

i - SaGAA 2012 Executive Summary

The International Conference on Science and Geopolitics of Arctic and Antarctic (i- SaGAA 2012) in New Delhi was in continuation of SaGAA National 2011. Science interacts with the atmosphere, land and sea and the role of inherent geopolitics in these aspects has a special part to play which cannot be underestimated and overlooked. The Arctic and Antarctic regions have drawn the attention of scientists and researchers in the last few decades like never before. The emergence of political interventions and strategic scientific development in this region demands the utmost attention of the world. Arctic region is under transformation the change in climate has increased accessibility in Arctic and the high demand for energy resources has encouraged exploitation of the Arctic region furthermore. The decreasing Arctic sea ice and the heating of the ocean which ultimately leaves a great impact on the temperatures of the regions around the globe specifically the countries in the northern belt is a matter of concern in the scientific world. The resulting climate change and its impact on the entire human kind are immense, irreparable and irrevocable. Thus there is dire need to explore new ideas and dimensions over and regarding the aforesaid region by taking a holistic view.

The international conference held on 9th – 11th March, 2012 successfully bounded the issues of Geopolitics: UNCLOS and the global commons geopolitics of the global realms, Biotechnology: Microbial resources in Polar Regions dynamics in Polar marine biodiversity (Prokaryotes, vertebrates and invertebrates) information exchange and intellectual property rights, resources of the Southern Ocean, Ice core for Paleo climates, Southern ocean and solar impact: sea ice melting, ice core studies, Southern ocean experiments Paleo climate studies and Geology: geophysical studies glacial and fluvial environmental Southern ocean and marine environments. Theses identified themes helped for enhancing our understanding of the Polar realms by synergising geopolitics and science.

The senior scientists such as Prof. John Turner, Dr. Timo Koivurova, Dr. Victor Smetacek, Dr. John P. Bowman, Prof. Nalan Koc, Prof. John M. Reynolds, Rasik Ravindra, Dr. George John, Dr. M. Sudhakar, Dr. S. Shivaji, Dr. Ajit Tyagi, Prof. Sanjay Chaturvedi, Dr. Vijay Sakhuja, Dr. Ajai Saxena, Dr. P. A. Loka Bharathi, Dr. Maria Judith Gonsalves, Dr. Savita Kerkar, Dr. B. Meenakumari, Dr. C.N. Ravishankar, Dr. Pravin Puthra, Prof R. Ramesh, Dr. S. W. A. Naqvi, Prof. Nalan Koc, Prof. A. K. Gwal, Dr. T. Meloth, Abhinav Srivastava, Dr. C.G. Deshpande, Dr. Sandip Oza, Dr. Nityanand Singh, Dr. S Rajan, Dr. R P Lal, Jai Prakash Chaubey, Prof. S. K. Tandon, Prof. A. L. Ramanathan and Dr. D.P. Dobhal attended apart from representation from all the countries like United Kingdom, Finland, Germany, Australia, Norway and Chile.

The significant work of senior geopoliticians and scientists showed a path to bring forth polar issues in the perspective of developing a dialogue for countries with new scientific interest in the polar region. The conference also contained deliberation of P. S. Goel, Prof. John Turner, Dr.

Timo Koivurova, Dr. John P. Bowman, Prof. Nalan Koc, Prof. John M. Reynolds, Prof. A. K. Gwal, Dr. S. Shivaji and Prof. Sanjay Chaturvedi, wherein curriculum and career initiatives were discussed and directions were provided to students to streamline their careers, who came from different institutes in Delhi and other states. The participation of total 99 attendees was observed in this conference including many reputed and renowned scientists from all over the world along with students, and research scholars from different parts of India. Marvelously remarkable factor remained that the strength of the participants stayed the same from the first day to the last day of the conference, contributing to all the other incredible inputs throughout the conference that became the reason for the successful completion of the event.

The Focus

New and significant trends are emerging in the bi/tri polar discourse, especially in the wake of the landmarks achieved during the International Polar Year (IPY) 2007-09. Diverse views of myriad nations on governance proposals - as to whether the poles need a new treaty regime; on frontier research and exploitation of raw materials; on new shipping routes, on fishery development and more needs to be highlighted and consensus sought in political and scientific global meets. With changing climatic regimes and threats perceived therein it is now pertinent to look towards an amicable understanding amongst intellectuals of various nations. The debate that needs building up is whether the Law of the Sea and resource augmentation of lesser developed Nations can extend beyond the areas of national jurisdiction e.g. central Arctic Ocean. Will the interests of lesser developed countries be safeguarded and scientific cooperation achieved. The Conference on Science and Geopolitics of Arctic and Antarctic (SaGAA) reaffirms the need for concerted international dialogue regarding such and more inter-disciplinary issues pertaining to the polar regions.

What is the trajectory of future priorities for polar geopolitics and what are its legal aspects? What can marine science tell us about climate change? What implications do the changing geographies of sea ice have for polar geopolitics? How can international cooperation on polar issues be strengthened?

The International Conference on SaGAA in New Delhi, an outcome of an extremely successful national level deliberation in January 2011, will focus on these and many other related questions. Numerous experts from India and abroad will attend the Conference on 9-11 March 2012. Supported by the Indian Ministry of Earth Sciences and National Centre for Antarctic and Ocean Research, Goa, India, the Conference is a continuation of a curtain raiser national event held at New Delhi, which engaged with the momentous changes underway in the polar regions and southern oceans.

Objectives

The i-SaGAA 2012 was an initiative to discuss the interface between science and global commons geopolitics of the global realms and the role of different countries that dictate the geopolitics of the two regions.

The different objectives of this International Conference are as following:

- a) To conduct a bi/tri polar Conference
- b) To create interface between Geopolitics and Science
- c) To create a networked platform for scientists.
- d) To work towards policy and the role of developing countries like India in Polar regions
- e) To explore career opportunities and educational avenues for students

The i-SaGAA 2012 Proceedings

Preconference Session:

Curriculum Initiatives and Careers in Arctic and Antarctic Studies



Presided by Dr. P. S. Goel, Chairman, RAC, Defence Research and Development Organisations, New Delhi.

