HOSTED BY THE INDIAN GEOPHYSICAL UNION

AOGS NEWS

5 TO 9 JULY 2010 | HYDERABAD
HYDERABAD INTERNATIONAL CONVENTION CENTRE, INDIA

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WEDNESDAY | JULY 7, 2010 | HYDERABAD

SPECIAL SUPPLEMENT | 7TH ANNUAL MEET

GLACIAL MELT

On glaciers' trail

GATEWAY MEDIA NEWS BUREAU

Much debated, researched upon and widely discussed of all environmental events, glacial melt is something that never fails to trigger an aura of interest in the scientific world or amongst the public. It is likely to affect us either directly or indirectly, and researchers have taken turns to highlight their importance in supporting life as we understand it and how the glaciers' gradual receding will affect long-term changes. However, scepticism has trailed it ever since the first event of unseasonal glacial melt was observed. These are changes that certain groups fail to acknowledge as results of humanity-induced damage to climate. But, despite the wide-spread refusal to see reason in the rapid reduction of glacial size, research in the area has been increasing and bringing forth unusual data, a fact that was discussed in detail and supported by papers presented during the Asian Snow-Glaciers and Climate Change session on the second day of the AOGS meet.

While research activity in the area has witnessed an upsurge, remote sensing techniques as tools are also finding increasing application, highlighting which Dr Anil Kulkarni from Indian Space Research Organisation said that remote sensing techniques have facilitated the observation of areas that may perhaps be too difficult to reach. Studies carried out in the Wangar Gad basin have highlighted large-scale melting, with the mean glacial extent decreasing from 1.4 to 0.32 sq km. Even more shocking is the fact that 1317 glaciers in the Himalayas are retreating. The Bhaga and Alaknanda basins have been extensively observed for snow accumulation and ablation patterns and a definite change as been noticed according to him. Not only is the melting depicted as a sharp curve (observations made in 2006-2007) but has started early too. Moreover, avalanches in the Himalayas have caused the snow to become hollow.

Deliberating on the event of an increase of 1o C in global temperatures, Dr Kulkarni observed that the glacial mass balance would change with the snow extension decreasing to 209 sq km in 2040 as compared to 234 sq km in 2004. This clearly stresses on the need for Renewed Thrust on studying Himalayan Glaciology, which incidentally was the title for the next presentation by Mukundaraj Prithviraj and P Sanjeeva Rao from the Department of Science and Technology, Delhi. Emphasising the importance of studying the Himalayas he said that they are the youngest fold mountains and act as a natural boundary for India. In addition to affecting the monsoon cycles they also keep a tab on the country's climate while supporting its rivers and sustaining its economy.

The National Programme on Himalayan Glaciology, launched in 1986 (the 7th five-year plan) specifies a clear objective to study Himalayan glaciers and explore their interaction with climate change. So also the study of glacial systems such as Gangotri, Dokriani, Chota Shigri and Durang-Dung glacier amongst others is being carried out to analyse if the retreat is actually due to unusual warming and if it is, is it alarming. The objective is to capture the trend and predict future scenario and analyse the possible adverse effects that glacial melt is likely to produce. According to the presenters, work has been initiated by several institutes, but there is an urgent need for coordination, so that a reliable database on the Himalayan glaciers can be generated. Additionally, trained manpower, with specialised focus on glaciology will have to be produced. However, despite the advances that have been made in glacier research technology, India is still ill-equipped to carry out snow/ice chemical and physical studies.

The last presentation by Jose George Pottakkal from Jawaharlal Nehru University, in the first slot, discussed the Gangotri glacier in detail and Gomukh in particular. George, who has been a part of the project that studies Gomukh, pointed out that there has been a debate on whether Gangotri's retreat has stopped. However, a closer look at the glacier has revealed a fractured base and the formation of ponds in the area due to melt waters coming into the glacier. The study observed that the Raktavaran Nala (which earlier was a smaller glacial system which fed the Gangotri) was feeding melt water and causing the glacier's hydrology to change, to study which dye injection experiments were conducted by the team.

Notwithstanding the debate on whether glaciers are retreating or not, it is a fact that they are our life support and will have to be studied and analysed, keeping in mind the size of the glacier and the environment surrounding it, as a member of the audience was quick to point out.

