November 8–10, 1999
Goa, India

The Third (1999) ISOPE
Ocean Mining
Symposium &
Workshop

ISOPE OMS-99
National Institute of Oceanography
Dona Paula, Goa, India
November 8–10, 1999

Technical Program
Invited and Refereed Papers

Environment Mining Systems & Technology
Exploration & Survey Materials and Processing

Organized by:
International Organizing Committee

Sponsored by:
International Society of Offshore and Polar Engineers (ISOPE) with cooperating organizations (list inside)
Department of Ocean Development, Government of India
National Institute of Oceanography, Goa, India

ISOPE OMS-99 secretariat
Attn.: Dr. Rahul Sharma
National Institute of Oceanography
Dona Paula, Goa 403 004, India
Fax +91-832-223340: E-mail rsharma@darya.nio.org

Visit www.isope.org
Welcome to ISOPE OMS-99

We greatly appreciate the excellent responses and help we have received from colleagues around the world in the successful organization of the 3rd ISOPE Ocean Mining Symposium (ISOPE-OMS-99), Goa, India, November 8-10, 1999. The symposium features 10 sessions of refereed papers and 1 workshop on environment from 10 countries.

The 1st (1995) ISOPE Ocean Mining Symposium (ISOPE OMS-95) was held in Tsukuba. An informal organizational meeting of Ocean Mining Working Group (OMWG) was held in Tsukuba, Japan, on November 22, 1995. At the meeting, representatives from 7 countries desired to have a close international cooperation and more exchange of the individuals’ progress. It was agreed to establish a non-governmental body, OMWG, which can also act as an informal channel among the governments: The OMWG concept got blessing from director generals of the participating governments: US, France (Ifremer joined later), Germany, Japan, IOM, Korea, India, and China (joined later). The OMWG covers exploration and survey, environment, mining systems, and processing systems.

The primary objectives of the OMWG are:

- to advance at an international level technological progress in the interdisciplinary field of ocean resources, environment and mining and related technologies, through international cooperation and participation;
- to disseminate scientific knowledge and provide timely exchange of technical knowledge and information;
- to provide opportunities through its programs for interested individuals to maintain and expand their knowledge in these fields for the benefit of engineering and scientific profession.

To facilitate opportunities or the members to interact with their governments. The International Society of Offshore and Polar Engineers (ISOPE) facilitates the OMWG activities.

On behalf of the International Organizing Committee, it is our pleasure to welcome participants to the ISOPE OMS-99 Symposium in Goa.

Co-chairmen of the ISOPE OMS-99 Symposium

Jin S. Chung, USA
A.E. Muthunayagam and E. Desa, India
Tetsuo Yamazaki, Japan
SUNDAY November 7

15:00
OMS-99 Executive Committee Meeting
Conference room

16:00
Ocean Mining Working Group (OMWG) Meeting
Conference room

For Tour Information
(see the Bulletin board at the Lobby)