Dr. P. S. Goel discussed the global consequences of science and geopolitical issues of Arctic and Antarctic and the aspect of career opportunities for young researchers and scholars in this field of study which is yet unexplored in the country. He said that the very aspect of career by itself is related to preparing people for the needs of the country. Large number of students engaged in similar field of education will consequently bring career issues and result in larger number of unemployed masses, who are unable to get proper vocational training, resulting from lack of choices in selecting interest fields in academics and due to other infrastructural lags adding to these problems and thereby, linking education and career in a direct relationship. The issue particularly the understanding of Arctic and Antarctic and how the various climatic changes in these Polar regions effect and get affected by the change in the complex global environment is a subject that holds great career potential. As students it is really important to know that how the Antarctic science gets affected by the potential climate change which is a very intricate issue. Here improving the career prospect is the main topic. A curriculum should be initiated to address this subject in the primary, graduate, post graduate and research level. He suggested that the link to post graduate level will help in the research and career avenues. Employment in any one particular subject is another issue that needs to be addressed.

The panelists in the preconference session:

The International Panelists were:

- Prof. John Turner, British Antarctic Survey, UK,
- Dr. Timo Koivurova, Director, Northern Institute of Environment & Minority Law, University of Lapland, Finland,
- Dr. John P. Bowman, Associate Professor, University of Tasmania, Australia,
- Prof. Nalan Koc, Research Director, Norwegian Polar Institute, Norway, and
- Prof. John M. Reynolds, Managing Director, Reynolds International Limited, UK

The National Panelists were:

- Dr. S. Shivaji, Scientist, Centre for Cellular and molecular biology, Hyderabad and
- Prof. Sanjay Chaturvedi, Professor of Political Science at Punjab University and Coordination, Centre for the Study of Geopolitics, Chandigarh
- Prof. A. K. Gwal, Barkatullah University , Bhopal

Inaugural Session:



The inaugural session of i- SaGAA 2012 began with a welcome address by Dr. D. P. S. Seth Chairman, Organising Secretariat – LIGHTS, Former Member TRAI, and Ex - officio Secretary, Department of Telecommunications, Government of India, Former CMD, BSNL. Then there were addresses by Dr. Victor Smetacek, Alfred Wegener Institute for polar and marine research, Germany, Rasik Ravindra, Chairman, Organising Committee, Director, National Centre for Antarctic and Ocean Research, Goa and Prof. John Turner, British Antarctic Survey, UK. The key note address was given by Dr. P.S. Goel, Chairman, RAC, Defense Research and Development Organisation, New Delhi. The inaugural speech was given by Chief Guest Dr. Sailesh Nayak, Secretary, Ministry of Earth Sciences, Government of India, New Delhi. The vote of Thanks was given by Sulagna Chattopadhyay, Convenor i – SaGAA 2012, President LIGHTS Research Foundation, Editor, Geography and You.

The distinguished guests who attended the inaugural session were Swashpawan Singh, Former Ambassador and permanent Representative of India to the United Nations in Geneva; Dr. B. Meenakumari, Deputy Director General (Fisheries), Indian Council of Agricultural Research, New Delhi; Dr. L.S. Rathore, DGM, Indian Meteorological Department; Dr. Ajit Tyagi former DG, Indian Meteorological Department; Dr. George John, Advisor, Department of Biotechnology, New Delhi and Dr. M. Sudhakar Advisor, Ministry of Earth Sciences, Govt. of India, New Delhi.

The ceremonial session started by the introduction of the key personalities by Ms. Ankita Sah Research Officer, LIGHTS Research Foundation. A welcome address was given by Dr. D. P. S. Seth Chairman, Organising Secretariat – LIGHTS, Former Member TRAI, and Ex - officio Secretary, Department of Telecommunications, Government of India, Former CMD, BSNL.

Welcome address by Dr. D.P.S. Seth



Dr. D.P.S. Seth started his speech expressing that though he is in no way directly connected with the subject area of this conference but just happens to have a keen interest in scientific studies of such paramount importance. He also said that he loves reading articles published in the bi-monthly journal Geography and You, covering issues on science, humanities and technology. He briefly spoke about the two Polar Regions - Arctic and Antarctic and how the ocean surrounding these regions control the climatic regions of our planet, offering an ideal lab for mankind to probe issues related to atmospheric and meteorological sciences. The study of Earth sciences including, geophysics, glaciology, biology, environmental sciences, human physiology, medical sciences and cold region engineering makes the two Polar Regions most intriguing and interesting for various scientific research programmes. Further he described the objectives and the main focus of the conference. He remarked that the polar regions contain 70 % of the world's water resources and future resources of untapped minerals and hydro resources. The region has huge environmental implications and requires an equitable floor of the benefits for all. This makes the geopolitics of the regions a major subject for consideration and needs an active deliberation by all the nations of Earth. He explained that it is with these ideas and purpose that the organization, LIGHTS Research Foundation has endeavored to organise this international conference on Science and Geopolitics of Arctic and Antarctic as LIGHTS stand for learning in Geography, Humanity, Technology and Sciences. He told that this organization has been working in various areas such as research oriented field surveys, analysis and documentation outreach, brain storming seminars, conferences and capacity building programmes, exhibitions and scholarships for girl children especially in Delhi. He said that organising this kind of a conference is uniting science and geopolitics on one hand and Arctic and Antarctic issues on the other hand. Beside a workshop to discuss curriculum initiatives to include these issues in main stream is a humble new endeavor in this direction. He said that this conference will not only provide an opportunity to the scientists, researchers and the experts in geopolitics to share views

and approaches and discuss the variety of incredible work done in this field but also to disseminate these to the common masses, students and young researchers inclined to the field. Lastly, he welcomed all the reputed speakers and eminent guests towards the wonderful start of the International event.

Address by Rasik Ravindra:



The discussion was carried forward by Rasik Ravindra, Chairman, organizing Committee, Director, National Centre for Antarctic and Ocean Research, Goa.

