

TECHNICAL PUBLICATION NO.18



Scientific Report

**TWENTIETH
INDIAN EXPEDITION TO
ANTARCTICA**



**Ministry of Earth Sciences
New Delhi
2006**

Cover Photo:
GSI Team doing field work in
Muhlig-Hofmann Fjella

Back Cover Photo:
Maitri—The Indian Antarctic base
standing tall in Antarctica

SCIENTIFIC REPORT OF
TWENTIETH
INDIAN ANTARCTIC EXPEDITION

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सत्यमेव जयते

NATIONAL CENTRE FOR ANTARCTIC & OCEAN RESEARCH
(MINISTRY OF EARTH SCIENCES)
HEADLAND SADA, VASCO, GOA-403804
INDIA
2006

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FOREWORD

Antarctica, the isolated landmass covered with ice is attracting scientists as it has been realized that this icy wilderness could offer clues to understand the present day climatic perturbations. This region is considered to be a storehouse of information on past climatic changes that can be stretched several million years back. Besides this, Antarctica was in the thick of a major orogeny as early as 500 million years back which formed a super continent Gondwanaland and hence shared a continental evolutionary history with India.

Indian Antarctic Research has now matured, as its scientific research is increasingly being targeted towards globally relevant topics discussed above. During the 20th Expedition, a large component of scientific research in Antarctica was aimed at understanding the earth system as a whole, that involved atmospheric and earth science studies. During this expedition, two scientists from T U Dresden, Germany joined the Indian Expedition to study the geodynamic phenomena. A variety of geodetic observations were made in central Dronning Maud land. Indian base, *Maitri*, is also recognized as a base GPS station in a global network established to understand the geodynamic processes. Besides this, the Seismological Observatory set up at *Maitri* has attained prominence as an Antarctic Station in the global seismological network. It is really heartening to see that the multi-disciplinary Indian Antarctic Research Program functions in perfect coordination each year to make a very important scientific contribution.

The Technical Report edited by Shri Mervin D'Souza, Leader of the 20th Indian Antarctic Expedition is yet another example of India's continued quest and interest in the Continent dedicated for science. I am sure the content of this Volume will augment the polar database which is proving to be very important to understand earth sustaining system of past, present, and perhaps future too!


P.S. Goel



Rasik Ravindra

Director



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Preface

The present report is a collection of scientific papers that have originated out of Scientific Research carried out during the XX Indian Antarctic Expedition. The volume has sixteen papers and two communications on the logistics. The volume highlights the multidisciplinary character of Indian Antarctic Endeavor.

The research papers have been classified into Atmospheric Science, Earth Science, Environmental Science and Medical Science sections. Atmospheric and Earth Science were the major fields, covered during the expedition. Physical Research Laboratory, Ahmedabad, has reflected interesting observations on Aerosol Characteristics over Indian Base Maitri. The Indian Institute of Geomagnetism could successfully conduct Three Station Triangulation Experiment to understand Magnetic Pulsations over Antarctica, results of which are presented in this volume. Geological Survey of India pursuing its geological mapping programme, could successfully map an area between 6°30' to 7°E longitude. This area exposing Granites associated with Pan-African tectonic event, has helped the scientists to elaborate on the process of magma generation associated with major continent - continent collision events. This event achieves significance, as it was responsible for amalgamation and formation of mega-continent in geological past. The present volume also includes a paper by NGRl on their effort in establishing seismic station at Maitri and contribution of Maitri as a Base in International geodetic networks (established to understand movements of plates). The two papers listed under the Medical science are an effort at studying human adaptability to extreme stresses of Antarctic originating out of climate, and extended isolation.

This volume exemplifies the maturity, Indian Antarctic programme has attained over the years. It is an effort to exploit the serene and pristine environment of Antarctica for betterment of humankind. Indian research is committed to excellence in polar research without distributing the fragile Antarctic environment.

I compliment the Leader, Mervin J D'souza and the members of expedition for the excellent work.

