decreases and acid rain. Ash and aerosol particles suspended in the atmosphere scatter light of red wavelengths, often resulting in brilliantly coloured sunsets and sunrises around the world. The spectacular optical effects of the 1883 Krakatau eruption cloud were observed across the globe, and may have inspired numerous artists and writers in their work. The luminous, vibrant renderings of the fiery late day skyline above the Thames River in London by the British painter William Ascroft, for instance, may be the result of the distant Krakatau eruption. In 1815, the Indonesian volcano Tambora propelled more ash and volcanic gases into the atmosphere than any other eruption in history and resulted in significant atmospheric cooling on a global scale, much like Krakatau a few decades later. New England and Europe were particularly hard hit, with snowfalls as late as August and massive crop failures.

The cold, wet, and unpleasant climatic effects of the eruption led 1816 to be known as "the year without a summer," and inspired Lord Byron to write:

"The bright Sun was extinguished,
And the stars Did wander darkling in the
Eternal space Ray less and pathless,

And the icy earth
Swung blind and blackening in the moon less air;
Morn came and went and came,
And brought no day"   --Lord Byron,

(**Source:**https://www.scientificamerican.com/article/how-do-volcanoes-affect-w/)

*****Volcano's Toxic Plume Returns as Stealth Hazard**

Toxic airborne emissions from volcanoes in Iceland may be dangerous even when pollution-monitoring instruments indicate that the air is safe, according to a new study. Volcanologists observing a 2014–2015 eruption in Iceland have found that even when air quality detectors had determined that sulfur dioxide (SO_2) gas had fallen to acceptable levels in the air downwind from an eruption, another form of contamination known as sulfate aerosols had sneaked back, sullying the air.

The aerosols' ingredients, tiny particles of sulfuric acid and trace metals, likely also harm people, but less is known about their toxicity than about the health consequences of SO_2. These pollutants contain heavy metals found in human-made air pollution that are linked to negative health effects. More than a cubic km of lava gushed from the rift, along with record-breaking amounts of sulfur dioxide gas. For 6 months spanning the end of 2014 and the beginning of 2015, an eruption from the Holuhraun fissure in the Bárðarbunga volcanic system of south-eastern Iceland captivated the world. More than a cubic km of lava gushed from the rift, along with record-breaking amounts of SO_2, a common volcanic emission that can be extremely harmful to humans. Readings came from the volcano site and monitoring stations in cities downwind from the eruption. Also during the eruption, Ilyinskaya and her collaborators collected their own gas samples from a helicopter hovering just tens of meters above the fiery rift. Long after the eruption had ended, when the researchers started analyzing their data along with data from monitoring stations in areas surrounding the volcano, something odd stuck out. In two cities, a small town called Reykjahlíð, 100 km downwind from the eruption, and Iceland's capital, Reykjavík, 250 km downwind, the researchers noticed that on some days when monitoring stations detected low levels of SO_2, their data indicated simultaneous high levels of sulfate aerosols, which arise from sulfur dioxide cooling in the air while reacting with other airborne molecules with the help of sunlight. Ilyinskaya and her team found that a plume of sulfur dioxide would evolve into aerosols and travel back toward Iceland in a matter of days—they dubbed these secondary plumes "plumerangs.". The researchers were stunned to see that the SO_2 plumes could last long enough to "mature," or fully convert into plumes of aerosols. On at least 18 days during the 6-month-long eruption, the plumerang was in the capital city of Reykjavík, while the official forecast showed 'no plume.

The researchers are currently conducting a follow-up study to determine what kinds of health effects resulted from the plumerangs, Ilyinskaya said. In the meantime, the researchers suggest that SO_2-to-aerosol conversions should be considered in future air pollution forecasts, especially considering the profuse SO_2 emissions known to come from Iceland's volcanoes.

Source: Wendel, J. (2017), Volcano's toxic plume returns as stealth hazard, Eos, 98,https://doi.org/10.1029/2017EO078265.

From a recent study it is evident that in future Iceland will be devastating parts of earth as it is sitting over a molten lava chamber of significant dimensions. Please read the following to know more details.

*****Getting to the root of Iceland's molten rock origins**

New data reveal an unprecedented depiction of a region of partially molten rock deep within the Earth, which appears to be feeding material in the form of a plume to the surface, where Iceland is located.