He started his speech by reminding the 2011 SaGAA seminar. He mainly focused on the opportunity that has provided a platform to discuss the politics of Arctic and Antarctic region. He said that the regions lie in the northern hemisphere and southern hemisphere respectively, and because of their unique locations have tremendous amount of rare and undiscovered resources which demand a huge investment along with generating string of interests in the research and development field. He told that this conference has taken the lead in this sphere and in the following discussions it will not only relate to environmental aspects of science in this particular region but also it will give some opportunity to discuss the very recent issues of politics which are gradually gaining grounds in both these areas whether it is the resource potential of Antarctic or pertaining to issues of some treaty in the Arctic.

Address by Dr. Victor Smetacek:



Dr. Victor Smetacek, Alfred Wegener Institute for Polar and Marine Research, Germany

Dr. Victor Smetacek in his brief address spoke about his passion for nature and environment, his love and attachment for mountains and how he grew up in the serene and pollution free environs of Nainital, he described his trip to the Baltic Sea which is also an ice covered sea in the Arctic. He emphasized that the world is a beautiful and mysterious place with great secrets to unravel and that what is needed is to take steps towards preparing for challenges of future. He discussed about the challenges that face India like mining activities and increasing population and that how difficult it will be in future for India to accommodate 50 million people. This is a big crisis coming towards the country in the near future. He discussed how he is deeply involved with the nature and is hoping to bring some innovation through this conference and how this will go beyond science.

Key note address by Dr. P. S. Goel :



Dr. P. S. Goel, Chairman, RAC, Defence Research and Development Organisation, New Delhi

Dr. P.S. Goel in his keynote discussed about how everyone is looking towards many elements like atmospheric research, ocean development, geology etc. The issue in science is a larger issue particularly in the context of changing environment. The issue is mainly the survivability of the people in this planet. Science of Arctic and Antarctic is a small substance of the climate but is a very important subject. We have to find out the answers and the answers will lead us to the basic survival of this planet. He said that if people in this planet have to survive then many questions need to be addressed. Dr P S Goel pointed out that studies in marine biology is vital to learning the law of nature. In Antarctica there is a lot more than the science. Thus, the geopolitical issue is not entirely different for the Arctic and Antarctic. So these issues should be addressed in the larger context. He said that the space treaty is derived from the Antarctic treaty. We know that the geopolitical issues of the Antarctic are clearly drawn but there is no such clarity in the context of the Arctic region. As for Arctic it is very different in nature because it is surrounded by many developed countries. The Russians imposed supremacy by putting their national flag in a random area in the Arctic, as an indicative of possessing the ownership over the Arctic territory. It is just the issue of showing power and also giving an authoritative message to the whole world and thereby claiming the resources of the Arctic region. The scientists are making views on the geopolitical systems perhaps in a rational way and this is where the conference like this is needed, where people can debate and come up with some kind of rational thinking. In future the geopolitics should be more guided by the larger interest of the community. In past there is a concept called 'vasundhara kutumbakam' which means the whole earth is our own family. But in present scenario this concept is seemingly difficult to work, as the whole world is divided into different nations and various societies. So the question here arises that can the scientists and community resolve this issue? He said that we have to succeed in the larger goal of keeping earth as one sustainable system. In this context the science and geopolitics is quite valid.

All of these issues are important to understand and initiatives have to be taken to resolve these critical scenarios encompassing the Polar Regions.

Chief Guest Address by Dr. Sailesh Nayak:



Dr. Sailesh Nayak, Secretary, Ministry of Earth Sciences, Government of India, New Delhi

Dr Sailesh Nayak started his speech by saying that the most peaceful part of the world is Antarctic and it is not a sovereign country and that the area is largely managed by the scientists. The scientists have their rules and regulations about how to protect the environment, what kind of experiment should be done. This is extremely a good system where people of almost 25 countries sitting together decide about the various aspect of this region. There are different rules and regulations related to environment, fishing and all different fields. He discussed about the science and geopolitics of Antarctic, Arctic and also Himalayan South pole. India's interest in Arctic and Antarctic purely stands on science because whatever happens in these areas largely effects India as well and since the earth behaves as a single system the effects are felt worldwide. He discussed about how science interact with the atmosphere land and sea. So it is essential to learn exactly what is happening in this region. He spoke about the decreasing Arctic sea ice and the heating of the ocean which ultimately leaves a great impact on the temperatures of the regions around the globe specifically the countries in the northern belt. He spoke about the projects undergoing research work on the studies of the effects of Northern Arctic region on the Indian monsoons, likewise there are various issues that are more global in nature and not pertaining to any country. He also raised the issue of climate change which affects the whole world. India is very active in the Antarctic from the last several years, contributing with the establishment of major stations like Maitri space station and another in Larsemann Hills, which is on the eastern side where we can understand the Antarctic much better as the area was adjoined with Indian peninsula years before. Another issue is the study of Paleo climate which can help us understand the insight on the past climate and environment. He also put forth the

issue of glaciers which can be discussed in Antarctic and Arctic but acknowledged the difficulty to start the study in the Himalayan region and added that another area that needs to be addressed is the biological aspect or the bio diversity which is of utmost importance to any field of study. He also said that there are several new species in Antarctic and Arctic and these areas need to be studied to learn and understand the various complicated and interconnected aspects. So it is essential to learn how the plants and animals survive in these kinds of complicated conditions and realise that earth's sustainability depends on how we learn from the nature especially from the Antarctic and Arctic. In this case all kind of scientific experiments should continue further and studied deeply. He again asked the scientific community to go ahead to explore and manage the large continent and also learn more about the region so that the Antarctic, Arctic and Himalaya is available to the future generation for the scientific experiments and exploration.

Vote of Thanks by Sulagna Chattopadhyay



Sulagna Chattopadhyay, President, LIGHTS, Research Foundation, Convenor I – SaGAA 2012

Sulagna Chattopadhyay gave her heartfelt thanks to all the distinguished guests, speakers and all the participants for their participation and also commemorated the processes that underwent in making the International Conference on Science and Geopolitics of Arctic and Antarctic (i-SaGAA 2012) a success.

The Plenary Session or Theme A:



Geopolitics: UNCLOS and the Global Commons Geopolitics of the Global Realms

Chaired by Swashpawan Singh, Former Ambassador and permanent representative of India to the United Nations in Geneva

Co - chaired by Dr. Timo Koivurova, Director, Northern Institute of Environmental & Minority Law, University of Lapland, Finland.