MONDAY November 8

9.00 -10.00
Symposium Registration
Lobby

10.00 -11.00
1. Opening Session
Seminar Hall

11.30-13.00
2. MINING TECHNOLOGY & SYSTEMS I
Seminar Hall

13.00-14.00
Group Lunch
NIO Canteen

14.00-15.30
3. MINING TECHNOLOGY & SYSTEMS II
Seminar Hall

16.00-18.00
4. EXPLORATION & SURVEY
Seminar Hall

19.30-21.30
SYMPOSIUM RECEPTION
Cidade-de-Goa

TUESDAY November 9

09.00 -11.00
5. ENVIRONMENT I
Seminar Hall

11.30-13.00
6. ENVIRONMENT II
Seminar Hall

13.00-14.00
Group Lunch
NIO Canteen

14.00-15.30
7. ENVIRONMENT III
Seminar Hall

16.00-19.00
8. ENGINEERING AND ENVIRONMENT ASSESSMENT WORKSHOP
Seminar Hall

Audio/Visual Practice
Monday - Wednesday

On-site Registration
Training Hall

2
WEDNESDAY NOVEMBER 10

09.00-10.00
9. ENVIRONMENT IV  Seminar Hall

10.30-13.00
10. PROCESSING TECHNOLOGY  Seminar Hall

13.00-14.00
Group Lunch  NIO Canteen

14.00-15.30
CLOSING SESSION  Seminar Hall

16.00-20.00
EXCURSION  Old Goa Churches and city tour

Technical and Optional Tours  see program and bulletin board

Cosponsored by:
International Society of Offshore and Polar Engineers (ISOPE)
Department of Ocean Development, Government of India
National Institute of Oceanography, India

Cooperated by:
Korea Committee for Ocean and Resources Engineering (KCORE)
International Society of Offshore and Polar Engineers (ISOPE)
U.S. National Science Foundation (NSF)
Mining and Materials Processing Institute of Japan (MMIJ)
Korea Association for Deep Ocean Minerals Development (KADOM)
Kansal Society of Naval Architects of Japan (KSNAJ)
Ifremer (France)
National Institute of Oceanography (NIO, India)
InterOceanMetal (Poland)
China Ocean Mineral Resources R&D Association (COMRA)

Secretariat:
Dr. Rahul Sharma, National Institute of Oceanography, India

Technical Executive Committee:
Prof. Jin S. Chung, Colorado School of Mines, Golden, USA
Dr. Rahul Sharma, National Institute of Oceanography, Goa, India
Dr. Tetsuo Yamazaki, NIRE, Tsukuba, Japan

International Organizing Committee
Prof. Jin S. Chung (Chairman), Colorado School of Mines, Colorado, USA
Dr. E. Desa, National Institute of Oceanography, Goa, India
Dr. Ning Yang, Changsha Research Inst. of Mining and Metallurgy, Changsha, China
Dr. Seok Won Hong, Korea Research Inst. of Ship and Ocean Engineering, Korea
Prof. Kun Mo Han, Dong-A University, Pusan, Korea
Mr. Myungjae Yoon, KADOM, Seoul, Korea  
ir. M. Olagnon, Ifremer, France  
Dr. K. Otsuka, Osaka Prefecture University, Osaka, Japan  
Dr. Y. Okano, University of Tokyo, Tokyo, Japan  
Dr. G. Schriever, BIOLAB Forschungsistitut, Germany  
Dr. T. Yamazaki, National Inst. for Resources and Environment, Japan

Conference Co-chairmen  
Jin S. Chung, Colorado School of Mines, USA  
A.E. Muthunayagam, Department of Ocean Development, Government of India  
E. Desa, National Institute of Oceanography, India  
Dr. Tetsuo Yamazaki, National Institute for Resources and Environment, Japan

TECHNICAL PROGRAM

1. OPENING SESSION

Monday 10:00 Seminar Hall

Coordinator: Rahul Sharma, National Institute of Oceanography, India

Development of Manganese Nodule Resources in Indian Ocean  
Dr. A.E. Muthunayagam, S.K. Das, Department of Ocean Development, New Delhi, India

Opportunity for Offshore Minerals Exploration in Indian Ocean  
Dr. E. Desa, National Institute of Oceanography, India

Deep-Ocean Mining and Ocean Mining Working Group (OMWG)  
Prof. Jin S. Chang, Colorado School of Mines, USA

2. MINING TECHNOLOGY & SYSTEMS I

Monday 11:30 Seminar Hall

Chair: Jin S. Chang, Colorado School of Mines, USA  
Co-chair: Sup Hong, Korea Research Inst. of Ship and Ocean Engineering, Korea

Mining System with Free Swimming Pick-Up Device and Dose Test of Environment Assessment  
(Oral Presentation Only)  
Ning Yang, Changsha Research Inst of Mining & Metallurgy, Hunan, China

