

## Indian scientific endeavors in Ny-Ålesund, Arctic

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ニーオルスンを基地にしたインドの北極観測

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**要旨:** 北極に氷がなくなる事は、熱帯の気候に影響を与える。北極域の氷の状態は、それゆえ、インドの気候変動を理解する鍵である。北極域で様々な研究に着手するために、2008年7月1日に、インドの基地「ヒマドリ」をニーオルスンに開設した。ニーオルスンには現在、インドを含め10カ国から15の基地が設けられている。この論文では北極域でインドが行っている主要な研究を紹介する。

**Abstract:** An ice free Arctic can effect tropical climate and is therefore a key variable to understand the climate change. In order to undertake studies in the Arctic region, on 1st July 2008, the Indian station 'Himadri' has been opened in Ny-Ålesund. With India, 15 stations from 10 countries are now established in Ny-Ålesund. This report highlights Indian initiatives in the Arctic region.

## 1. Introduction

The Arctic Ocean and the surrounding regions are one of the most important areas that not only govern the earth's climate but also faithfully record its past climatic history. The region is also an excellent harbinger of future change, because the signals or clues that signify climate change are so much stronger in the Arctic than elsewhere on the planet. The thermohaline circulation that originates in the northern Atlantic and southern Arctic is the major force that drives not only the oceanic circulation but also regulates the global climate. Possible changes in this global circulation can pose a threat to the Arctic region and thereby the global climate. Any change in the extreme north (Arctic region) can affect the global climate, sea level, biodiversity etc.

The region is also of special significance to the Indian subcontinent as several studies have shown that there exists a tele-connection between the northern polar region and Indian monsoon intensity, which affects the Indian economy. The exact mechanism by which this tele-connection exists is still open to debate and is a topic of ongoing research.

Realizing the scientific importance of the Arctic and considering that the "International Polar Year 2007–2008" will be an excellent opportunity to develop a bipolar research program in co-operation

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with other countries, the Government of India has decided to extend the country's scientific endeavors to include the Arctic.

The National Centre for Antarctic and Ocean Research (NCAOR), an autonomous R&D wing of the Ministry of Earth Sciences (MoES), Government of India has been designated as the agency responsible for the planning, co-ordination and implementation of the Indian Arctic Program on behalf of the Ministry.

## 2. The Indian Arctic Program

The Indian Arctic Program was started in August 2007 when a small contingent of 5 scientists visited Ny-Ålesund (Fig. 1) for 4 weeks. This was followed by 2nd expedition team which visited Ny-Ålesund for 4 weeks in March 2008 and had a total of 7 scientists. The details of research programs are given below:

### 1) The Summer Program (September 2007)

Arctic microbiology:

- Inventory of microbes from various habitats of the Arctic, and evaluation of their population dynamics as biological indices of change in season, anthropogenic factors etc.

Atmospheric Sciences:

- Simultaneous and continuous measurements of atmospheric electrical field, conductivity, and the concentrations and size distribution of atmospheric aerosols

Earth Science and Glaciology:

- Understanding the geological and geomorphological evolution of the area
- Study of glacial landforms of the area



Fig. 1. Area map showing location of Ny-Ålesund where Indian research base 'Himadri, is situated.

## 2) The Winter/Spring Program (March 2008)

- Snow pack production of carbon monoxide and its diurnal variability
- Sea-ice microbial communities project
- Relation of glaciers in the Northern Hemisphere to variations of climate.
- Study of space weather effect on auroral ionosphere

## 3) The Summer Program (June-August 2008)

- Continuation of the study of space weather effects on the polar ionosphere
- Geological studies in Svalbard and the surrounding ocean; implications for Quaternary paleoclimate, Permo-Carboniferous and Mesozoic-Tertiary biostratigraphy, biogeography, ecology, tectonics and hydrocarbon potential.
- Continuous monitoring of a hitherto unmonitored glacier.
- Experiments during total solar eclipse over the Arctic.
- Paleoclimatic assessment of Arctic Ocean using diatom variability
- Studies on hydrodynamics of the Kongsfjorden
- Paleoceanography of the Arctic Ocean including possible linkages with tropical (Indian) climate changes through multi-disciplinary approach.
- Snout monitoring and geomorphologic features of Midre Lovén Glacier, Ny-Ålesund.
- Sedimentology and geomorphology of the Ny-Ålesund region and its implication for palaeoclimatic reconstruction.
- Relation of glaciers in the Northern Hemisphere to variations of climate—interannual and intraannual.
- Continuation of the snow-pack production of carbon monoxide and its diurnal variability
- Measurements of atmospheric electrical parameters to understand the global electric circuit.

### 3. Inauguration of Indian research base ‘Himadri’

The Indian research base ‘Himadri’ at Ny-Ålesund (Fig. 2) was inaugurated on July 1, 2008 by Indian Science and Technology and Earth Science Minister Shri Kapil Sibal. This is India's first full fledged research station in the Arctic region. The research base will be used for conducting year-round scientific research in Arctic science with special emphasis on climate change.

With the opening of the Indian research base in the Arctic, NCAOR has become the 15th institution in addition to the following fourteen institutions to have a permanent station at Ny-Ålesund:

- Norwegian Polar Institute Ny-Ålesund (NPI)
- Norwegian Institute for Air Research (NILU)
- Stockholm University (SU)
- AWIPEV Arctic Research Base (France, Germany)
- National Institute of Polar Research (NIPR), Japan
- British Antarctic Survey (BAS)
- Norwegian Mapping authority (NMA) (Norwegian only)
- The Arctic Centre of the University of Groningen (Netherlands)
- Norwegian Space Centre/Andoya Rocket Range (SvalRak)
- The National Research Council of Italy (CNR)
- Korea Polar Research Institute (KOPRI)
- Chinese Arctic and Antarctic Administration (CAAA)



*Fig. 2. A close view of the Indian Research Base 'Himadri' at Ny-Ålesund (Arctic).*



*Fig. 3. Aerial photograph showing stations of other countries around Indian research base 'Himadri' in Ny-Ålesund.*

- The Kings Bay Marine Laboratory
- Germany's National Research Centre for Geosciences (GFZ)

India has become the 10th country to have established its research station at Ny-Ålesund.