The finding, in combination with evidence from previous studies, suggests that these molten regions deep below, near the core-mantle boundary of the Earth, may cause basaltic ocean island chains to form along the surface. Around the Earth's core-mantle boundary are regions called ultralow-velocity zones (ULVZs), which are characterized by liquid rock with velocities up to 30% lower than surrounding material.

However, depicting ULVZs has been particularly difficult given their extreme depths. ULVZs have been detected below the Polynesian country of Samoa and the Hawaiian islands, yet a clear depiction of their shape has eluded scientists. The proximity of these ULVZs below volcanic island chains has prompted theories suggesting that the giant reservoirs of molten rock feed the mantle plumes that create the islands on Earth's surface.

Here, Kaiqing Yuan and Barbara Romanowicz used seismic tomography, which constructs an x-ray-like picture of the Earth's interior using seismic waves, to probe a ULVZ below Iceland.

Based on their results, there appears to be a massive circular blob of partially molten rock, approximately 800 km in diameter and 15 km in height, along the core-mantle boundary, feeding the plume directly below the basaltic island.

The authors note that this ULVZ's location, shape and large diameter, which is proportionate with the width of the plume higher up in the lower mantle, suggests a close link between the ULVZ and the rising plume above it.

These new data, in combination with the known presence of ULVZs below Samoa and Hawaii, led the authors to propose that a specific class of large ULVZs form at the roots of broad plumes that feed active hotspots. (**Source:** Kaiqing Yuan, Barbara Romanowicz. Seismic evidence for partial melting at the root of major hot spot plumes**.** Science*,* 2017; 357 (6349): 393 DOI: 10.1126/science.aan0760)

*****A Volcanic Trigger for Earth's First Mass Extinction?**

Abnormally high levels of mercury in Ordovician rocks may imply that a huge surge of volcanism took place at a time when much of the planet's ocean life vanished. Five major mass extinctions punctuate the history of life on Earth. The first is the Late Ordovician mass extinction, which began about 445 million years ago, triggered by a severe ice age and subsequent global warming that exterminated more than 85% of all marine species. Why the ice age that sparked the event was so drastic, however, is not clear. Recent research has suggested that large-scale volcanism before and during the extinction may be to blame. In a new study, researchers report the discovery of rock layers formed about the time of the extinction that are rich in the chemical element mercury, which they say is a telltale sign of volcanic activity.

Geochemist David Jones , collected Late Ordovician rocks from the Monitor Range mountains in Nevada, as well as from Wangjiawan in south China. When he analyzed the rocks in his laboratory, he found mercury concentrations that shot through the roof around the time of the great die out. Because volcanoes are the largest natural source of mercury to Earth's surface, discovering such a surge suggested that a connection may exist between the volcanism and the extinction.

The same kind of surge occurs in the south China rocks, in which mercury levels reach far above an average concentration of about 50 to 100 parts per billion to almost 400 parts per billion, he added.

Studying spikes in mercury concentrations is one of the best ways to try and correlate volcanic activity with extinction, particularly when there is a dearth of actual volcanic rock evidence in the rock record. Scientists now have strong evidence for volcanism occurring just prior to and during the extinction. Before, the Late Ordovician mass extinction (LOME) was the only one of the "Big Five" extinctions not associated with volcanic activity.

It's well known to geoscientists that LOME began during the Hirnantian age as large ice sheets grew over the single supercontinent that existed at that time, Gondwana, and reached their maximum extent between 445.2 and 443.8 million years ago. What's more, those ice sheets dwarfed those of Earth's most recent ice age, which reached its maximum extent about 20,000 years ago. Geochemical evidence suggests that total ice volume during the Hirnantian glacial maximum was significantly more.

Geochemists have found evidence likely helped drive the glaciation. Although volcanoes emit carbon dioxide, which, at sufficient concentrations, can warm the planet, geochemists explained that previous modeling work suggests that weathering of volcanic rock can lead to a drawdown of carbon dioxide in the atmosphere through the chemical weathering of that province. In addition to so-called Snowball Earth event wherein ice sheets covered much of the planet volcanoes also emit sulfur dioxide gas into the atmosphere, which can form sulfate ions that scatter incoming solar radiation, cooling the planet in the process. Although other researchers warmly welcomed the mercury evidence of volcanism, the cooling part of the scenario has raised eyebrows. Volcanism is often thought of as an agent of warming, so teasing out how it may also cause cooling is tricky. However, volcanism does not necessarily mean warming will ensue because how much carbon dioxide ancient volcanoes emitted into the atmosphere depended on how carbon-rich the sedimentary rocks surrounding the extruding lavas were. The amount of carbon dioxide released would depend critically on the geology of the region in which the eruption occurred, because the lava would help release the gas into the air. Further study of the geology will help reveal whether or not this was the case.