The session was started by Prof. Sanjay Chaturvedi who presented his paper on “Geopolitics of Knowledge and Future of Antarctic Governance”, Dr. Vijay Sakhuja presented his paper on “Politico - strategic developments in the Arctic Region”, Dr. Timo Koivurova presented his paper on “Arctic is warming – can the Arctic Council counter the vast challenges ahead?” and Dr. Ajai Saxena presented his paper on “Applicability and efficacy of Indian environmental laws in managing high seas and Antarctic”.



Prof. Sanjay Chaturvedi discussed about the background of Antarctic Treaty and the claims great game in Antarctica. The countries that mutually recognize each other's claims are Australia, New Zealand, Norway, France and the UK. He discussed about 1959 Antarctic Treaty, the scope of this treaty and the key principles of Antarctic Treaty. He discussed about Antarctic Treaty consultative meeting. India arrives in the Antarctic scene in the period of CRAMRA negotiations and also the rise and fall of CRAMRA: Crisis of consensus in the ATS. He also talked about 1991 Environmental Protocol: object and purpose. He also discussed about geopolitics of fear and finally he spoke about the key questions.



Dr. Vijay Sakhuja spoke about how Arctic region is under transformation. The climate change has increased accessibility to the Arctic and the high demand for energy encourages exploitation of Arctic resources. The competing claims under 1982 Law of the Sea. He also talked about the average temperatures in the Arctic region rising twice as fast as elsewhere in the world. He discussed about politico strategic dynamics in Arctic boundaries, resources and routes and also specially focuses on the energy resources in the Arctic. He also focused on climate change and international shipping. The Asian responses in the changing Arctic were also discussed and how China, Japan and India are working there was clearly indicated.



Prof. Timo Koivurova spoke about the background larger changes playing into how the Arctic wide co-operation has evolved. Analysis of the changes in Arctic wide-operation from the perspectives of institutional structure, mandate and mode of functioning and the future problems and possibilities. The image changed during the Arctic Council sponsored ACIA, which turned the image of the region to its previous opposite: dynamically changing region. He also discussed about why in Arctic there is outside interest. Finally he said that the AC has stepped up its efforts because of the changing image of the Arctic, A5, outside interests, etc. and it is gradually consolidating itself. It has found a "niche" for itself by producing reliable and relevant science and yet, still, the A8 seem to treat it as their "backyard", which does not promise much for the capability of the Arctic governance system to address the vast challenges ahead to its sustainability and lastly there would be a great chance to involve also other States (who have guaranteed maritime rights in the Arctic) for broader Arctic (and even world) governance – when the sea ice is still there.



Ajai Saxena talked about obligations under UNCLOS & Customary laws for protection of marine environment. He discussed about world Summit on sustainable development (UNCED) 2002 & Agenda 21 and the Convention on Biological Diversity (CBD) and Annex V of Madrid Protocol, 1991 under ATS. He also talked about environmental protection and biodiversity

conservation laws and issues related to applicability beyond the National jurisdiction. Some steps those are needed such as an immediate step applicability of our special laws such as WPA, BDA and EPA are to be extended beyond Territorial Waters to the EEZ. To meet our obligations in areas beyond our national jurisdictions, such as the Seabed allotted under the LOS, operational areas in Antarctica including ASPAs and ASMAs, need to be included in EPA, WPA and other relevant Laws / Regulations and need to enact special law(s) for managing areas under our jurisdictions/control in High Seas and in Antarctica.

Concluding comment by the co – chair Prof. Timo Koivurova:

We should be mindful of the terminology we use as the law of the sea convention (UNCLOS) is mentioned in the title of this panel. In the Arctic, this is not a correct term as the United States is not a party to the UNCLOS. This has practical relevance: the US cannot make submission to the commission on the limits of continental shelf (CLCS).

One challenge that we face in both Polar Regions is that we are standing at cross-roads in both polar regimes. This has been a clear red line going through all the presentations: will the claimant states in the Antarctica continue to hold on to their claims, one possible trajectory identified by Prof. Chaturvedi or will the Antarctic treaty system finally start acting as trustees for the region. Will the arctic state continue to develop their national interests in the area, as suggested by Dr. Sakuja or will co-operative “stewardship” orientation become the dominating logic in the region. The chair of the session Ambassador Singh also referred to this dilemma trusteeship logic-governing the polar regions via common interests of human kind was agreed by all panelists to be the best way forward, as also suggested by Dr. Saxena.

The Second Session Theme BI:



Biotechnology: Microbial resources in Polar Regions dynamics in Polar marine biodiversity (Prokaryotes, vertebrates and invertebrates) information exchange and intellectual property rights, resources of the Southern Ocean

Chaired by Dr. George John, Advisor, Department of Biotechnology, New Delhi

Co – chaired by Dr. S.Shivaji, Centre for Cellular and Molecular Biology, Hyderabad

This session was started by Dr. John P. Bowman presented his paper on Genomic, functionality and ecology of closely related true versus ‘part time’ Psychrophiles of Antarctic”, Dr. S.Shivaji presented his paper on “Cold loving bacteria from Antarctic an Arctic: occurrences, survival and usefulness”, Dr. Victor Smetacek presented his paper on “Harnessing the biosphere to mitigate global climate change and sea level rise.



Prof John Bowmen lecture mainly centered on Genomics functionality and ecology of psychrophiles of Antarctica. The highlights were the Psychrophilic bacteria possess additional genes required for cold adaptation such as genes coding for poly-unsaturated fatty acids, exopolysaccharides etc., Psychrophiles generate energy from light via proteorhodopsin light harvesting system and Enzymes, pigments and fatty acids could be of immense use to biotechnology.



Dr. S. Shivaji mainly spoke about Antarctic bacterial diversity is immense and very similar to the diversity in the Arctic and Himalayan glaciers. He said about the novel species are a bioresource and could be used for generating enzymes, pigments, fatty acids etc. for use in biotechnology. He said that the modulation of membrane fluidity is crucial to survival of life forms at low temperature. Finally he said that the candidate genes have been identified for their role in cold adaption.