The session threw open several questions, many of which basically focussed on why the decision making authorities of the country have failed to see facts that are screaming from the data; that glaciers are retreating. More importantly, why don't the researchers come out in the open and share their results with sceptics who are trying to paint a wrong picture of 'all is well with the Himalayan glaciers'. AOGS

Pic: A Ravindranath

Mukundaraj Prithviraj presenting a paper on Renewed Thrust on Himalayan Glaciology

CHANGING CLIMATE

Heeding to global warming signals

GATEWAY MEDIA NEWS BUREAU

Pic: A Ravindranath

Prof Jai Ho OH, from the department of Environment and Atmospheric Sciences, Pukyong National University, South Korea, speaks on global warming and possible climate crises at the AOGS seminar in Hyderabad on Tuesday

It's a concept that is being deliberated with repeated consistency, given the urgency of the situation; the possible consequences it can have on the way the earth behaves, the manner in which the planet reacts and the disaster it may unleash. Global warming and climate crises are not mere concepts anymore, they are under the scanner, so that facts can be unearthed and they in turn, help us combat the growing deluge.

This was the underlining purpose of Professor Jai Ho Oh's talk on Tuesday. Instead of focussing on the term and what it connotes, Professor Ho, from the department of Environment and Atmospheric Sciences, Pukyong, National University, South Korea, spoke about ways in which global warming and climate crisis need to be probed. "For one, the indices are important. They should be simple, but comprehensive, measurable and, make common sense."

According to him, the conditions for basis data to study the climate crisis index should be availability, accessibility, safety and stability. The factors which determine it are primary causes like carbon dioxide concentration and temperature while the potential crisis is food, energy and water crisis.

PRIMARY CAUSES

- **Carbon dioxide index:** New computer simulations have revealed the extent to which the average air temperatures at the earth's surface could warm by 2080-2099 if the greenhouse gas emissions continue to increase. Halving carbon emissions can help combat global warming.
- **Temperature:** Studies have revealed that over the years, the Earth has definitely become hotter. Through graphs, it was explained how temperature rise would affect the world.

POTENTIAL CRISIS

- **Food crisis:** The change in agriculture output is believed to be due to increased temperature and experts worry that as population and hunger grow, India is likely to bear the brunt.
- **Energy:** Experts from the Energy Information Association feel that all across the world, electricity is the most expensive in Japan, when domestic electricity prices are calculated.
- **Water:** Experts examining the water security index found that India's was the highest.

Also, in crisis vulnerability, the aspect of governance was discussed. In this the climate crisis index was examined from the 50's to 90s and 2000. It was revealed that from 2010 to 2020, India was in the climate mortality zone and hence, measures must be taken to tackle the problem.

CLIMATE CHANGE

It is believed that climate change could make future conflict more likely. A study by a senior scientist was quoted to explain that even a one degree Celsius temperature rise would increase the risk of African war by 55 per cent by the year 2030.

Cont... 2

Memento moments

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Pics: A Ravindranath

Dr Anil Bharadwaj, Head Planetary Sciences, VSSC presenting memento to Chris T Russell, University of California, Los Angeles

Dr Anil Bharadwaj, Head Planetary Sciences, VSSC presenting memento to Tadashi Mukai, Kobe University

Prof. P.K.Manoharan, Head, Radio Astronomy Centre presenting memento to Iver CAIRNS, University of Sydney

Prof. P.K.Manoharan, Head, Radio Astronomy Centre presenting memento to Nat Gopalswamy, NASA Goddard Space Flight Centre

QUICK 5

Iver Cairns & Nat Gopalswamy, *authorities on Solar & Terrestrial Sciences try to clear the air around solar eruptions and their possible effects*

1 ***Just like the atmosphere surrounding the Earth affects changes in its temperature and climate, is it the case with space as well?***

The temperature of the inter-planetary media; the plasma between the Sun and the Earth definitely changes its temperature with time and position, and that is driven by changes in the Sun. Since it is ionised gas the plasma tends to get hotter or colder. In the Sun, there are different levels of heating in different regions and active sunspots. The hot plasma leaves the sun and goes out. With heat variations, there is naturally a variation in temperature with time and position.

2 ***Are solar eruptions happening often? If so, why?***

Yes! they happen often depending on the phase of the Sun cycle you are experiencing and the sunspots. If there are excessive sunspots, there will be many eruptions and if there are very few or no sunspots, there will be fewer eruptions.

3 ***What are the ramifications of changes that happen in the sunspots and eruptions, on Earth's atmosphere?***

When there is an eruption, which includes both electromagnetic emissions and mass coming out from the surface of the Sun; mainly comprising of solid gas (something like a billion tonnes moving at millions of kilometres per hour) energy gets released. If the mass comes into the atmosphere, it disturbs the underlying currents. These currents are connected with Earth's magnetic field. So it is likely that Earth might experience less magnetic pull for some time. The light produced during the eruptions, especially the ultraviolet or invisible rays too reach the atmosphere. If this happens, a spacecraft in the vicinity might experience a drag and might move away from its path. It affects satellites too, which normally move in circles. Too many eruptions and the electromagnetic rays may cause them to move in an elliptical orbit, and eventually they burn up in the atmosphere.