However the volcanic cooling hypothesis pans out, the biggest revelation in the new work is that there is now evidence that each of the five major mass extinctions coincided with widespread volcanism. The new findings may imply that a large igneous province is almost a precondition to have a mass extinction. **Source:** Joel, L. (2017), A volcanic trigger for Earth's first mass extinction?, Eos, 98,https://doi.org/10.1029/2017EO074813.

Outstanding Contribution in Oceanography

Tadepalli Satyanarayana Murty

Dr. Murty was born in 1938 in India and carried out initial schooling and college education in India. He is presently having Indo-Canadian nationality. He has significant research experience in Oceanography.

Tad S. Murty is an expert on tsunamis. He is the former president of the Tsunami Society. He is an adjunct professor in the departments of Civil Engineering and Earth Sciences at the University of Ottawa. Murty has a PhD degree in oceanography and meteorology from the University of Chicago. He is co-editor of the journal Natural Hazards with Tom Beer of CSIRO and Vladimir Schenk of the Czech Republic.

Affiliations

* Natural Resources Stewardship Project **(**NRSP**)** — Past "Allied Expert." The NRSP is now defunct.
* International Climate Science Coalition **(**ICSC**)** — "Consultant Science Adviser."
* International Climate and Environmental Change Assessment Project **(**ICECAP**)** — "Expert."

Climate change

He has taken part in a review of the 2007 Intergovernmental Panel on Climate Change. Murty characterizes himself as a global warming skeptic. In an August 17, 2006 interview, he stated that "I started with a firm belief about global warming, until I started working on it myself...I switched to the other side in the early 1990s when Fisheries and Oceans Canada asked me to prepare a position paper and I started to look into the problem seriously." There is no global warming due to human anthropogenic activities". Murty was among the sixty scientists from climate research and related disciplines who authored a 2006 open letter to Canadian Prime Minister Stephen Harper criticizing the Kyoto Protocol and the scientific basis of anthropogenic global warming.

His main research interests include mathematical modeling of natural hazards, which include hurricanes, winter storms, storm surges, ocean waves, tides, coastal inundation, tsunamis, river floods, coastal erosion and sedimentation and how climate change affects these phenomena. He is one of the editors of the renown international scientific journal, Natural hazards, published by Springer in the Netherlands, Senior Associate editor of Marine Geodesy published by Taylor & Francis in New York and is on the editorial board of Science of Tsunami Hazards, published by the International tsunami Society in Honolulu.

He is the Vice-president of the International Tsunami Society and a member of the Expert Advisory Group of the Kalpasar Project (the largest civil engineering project ever in Indian history and among the largest in the world) in the state of Gujarat in India. He is a Visiting Scientist at the Beijing Institute of Technology and the Indian Institute of technology in New Delhi, India.

He received numerous national and international awards, including the Lifetime Achievement Award from the International Tsunami Society, the Gold Medal in Oceanography from the Indian Geophysical Union, Applied Oceanography Prize from the Canadian Meteorological & Oceanographic Society, and the Professional Man of the Year Award from the Indo-Canada Chamber of Commerce.

Since receiving the Ph.D. from the University of Chicago, Dr. Murty served as Senior Research Scientist in the Canadian Federal Department of Fisheries & Oceans, as the Director of Australian National Tidal facility and Professor of Earth Sciences in Flinders University in Adelaide. Later he worked as a Senior Scientist with Baird & Associates Coastal Engineers in Ottawa, prior to joining the University of Ottawa as an Adjunct Professor.

Dr. Murty has some 20 books to his credit, as an author, co-author and editor and has published extensively in peer reviewed scientific journals. He has been a co-supervisor for M.S. and Ph.D. students in various universities worldwide. He served as a consultant to various United Nations Organizations and also as a resource person for various workshops worldwide. He also participated in scientific projects in several countries on all the continents.

Fields of Interest

* Mathematical modelling of natural hazards;
* Climate change;
* Cyclones;
* Tsunamis;
* Storm surges;
* Coastal Zone Management

Resources

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5) "Independent Summary for Policymakers of the IPCC Fourth Assessment Report (Working Group I)," Retrieved January, 2012, from Ross Mckitrick's homepage at the University of Guelph (www.uquelph.ca/~rmckitri).
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9) "Tad Murty," Wikipedia Entry.
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