Dr. Victor Smetacek presentation was an eye-opener with respect to global warming. It also offers a strategy for mitigating the global change by sequestering CO₂ from atmosphere by carrying out iron fertilization of the Southern Ocean. The role of phytoplankton in sequestering CO₂ and subsequently zooplankton which graze on the phytoplanktons and sequester CO₂ to the deep sea bottom was very vividly described.

Concluding recommendation by the co – chair Dr. S. Shivaji:

Firstly, strengthen microbial diversity studies in Antarctica, Arctic and Himalayan glaciers. Secondly, identify genes involved in cold adaptation for possible application in low temperature agriculture. Thirdly, focus on enzymes, pigments, fatty acids etc. of importance to biotech industry. Lastly, sequence novel psychrophiles for identifying new genes and pathways.

Theme B II:



Chaired by Dr. Victor Smetacek, Alfred Wegener Institute for Polar and Marine Research

Co – chaired by Dr. John P. Bowman, Associate Professor, University of Tasmania, Australia

The first presentation in this session was given by Dr. P.A. Loka Bharathi on her paper “Importance of contextual information for harnessing microbial resources from polar regions”, Dr. Maria Judith Gonsalves presented her paper on psychotropic metal tolerant bacteria from mobilization of metals”, Dr. B. Meenakumari has presented her paper on “ Antarctic Krill Harvesting – Indian experience”, Dr. Savita Kerker presented her paper on “The effect of a temperature rise on the sulfate reducing rates in cold marine sediments of Kongsgforden (Svalbard, Arctic ocean)”, Dr. C.N. Ravishankar presented his paper on “ Post harvest technological aspects of Antarctic krills Euphausia Superba Dana” and finally Dr. Pravin Puthra presented his paper on Squid Jigging operations in the Southern Ocean”.



Dr. P. A. Loka Bharathi spoke about extreme conditions at the pole. She identified some characteristics of Polynyas they were, increase in warming, increase in terrestrial DOC and increase bacterial respiration and out gassing. The adaptations are cold, arid saline conditions, compatible solutes or osmolytes, amino acids and polyols, and glycine, betaine, ectoine, sucrose, trehalose glycerol. She also discussed about application of metabolites. She also spoke about growing number of biotech companies. She also discussed about awareness and needs such as environmental Diplomacy & Governance and stress on ecological aspects. She has also suggested some immediate actions importance to linkages components, emphasis on emergent properties of interactions, accelerate basic understanding, endeavour to simulate natural conditions and co-ordination to increase complementary research and environment nurtures.



Dr. Maria Judith Gonsalves discussed about a broad coverage of metal mobilization potential by cold-adapted (psychrotrophic) Antarctic bacteria. She found that most of her isolates from lake and sea water samples were metal resistant, i.e. , Cu^{2+} , Cd^{2+} , CO_2^{+} , Hg^{2+} . She proposed that these bacteria could be applied to mobilise metals in a useful way, e.g. , iron fertilization of the ocean.



Dr. Savita Kerkar in her discussion demonstrated that sulfate reduction in Svalbard was higher temperature (simulating climate change). She suggested that SO₄ reduction rates could also be affected by changes in salinity and found SO₄ reduction was still high even at quite low salinity. The sulfate reducing rate increased by 45% with a 4°C rise in temperature SRB contribute to the CO₂ flux. There is an increase in the utilization of lactate and acetate at 4°C compared to 0°C. SRR are maximum at 30 psu however due to global warming where glaciers melt, SRR decreases.



Dr. B. Meenakumari in her presentation spoke about Indian experience in Arctic Krill harvesting. Antarctic krill (*Euphausia superba*) is adjudged to be one of the promising under-utilized resources at a time when most of the conventional resources are either approaching or have exceeded maximum sustainable limits. This has a circumpolar distribution and is central to the food chain of the Southern Ocean which estimates of krill stocks vary greatly, but generally fall between 100 and 500 million tonnes (Kalinowski and Witek, 1983). She also discussed about detection of krill swarms and commercial krill harvesting operations. Finally she said that in view of the expanding market for krill and krill based products and the perceived massive

abundance of krill stocks in Southern Ocean, the interest in the Antarctic krill fishery is expected to increase significantly in future.



Dr. C.N. Ravishankar described post-harvest processing of krill including demonstrating the facts on fluoride content Omega-3 oils and essential amino-acids. The discussion mainly suggested krill fishing to be problematic due to various problems like declining stocks, salpsbloching trawler nets etc.



Dr. Pravin Puthra gave the final presentation who described in his presentation about squid jigging and the particular problems related to that and various benefits in developing a squid fishery in the Southern Ocean.

Concluding recommendation by the co – chair Dr. P. Bowmen:

He said that the presentations ranged from basic to extremely applied phase. It is hoped that this research leads to benefits to India and that the resources explored can be sustainably harnessed.

The Third Session Theme CI:



Ice Core for Paleo Climates, Southern Ocean and Solar Impact: Sea Ice melting, Ice core studies, Southern Ocean Experiments Paleo climate studies

Chaired by Prof John Turner, British Antarctic Survey, UK

Co-chaired by Prof. A K Gwal, Barkatullah University, Bhopal

This session was started by Prof. R. Ramesh's presentation on "First stable isotopic study of Southern Ocean Surface water and atmospheric water vapour", Dr. S.W.A. Naqvi presented his paper on "Ocean iron fertilizations an updates based on LohaFEX Experiments, Prof. Nalan Koc presented her paper in "Arctic sea ice – Past , present and future".



Prof R. Ramesh spoke about the study of stable isotope from southern ocean surface water and atmospheric water vapour. This study may help in assessing the extent of Global warming and thereby context of ice melting.



Dr. S. W. A. Naqvi discussed about the detailed overview of iron fertilization of ocean with the help of LOHAFEX Experiment. The results have explained its implications in the generation of Vphytoplankton in the Southern Ocean. He had also discussed various micro-nutrients.



Prof. Nalan Koc discussed about the Arctic sea ice extent which is having decreased trends in all seasons. This will reveal that Arctic would be ice free in summer. Datasets show the climatic trend. She had suggested that the ice cores from Savalbard will be investigated and worth to predict paleoclimate.

Theme C II:



Chaired by Dr. M Sudhakar, Advisor, MoES

Co-chaired by Prof Nalan Koc, Research Director, Norwegian Polar Institute.