4 ***From a common man's perspective, are we ringing the alarm bells too soon about the likely increase in solar eruptions?***

Generally it happens because lack of knowledge and fear go together. But now people do understand and want to know. We have been conducting outreach activities and awareness campaigns at various levels. Humanity has evolved for five billion years and the Sun has been active for a billion years longer. The eruptions then and now are different.

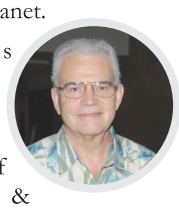
5 ***What about economic repercussions?***

We now have a more technological civilisation and are better equipped to read the indications. More importantly, we care about radio communication and about satellites not losing their paths. We care about electrical and power grids. As a technological society that depends on these factors, we are much more sensitive to large solar eruptions. According to a prediction by the National Research Council of the United States in 2009, if the solar eruptions that happened in 1923 were to happen now, they would severely damage the US electricity grid and cause a loss of almost one trillion dollars. That is why it is important to study the space weather phenomenon because we need to take appropriate measures. AOGS

Science with a human face

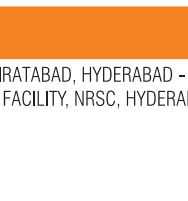
There is no such thing as applied sciences, only applications of science
- Louis Pasteur

What is the use of scientific research if it doesn't affect the lives of people in a positive way? The common man is not interested in the nitty-gritty of research and the intricate details that go into it. What he is interested in is how it will affect him. The Gateway Media team met up with some scientists from various streams to know what they have been working on and how it is going to change the lives of people and the planet.



When this question was posed to Dr Michael Brown, Professor of Geology & Department Chair, Laboratory for Crustal Petrology, College Park, Maryland, this is what he had to say, "Science has to be accessible to the public. The work that I am involved in is on the high temperature evolution of the continental crust. It provides a context to understand mineral deposits. For instance, gold, which occurs in old crust that peninsular India is made of." The knowledge of the areas of old crust, he feels, will go a long way in tapping resources.

Denise L Mauzerall, Associate Professor of Environmental Engineering & International Affairs, Princeton, New Jersey, who works on black carbon, states, "Black carbon has detrimental affects on health and is carcinogenic. Not only does it increase premature mortality and warm the planet, it also gets deposited on glaciers and increases their melting. There is a lot of research work going on in this area." Echoing the same sentiment is Surabi Menon from the Lawrence Berkeley National Laboratory. She adds, "It's nice to see the amount of work that is happening on glaciers and measurements." With global warming looming large, all the work on glaciers is surely going to help mitigate the problems.



Hiren Jethwa, a post-doctoral researcher from the Hampton University, US, says that this is the second time that he is attending AOGS. The first time he attended the meet was when it was held in Singapore. Hiren works on quantifying the atmospheric aerosols load in case of forest fires and biomass burnings using satellite measurements.

Dr Vinod Kumar, head of the Geosciences Division at NRSC says, "Remote Sensing inputs help in understanding natural disasters." He's quick to add, "Now-a-days, the concept is to look at Earth Sciences as a system. Unlike yesteryears, each branch was studied in silo. But, this conference brings all scientists from different fields of Earth Sciences together. At the same time, there is a group sharing the Planetary Science experience as well." AOGS

Heeding to warming signals

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In the second part of the session, Krishna Achuta Rao, associate professor at the Centre for Atmospheric Sciences, IIT, New Delhi, spoke on the inter-annual to decadal variations in extreme precipitation over India.

Explaining why he undertook the study, Prof Rao said, "The main reason why I chose to do this was because in the last three years, there have been very few papers which examine changes over extreme rainfall in India and the increase in rainfall events."

The purpose of his study, he added, was to examine whether the changes in the last 30 years are a threat to us. For the methodology, the Gridded IMD Rainfall Data was used and the focus was on 1x1 degree (1901-2001) dataset. However, he chose to avoid regionalism, a move which he said was deliberate. "The aim was also to find out, at what resolution one can pick up differences in variability," Prof Rao concurred.

Using the climatological 90th percentile values for each month, from 1961 to 1990, it was found that Delhi's rainfall was above the 90th percentile in the period from January 1901 to January 2005. It was also found that different locations have different periods of high and low rainfall. The cities chosen for the study were Kolkata, Mumbai, Delhi and Bangalore. Interestingly, when the 90th, 95th and 99th percentile were examined, it was found that the percentage of grid (for the low one) was almost the same. The period of the 60s and 70s vs the 80s and the 90s was also studied, the question being, is there a decadal variability? Is there some variation?

Prof Rao found that the variability of extremes is different in different locations. Also, there was a change in spatial extent, in some parts of India. In the future, he said that he aimed at examining the higher resolution dataset.

"We need to understand variability instead of the trend if we have to examine the effect of climate change," he concluded. AOGS

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