Non-Linear Dynamic Response of Ocean Mining Pipe  
R.R. Babu and Suhail Ahmad, Indian Institute of Technology, New Delhi, India

Effects of Internal Flow on Dynamics of Deep Seawater Risers  
Koji Otsuka, Akiyoshi Bando and Yoshiho Ikeda, Osaka Prefecture University, Sakai, Japan

Kazuyuki Ouchi, Nakashima Propeller Co., Tokyo, Japan

To the Problem of Application of New Technologies of Mining Coal Seams in the Shelf of the Sea of Japan
Yury N. Niskovskiy, Elena V. Niskovskaya, Far Eastern State Technical University, Anatoliy M. Vasinovitch, Alexander G. Shakhirzanov, JSC “Primorskogol,” Vladivostok; Russia

An Experimental Study on the Flow Characteristics of Two Phase Solid-Liquid Mixture in a Vertical Tube (Proceedings Only)
Chi Ho Yoon, In Kee Kim, Kwang Soo Kwon, Seok Ki Kwon, Jung Seock Kang, Ou Kwang Kwon and Chi Won Seo, Korea Institute of Geology, Mining and Materials, Taejon, Korea

3. MINING TECHNOLOGY & SYSTEMS II

Monday 14:00 Seminar Hall
Chair: T. Yamazaki, National Inst. for Resources and Environment, Japan
Co-chair: M.S. Nagar, Indian Rare Earth Limited, India

Deepsea Core Boring by BMS in Northern Mariana Area
Katsutoki Matsumoto, Metal Mining Agency of Japan, Tokyo; Shigeru Sarata, National Inst for Resources and Environment, Tsukuba, Japan

Tracing Collector Passes and Preliminary Analysis of Collector Operation
Tetsuo Yamazaki, National Inst. for Resources and Environment, Japan

Track-Keeping Control of Seafloor Miner by Successive Learning of Unknown Velocity and Soil Properties
Jin S. Chung, Colorado School of Mines, Golden, Colorado, USA

Experimental Study on Performance of Waterjet Pickup Device of Manganese Nodule Collector
Sup Hong, Jong-Su Choi, Jin-Ha Kim and Chan-Kyu Yang, Korea Research Inst of Ships and Ocean Engineering, Taejon, Korea

Underwater Sand Mining System for Shallow Waters
C.R. Deepak, M. Pugazhaandi, S. Paul, M.A. Shajahan, M.A. Atmanand, R. Jeyamani, M. Ravindran, E. Schulte, Nat. Inst. of Ocean Technology, Chennai, India

4. EXPLORATION & SURVEY

Monday 16:00 Seminar Hall
Chair: T R P Singh, Engineers India Ltd., India
Co-chair: G P Glasby, University of Sheffield, UK

The First Phase of the IOM Survey Program According to Plan of Work for Exploration in the Area
R. Kotlinski and V. Stoyanova, Interocceanmetal Joint Organization, Szczecin, Poland

Mode of Occurrence of Ferromanganese Crusts on Inactive Seamounts in the Northwestern Pacific
Multibeam Echosounder Pseudo Sidescan Images as a Tool for Manganese Nodule Exploration
V.N. Kodagali, B. Chakraborty, National Institute Of Oceanography, Goa, India

The Implementation Agreement and Indian Interests
B. Vijay Kumar, National Institute of Oceanography, Goa, India

Hydrothermal Processes in the Manus Basin, Papua New Guinea, Southwest Pacific
Jean-Marie Auzende, IFREMER, Noumea cedex, New Caledonia; Tetsuro Urabe, Geological Survey of Japan, Tsukuba, Japan

5. ENVIRONMENT I

Tuesday 09.00 Seminar Hall
Chair: Gerd Schriever, BIOLAB Forschungsinstitut, Germany
Co-chair: Z A Ansari, National Institute Of Oceanography, India

Summary of the Japanese Environmental Study for Deep-sea Mining
Satoru Okubo, Metal Mining Agency of Japan, Tokyo, Japan