This session was started by the presentation of Prof A. K. Gwal on his paper “Space weather impact on high latitude ionospheric TEC during the low solar activity period”, Dr. T. Meloth presented his paper on “Twentieth Century Warming and associated increase in atmospheric pollutants at coastal Antarctica – A case study based on an ice core from the Dronning Maud Land”, finally Abhinav Srivastava presented his paper on “Study of secular inter annual variations of sea ice boundary of the Antarctic and the Arctic using altimeter data in the context to climate change”.



Prof. A. K. Gwal gave introduction about space weather observations such as total electron count and their importance in communication permeability and how it effects the communication. He provided definitions to the glossary of terms being used in his study (e.g. terrestrial plasma). He listed different space weather effects and GPS working principle, satellites in orbit and the

communication being effected by Ionosphere scintillation. He also presented the results of 2nd April to 10th Oct 2010.



Dr. T. Meloth shared with an overview of issues - Rising global temperature and Southern Hemisphere shift in Southern Annular Mode and Southern Hemisphere wind regime. He presented temperature trends in Northern and Southern hemispheres. He talked about climate reconstructions like paleoclimate reconstructions and instrumental records. Many instrumental records are only from the coastal Antarctica. He said that no interior data available. He showed the data since 1960 at Nova Station. The southern hemisphere data available is only for the past 50 years. He emphasized the importance of dating of ice cores as “High resolution records”. He gave data from 30 m long firn core representing about 50 years. The data presented include dust fluxes, their variability and climate. He discussed that the increased dust flux since 1980s seems to be influenced by shift in SAM. Trace metal sourcing is also described, however, he presented the source of dust and mechanisms involved that also carry pollutants.



Abhinav Srivastava used JASON-2 Altimeter along track data on coastal Antarctica 3 year analysis KU and C band data used (for 2009-2011). He said that the ice flags were used and variations between the years were seen. He discussed how different sectors of Antarctica sea-ice cover variations were observed from year to year. Lastly, he said that the brightness temperature values were assessed from the radiometer.

The fourth session Theme D I:



Polar Atmospheric Research: Ozone depletion Meteorological Studies

Chaired by Dr. Ajit Tyagi, Former Director General, IMD

This session was started by the talk of Prof John Turner who presented his paper on “Contrasting Climate Change in the two polar regions”, Dr. C. G. Deshpande presented his paper on the atmospheric aerosols and electrical measurements over polar regions” and lastly Dr. Sandip Oza presented his paper on “Investigations of the recent polar ice variations observed from the space – born optical and microwave sensors”.



Prof John Turner spoke on Polar Atmospheric Research is finding and that two Polar regions have undergone different climatic changes in recent decades while there has been a large scale warming across much of Arctic with resultant loss of permafrost and reduction of snow cover, the bulk of Antarctic has experienced little changes in surface temperature over the last 50 years although a slight cooling is evident around east Antarctic and warming across West Antarctic.



Dr. C.G. Deshpande spoke about his observation in polar region. He discussed about both Antarctic and Arctic atmospheric aerosols and electrical measurements over the regions and the outcomes of this research. These two regions are very important in case of electrical measurement. These Polar Regions are key players and they are having key role in climate change. They are very sensitive to the global changes. He said that the measurement of atmospheric aerosol was collected since 1920 onwards. He explained about the aerosols and also about global thunder storm activity.



Dr. Sandip Oza discussed about topographic factors, land, ocean distribution and meteorological conditions have been attributed to different climatic changes between two Polar Regions. Antarctic Ozone hole is hypothesized to have played profound effect on circulation on high latitude ocean and atmosphere isolating Antarctic region. Polar Regions are considered as clean observatory and provide unique opportunity to carry out observations to understand natural physical processes.

Concluding recommendation by the chair Dr. Ajit Tyagi:

He said that the long time series of meteorological, oceanic, cryosphere and environmental observations (aerosols) are recommended over Arctic & Antarctic Region. The Space based Studies hold great potential in Polar Studies and needs to be integrated in Polar observation & Research programmes.

Theme D II:



Chaired by Prof. R. Ramesh Project Director, ISRO

The first presentation of this session was given by Dr. Nityanand Singh on his paper “Reduction in Arctic – Antarctic Thermal Contrast and decline in Asia – Pacific Monsoon intensity and all India monsoon rainfall”, Dr. S. Rajan presented his paper on “Inner Seasonal Variability in an Arctic fjord: The Kongsfjorden System as a natural laboratory for climate change”, Dr. R. P. Lal and Dr. Ajit Tyagi presented their paper on “Temperature variations at Schirmacher OASIS and Larsemann hills during last two decades”, lastly Jai Prakash Chaubey has presented his paper on “Atmospheric aerosols studies over Arctic initiatives for long term data”.



Dr. Nityanand Singh started his discussion by saying, from 1979 onwards Southern Hemisphere has warmed more ($0-7^{\circ}\text{C}$) than the Northern Hemisphere (0.47°C). Temperature Gradient from equator to pole has decreased. Therefore, monsoon has become weaker by 4.5%. Rainfall prediction is difficult



Dr. S Rajan spoke about the work done in collaboration with NIO Fjords are ideal for climate change studies because the combined influence of Atlantic water masses and glacier runoff causes significant changes in salinity. The author was interested in the monitoring of biology: phytoplankton bacterial abundance, phyto-pigments, DNA, particulate matter phytoplankton increases with time, with maximum in September. There was no change in nutrient concentrations. Diatoms are more abundant than flagellates, which are again greater than prokaryotes.



Dr. R P Lal, IMD discussed about the basic information is provided for the sake of students present in the audience. He showed the 27 years of data (1971-2000) which was presented by Dr. Turner for the Antarctic region. Temperature in the Larsemann hills (Bharati region) are composed with those at Maitri (Schirmacher Oasis) data for maître is available with IMD. Other data are collected from Russian and Chinese stations. Maximum standard deviation in temperature is seen in winter months in all stations. Minimum temperature is in August. NOAA temperature of Antarctica shows a rising trend. But IMD data shows a cooling trend. Is it because of instrumental error?