Place : Headland Sada, Goa


(Rasik Ravindra)

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The Team : 20 Indian Antarctic Expedition

SI. No.	Name	Organization
Summer Component (Duration from December 2000 to April 2001)		
1.	Shri Jayapaul D.	Geological Survey of India, Faridabad
2.	Shri Praveen Mathur	Snow & Avalanche Study Establishment, Manali
3.	Shri S.K. Bera	Birbal Sahani Institute of Palaeo Botany, Lucknow
4.	Shri J.T.Gergen	Wadia Institute of Himalayan Geology, Dehradun
5.	Shri D.P.Dobhal	Wadia Institute of Himalayan Geology, Dehradun
6.	Shri R.J.Thayeen	Wadia Institute of Himalayan Geology, Dehradun
7.	Shri S.V.Singh	Survey of India, Dehradun
8.	Shri M.M.S. Negi	Survey of India, Dehradun
9.	Shri Avijit Nag	National Hydrographic Office, Dehradun
10.	Shri S. Gurvbaran	Indian Institute of Geomagnetism, Mumbai
11.	Shri M. Sridharan	Indian Institute of Geomagnetism, Mumbai
12.	Shri H.S. Gadhavi	Physical Research laboratory, Ahmedabad
13.	Shri K.V.George	National Environmental Engineering Institute, Nagpur
14.	Shri I.K. Pai	Deptt. of Zoology, Goa University
15.	Shri Praveen Vats	Defence Institute of Physiology & Allied Science, Delhi
16.	Shri Vinay Mishra	Barkatullah Univ., Bhopal
17.	Shri A.U. Sonawane	R&DE{E},Pune
18.	Miss S. Stella	India Meteorological Department, New Delhi
19.	Shri T.P.Mahato	National Hydrographic Office, Dehradun
20.	Shri R.P.Patel	Barkatullah Univ., Bhopal
21.	Shri M.H. Ansari	National Environmental Engineering Institute, Nagpur
22.	Shri N.S. Shekawat	Defence Electronics Applications Lab., Dehradun
23.	Shri N. Jayaraman	National Aerospace Laboratories, Bangalore
24.	Shri Kanakamuthu	National Aerospace Laboratories, Bangalore
25.	Shri Mahender Singh	Indo-Tibetan Border Police, Auli
26.	Shri Simanchal Padhy	National Geophysical Research Institute, Hyderabad
27.	Dr. A. Shivaji	MOES/NCAOR Observer
28.	Prof. Mirko Scheinhert	Tu-Dresden, Germany
29.	Dr Eberlein Lutz	Tu-Dresden, Germany

(Contd.)

SI. No. Name Organization

Winter Component (Duration from December 2000 to April 2002)

30.	Leader, Shri M.J.D'Souza	Geological Survey of India, Faridabad
31.	Shri Amit Dharwadkar	Geological Survey of India, Faridabad
32.	Shri S.K. Joshi	Snow & Avalanche Study Establishment, Manali
33.	Shri M.K.Dey	India Meteorological Department, New Delhi
34.	Shri S.S. Bist	Indian Institute of Geomagnetism, Mumbai
35.	Shri K.N. Khanduri	Defence Electronics Applications Lab., Dehradun
36.	Shri Bhagwati Prasad	Defence electronics applications lab., Dehradun
37.	Shri Narayan Singh	Indo-Tibetan Border Police, Auli
38.	Maj. Atul Apte	Army Team
39.	Hav. Ram Lakhani Prasad	Army Team
40.	Nb. Jaiveer Singh	Army Team
41.	Nk. Ranbeer Singh	Army Team
42.	Nb. Ashok Kumar	Army Team
43.	Nb. GNB Rao	Army Team
44.	Hav/EE Narendra Singh	Army Team
45.	Nk. Ramesh Kumar	Army Team
46.	Capt. Sachin Arvind Oka	Army Team
47.	Nb. C. Jayachandran	Army Team
48.	Nb. M. Gauthaman	Army Team
49.	Nk. Tejveer	Army Team
50.	Nk. Laxman Singh	Army Team
51.	Shri L. Prem Kishore	National Geophysical Research Institute, Hyderabad
52.	Shri Suresh Ram	India Meteorological Department, New Delhi
53.	Dr. N. R. Dharmasakti	Indo-Tibetan Border Police
54.	Dr. M.S. Martolia	Indo-Tibetan Border Police