# National Award in the field of Polar Science & Cryosphere
## Dr. Anil Vishnupant Kulkarni

Dr. Anil Vishnupant Kulkarni is a distinguished visiting scientist, presently working at the Divecha Centre for Climate Change, Indian Institute of Science, Bangalore. His journey in glaciology and cryosphere science started in 1979, where he joined Space Applications Centre (SAC), Ahmedabad , as a Junior Research Fellow. His career took shape as a scientist in SAC, where he served for a period of 30 years, between October 1980 and June 2010. Prior to his career as a Scientist, he acquired a post graduation degree in Applied Geology from University of Roorkee , now known as Indian Institute of Technology-Roorkee. In 1987, he was awarded a Commonwealth fellowship at McGill University, Montreal, Canada where, he obtained a Masters degree in Geography, followed by a doctorate degree in Geology, in 1995 from Shivaji University, Kolhapur, Maharashtra.

Dr. Kulkarni has developed a vast number of remote sensing based methods and models to understand the Himalayan cryosphere. The methods are widely used till date to map seasonal snow cover, glaciers and moraine dammed lakes. The models have also been successfully used for glacier mass balance, snow albedo, stream runoff, and to understand influence of climate change on Himalayan cryosphere. His initial investigations provides the information about: distribution of glaciers in the Himalaya, the changes in glacier area and the dramatic impact of climate change on Himalayan Cryosphere. He has extensively mapped the glacial terminus of about 1868 Himalayan glaciers, using a combination of field and remote sensing data. The study helped in understanding the process of glacial fragmentation in Indian Himalaya.

Dr. Kulkarni developed a model to estimate glacier mass balance by monitoring snow line on the glaciers. This has provided, the information on the mass balance of large number of Himalayan glaciers and indicated terminal retreat, as for many glaciers the snow line at the end of summer is higher than maximum glacier altitude. This work has created national and international awareness about the impact of climate change on Himalayan glaciers. Dr. Kulkarni lead numerous expeditions to Himalayan glaciers and initiated the use of modern techniques such as Ground Penetrating Radar, Laser Range Finder, GPS and Spectral radiometer for the study of glaciers.

Dr. Kulkarni has also developed a new algorithm to monitor seasonal snow cover and generated information about seasonal snow cover for the

Himalayan region. The results from this investigation showed seasonal snow cover melt in the middle of winter, which in turn influence the stream runoff. This is an important fingerprint for global warming. Dr. Kulkarni developed for the first time in India a snow and glacier melt runoff model to assess hydropower potential of small Himalayan streams and the study has provided hydropower potential of all glaciated streams in Himachal Pradesh, therefore contributing in systematic planning of resources and development of the country. His snow melt runoff model has also shown impact of climate change on hydropower generation, indicating reduction in power potential in all the seasons.

Recently, at the Indian Institute of Science, Dr. Kulkarni and his team developed a model based on velocity, slope and flow law to estimate distribution of ice-thickness. The technique has been successfully used in the Gangotri Glacier, indicating maximum thickness of glacier ice as 500 m. The technique can further be used to estimate distribution of ice thickness of thousands of glaciers in the data-scarce Himalaya, which will provide better estimate of glacier stored water in the entire Indian Himalaya. Dr. Kulkarni and his team have used combination of glacier mass balance and climate models to understand glacial mass loss under different emission scenario, indicating the threat to water resources under high emission scenarios. These contributions make Dr. Kulkarni one of the leading authorities in the world on Himalayan snow and ice cover.

Besides the development of many significant methods and models mentioned above, Dr. Kulkarni has more than 65 research publications in referred journals, and more than 30 research publications in seminar proceedings. He has also co-authored and published around 29 atlases giving inventory of Indian Himalayan glaciers and distribution of seasonal snow cover.

**Awards and Honors**

Dr. Kulkarni has been conferred with the prestigious National Geosciences award in 2009 as a recognition of his outstanding contribution in the field of Applied Geosciences. He has also received a Team excellence award in 2008 from Indian Space Research Organisation for his contribution as a team leader of Snow and Glacier project. He is also a recipient of the Canadian Commonwealth Fellowship between 1984 and 1986. Dr. Kulkarni has been appreciated by the President of Iceland for his great contribution in developing training program for young Indian Glaciologist with Iceland. He is a member and chairman of various scientific committees in India and abroad , some of which include PAC-Glaciology, PAC-Hydrology and cryosphere. He has delivered invited talk at highly prestigious academies and conferences,

such as Pontifical Academy of Sciences, Vatican; American Geophysical Union, San Francisco; and Indian Academy of Sciences, Bangalore.

In recognition of outstanding contributions to the study of Himalayan glaciers, the Ministry of Earth Sciences honors Dr. Anil Vishnupant Kulkarni with "National Award in Polar Science & Cryosphere  for the year 2014".