Jai Prakash Chaubey started his discussion by saying that he participated in the 'V' Arctic expedition in 2010. Hanle in Leh is the second highest aerosol laboratory in the world operational in 2009 (first highest is in Nepal). Antarctic column aerosol does not range with location, but black carbon changes from location to location. Black carbon in the Antarctic varies between 0-120 mg/m³. During summer the loading is very less. Median values are lowest in October. Black carbon increases in the winter because of transport by winds. And finally the local and long range transport must be quantified in future.

Concluding recommendation by the chair Dr. R Ramesh:

He said that the initiative for the long term data in the Arctic is very clearly articulated. The inner seasonal variability in an Arctic fjord the Kongsfjorden systems as a natural laboratory for climate change was discussed by a colleague of S. Rajan. Another presentation is on black carbon is very important for atmosphere gas control. These two are very interesting initiative and bring sustain management for long time. The two papers are very interesting about temperature variations at Schirmacher OASIS and Larsenmann Hills during last two decades and another is on monsoon intensity and all India monsoon rainfall and because of the changing temperature contrast equator and poles.

The Fifth Session Theme E:



Geology: Geophysical Studies Glacial and Fluvial Environmental Southern Ocean and Marine Environments

Chaired by Rasik Ravindra, Director, National Centre for Antarctic & Ocean Research, Goa

Co – chaired by Prof. S. K. Tandon, Former Pro. Vice Chancellor, Delhi University

This session was started by the presentation of Prof. John M. Reynolds on his paper “Comparison and replicability of ground penetrating radar surveys for detailed glaciological investigations between the polar and Himalayan regions”, Dr. M. Sudhakar presented his paper on “Who control seabed mineral resources in the Antarctic and the Antarctic ocean”, Dr. D. P. Dobhal presented his paper on “Recent retreat of Himalayan glaciers as evidence of climate change; observation and analyses”, and finally Rasik Ravindra presented his paper on “Evolution of Rocky Oases in East Antarctica study by Indian Scientists”.



Prof. John Reynolds spoke about comparison and explicability of grounds penetrating radar surveys for detailed glaciological investigations between the polar and Himalayan regions. He discussed about the radio glaciology, examples from Polar Regions, examples from non Polar Regions, potential applications in Himalayas. He also spoke about radio echo, soundings where the information is derived from RES measurements.



Prof. A. L. Ramanathan talked about the glacier mass balance studies in Vestre Broggerbreen, Svalbard region. The data related to glaciers is very important for the understanding of climate change. He discussed about mass balance and other glaciological studies requires knowledge of ice thickness, ice velocity, surface elevation and snow accumulation either from direct field measurements or via remote sensing methods. He talked about GPS standard tools for field measurement of ice kinematics and surface topography in the interior of the Antarctic continent.



Dr. D.P. Dobhal discussed about recent retreat of Himalayan Glaciers as evidence of climate change, observation and analyses. He spoke about world glaciers distributions in the Antarctic and Arctic and also about Himalayan glacier domain and studies undertaken. He talked about the general observations and also discussed about various studies undertaken by Wadia Institute of Himalayan Geology (WIHG). He has concluded on that the forthcoming Indian satellites will be useful for climate change studies in the Polar Regions.



Dr. M. Sudhakar spoke about who controls the seabed mineral resources in the Antarctic and the Antarctic Ocean. He talked about Third United Nations Conference on the Law of the Sea (UNCLOS-III). This was signed by 110 Countries in 1982 and came into force in 1994 when 60 countries ratified. The International Seabed Authority was established in 1996 and it deals with the Mineral Resources on the Seabed in the “AREA” beyond jurisdiction of countries. He talked about World distribution of Mn Nodules and Crusts. He raised lots of questions some of them are Do you need establish a new legal regime or the current regime of. Whether ATCM has its purview to address the issue related to Antarctic Ocean.



Rasik Ravindra spoke about Evolution of Rocky Oases in East Antarctica Study by Indian Scientists. He talked about Schirmacher Oasis on the eastern side of the Antarctic is the location for the next station. This oasis is a life house and unique in many terms. There are huge mountain ranges surrounded the Oasis in the eastern Antarctic region. There are continental ice, polar ice caps that override Schirmacher Oasis. There are various well water channels assuring ice towards the sea. All the ice has been moving for last many years flow around 20,000 years before. There are pressure ridges on the western edge of Schirmacher Oasis. Frozen tidal effects can be seen on the flow of ice in the various monitors providing data that study the flow of ice in the Antarctic. The record of summer and winter shows the surface on the ice shelf in the Antarctic. The long period of exposure of the terrain to the weathering processes after the retreat of the ice mass are shown by the super imposition of the wind features. The erosional features are indicative of an extensive erosional regime in operation immediately after the retreat of glacier. The studies of the Oasis has revealed that the areas was deglaciated in the early part of the Holocene or slightly before it and that a system of lakes had revealed making use of the depression carved and by glacial scouring.

Summary and Valediction Function:



Presided by Dr. B. Meenakumari, Deputy Director General (Fisheries), Indian Council of Agricultural Research, New Delhi



Dr. B. Meenakumari said that there is no need of influencing politics with science. However, when there is a discussion on the Arctic and Antarctic one cannot do away with politics, as these regions come under no man's land or territory, thereby politics cannot be excluded in this area. She said that on the Indian scientists who have worked extensively on Antarctica and Arctic his great responsibility to protect the special role of India. She specifically pointed out that 1983 Chile supported 201 scientists, Germany produces over 60 percent of Antarctic research papers, Argentina 18 papers and 250 core personnel, UK 80 personnel and 181 scientific papers. She urged Indian to think in a work diligent way on how much resources are being spent on the research and what is the outcome in the field.



Observation by Dr. M. Sudhakar, Advisor, Ministry of Earth Science, Government of India

Dr. Sudhakar started by saying that he appreciated the efforts of LIGHTS, Research Foundation to organise this international conference on the field of that undertakes controversial issues. He thanked all the institutional rational scientists from all around the globe to accept to present their papers. He congratulated LIGHTS to take the initiative and deliver the great standards. He stated that the way to deal in the area of Antarctic and Arctic is with the complete hand in hand approach of science and politics towards the issues.



Observation by Dr. Ajit Tyagi, Former Director General, IMD

Dr. Ajit Tyagi said that the paramount of the scientists is the credibility of the confidence of the layman and the politicians around the world. The larger goal of the society should be emphasized in this field of research and study that can benefit the world as a whole. A lot of science needs to

be done, observations need to be focused and more data needs to be collected. He said that only good science can lead to good geopolitics.



Observation by Dr. Timo Koivurova, Director, Northern Institute of Environmental & Minority Law, University of Lapland, Finland

Dr. Timo Koivurova said that, there exists a very widely accepted strong governance of Geopolitics in National and International level in both the Polar regions. He said that the presence of Arctic Council and Convention for Biological Diversity (CBD) is not enough as there is much more International space and we require more ambitious government interventions. He also said the it is our duty as academics to provoke the sense of trust issues, stewardship, principals that can help open a window of opportunity and as scientists to present our ideas on the scientific work being done on both the Polar regions within the realm of Polar vulnerability at the right time.



Observation by Dr. John P. Bowman, Associate Professor, University of Tasmania, Australia

Dr. John P. Bowman said that the area of Polar geopolitics and science is very vast and wide and that there are many commercial interests that also combine with various geopolitical aspects, thereby harnessing the actual resources of the Arctic and Antarctic in some form or the other. He spoke about the 'future crisis' to be brought by the ever increasing trend of world population, resulting to scarcity of resources and shortage of food supply, the consequences and effects of which will be detrimental and this situation will be the same everywhere around the world. He emphasized on scientific integrity and said that what is important and required is the role of fair and really good science, good attitude, and selfless work to fight future challenges that the world will have to face as one. He credited the i-SaGAA 2012 for helping to bring a platform where such vital issues can be realized and understood to help take best actions for the coming future.



Observation by Rasik Ravindra, Director, National Centre for Antarctic & Ocean Research, Goa

Rasik Ravindra said that the various talks given in the Conference contribute to a great variety of work done on the Polar regions. He told that there is no such platform that deals with subjects on Arctic and Antarctica in the External Affairs Ministry or Ministry of Foreign Affairs in India. He also told that in 1970s' the importance of divulgence in this field was realized by Smt. Indira Gandhi, and that science was the currency to the Antarctic. He said that understanding that the global atmospheric processes are very intricately linked and that environmental changes in the Tropical or Polar regions will eventually affect the whole planet as one, and therefore it is important for India to recognize a certain platform in these regions as a country and along with doing great scientific work also realize its stand in the geopolitics of Arctic and Antarctic.

Feed Back:

Dr. V. Sampath:

The Panel discussion in the pre-conference session on careers in Arctic and Antarctic, under the able leadership of Dr. P.S. Goel, Former Secretary, MoES and presently the Chairman, RC of DRDO, has suggested a number of measures for including in the school and college/University curriculum, which are critical for Polar Science studies, which are commendable.

Like the School Packs for Antarctic Studies developed by the British Antarctic Centre, India also should develop such a school pack on Polar Sciences and make them available to the schools/colleges/universities across the country. In the Universities, courses on Arctic and Antarctic studies should be included in the curriculum of the Academic Staff Colleges to create a knowledge base among the college/university faculty on Polar science and its importance/benefits to mankind.

Psychrophilic bacteria appear to have very good potential for synthesizing bioactive compounds. Efforts should be made to link up the polar biotechnology programmes – particularly the polar microbes, which have potential for pharmaceutical application, with the National Drugs from Sea Programme of the Ministry of Earth Sciences, to begin with as a pilot initiative. NCAOR could be the nodal agency with CCMB providing the scientific and R&D back up for the programme.

SAGAA 2012 was very well organised by LIGHTS under the dynamic leadership of Dr. D.P.S. Seth and Ms Sulagna Chattopadhyay and their Team. The topics chosen were in line with the global change and the Antarctic Treaty and Arctic Council. The Experts/Speakers have been chosen with utmost care, who have given the audience an in depth analysis of the issues and helped in upgrading the knowledge and understanding of Polar Science and its implications on the planet earth.

Dr. Savita Kekker

The first session on geopolitics was very informative and novel field for scientific people to ponder upon. The session on Geopolitics: UNCLOS and the Global Commons Geopolitics of the Global Realms and the session on Biotechnology: microbial resources in Polar Regions dynamics in Polar marine biodiversity (Prokaryotes, vertebrates and invertebrates) information exchange and intellectual property rights, resources of the Southern Ocean was most interesting session.

Jai Prakash Chaubey

It was very interesting and very informative for the polar scientists. It can be much better if we make a list of links on which we will find more information on all these aspects. The global perspective provided by the meeting was very beneficial.

The first session has provided with a view of political scenario involved in the scientific works at Arctic and Antarctic. Arctic Council and the Indian stand in Arctic is also interesting. Arctic and Antarctic being explored successfully from many decades and the politics linked to the climate change also works on noteworthy in the conference.

Dr. Parmanand Sharma

Geopolitics discussions were really very informative and worthwhile on this platform. The curiosity regarding the incorporate scientist community with policy makes for positive outcome of the science. Although there is lot of discussion regarding science that should be away from politics but there are wonderful outcomes recommended by delegates regarding policies that will help to grow science in these remote regions. The talk given by Prof. Sanjay Chaturvedi where he explained why global commons geopolitics is necessary and very supportive for providing fair science was wonderful. Even there is lots of interest for power in individual countries but there is a need to create a platform to establish association to sort out all the problems. ATS, ATCMS etc have come out with lots of situations.

The third session was really very interesting and had information for common man as well as deep scientific researches. Generally, this is well known and accepted fact by most scientific groups that the Arctic sea ice extent has been developing rapidly. But community worries about the fact that the changes undergoing day by day since 1990, indicate that Arctic could be ice free in summer much earlier than expected. The forth session was very interesting and had lots of information for anthropogenic signature coated by researchers including black stone.

Dr. P. A. Loka Bharthi

The first session was a totally new field for some of us and helped learn new perspectives from geopolitical angle including strategies and difficulties in involving all in global common geopolitics. The fourth session gave a learning experience and also helped realize situations when experiments do not yield results envisaged. Noting the crucial role of microbes underplayed.