Indian Deepsea Environment Experiment (INDEX): Achievements and Applications
Rahul Sharma, National Institute Of Oceanography, Goa, India

Vertical Distribution of Meiobenthos in Relation to Geotechnical Properties of Deep-Sea Sediment in the IOM Pioneer Area (Clarion-Clipperton Fracture Zone, NE Pacific)
Teresa Radziejewska and Igor Modlitba, Interoceanmetal Joint Organization, Szczecin, Poland

Sedimentological Impacts of INDEX Experiment
A.B. Valsangkar, N.V. Ambre, Maria Rodrigues, National Institute Of Oceanography, Goa, India

Effect of Benthic Disturbance on Geotechnical Characteristics of Sediments from Nodule Mining Area in the Central Indian Basin
N.H. Khadge, National Institute Of Oceanography, Goa, India

Baseline Studies and Evaluation of Effects of Surface Discharge of Deepsea Mining -INDEX Area
S.N. De Souza, S.D. Sardessai, National Institute of Oceanography, Goa, India

6. ENVIRONMENT II

Tuesday 11.30 Seminar Hall
Chair: R. Kotinski, Interoceanmetal Joint Organization, Szczecin, Poland
Co-chair: Rahul Sharma, National Institute of Oceanography, India

Environmental Impact of Suspended Tailings Discharge During Mining Nodules
Jianxin Xia and Ning Yang, Changsha Research Inst of Mining & Metallurgy, Hunan, China

Long-Term Propagation of Tailings from Deep-Sea Mining - Numerical Simulations Under Variable Conditions
Susanne Rolinski, Universitat Hamburg, Hamburg, Germany

Environmental Study on the Deepsea Mining of Manganese Nodules in the Northeastern Tropical Pacific: Modeling the Sediment-Laden Negative Buoyant Flow
Toshimasa Doi, Koichi Taguchi, Computer Tech. Integrator Co, Nagoya; Kisaburo Nakata and Masahisa Kubota, Tokai University, Shimizu; Shigeaki Aoki, National Inst for Resources and Environment, Tsukuba, Japan

Intercomparison Between Aanderaa and Potok Current Meters Deployed During Phase II of PMN EIA Programme.
A.A. Fernandes, Shailesh Pednekar, P. Vethamony, National Institute of Oceanography, Goa, India

7. ENVIRONMENT III

Wednesday 14.00 Seminar Hall
Chair: Yoshihisa Shirayama, Kyoto University, Japan
Co-chair: Nagender Nath, National Institute Of Oceanography, India

Mapping the Megabenthos as an Essential Part of Environmental Studies Related to Anthropogenic Impact in the Deep-Sea
Hartmut Bluhm, Alfred-Wegener-Institute for Polar and Marine Research, Bremerhaven, Germany

Biological Results of JET Project: An Overview
Yoshihisa Shirayama, Kyoto University, Wakayama, Japan

Immediate Response of Meio and Macrobenthos to Disturbance Caused by Benthic Disturber.

Validation of EIA Sampling Methods—Bacterial and Biochemical Analyses
Sheelu G., P.A. Loka Bharati, Shanta Nair, C. Raghukumar, C. Mohandass, National Institute of Oceanography, Goa, India

8. ENGINEERING AND ENVIRONMENT ASSESSMENT OF DEEP-SEA MINING WORKSHOP

Tuesday 16:00 Seminar Hall
Chair: Prof. H. Thiel, AWI für Polar- und Meeresforschung, Germany
Co-chair: Jin S. Chung, Colorado School of Mines, USA

Engineering Assessment
Tetsuo Yamazaki, National Inst of Resources and Environment, Japan

Scientific Assessment
G. Schriever, BIOLAB Forschungssttitut, Germany
9. ENVIRONMENT IV

Wednesday 09:00 Seminar Hall
Chair: Ning Yang, Changsha Research Inst of Mining & Metallurgy, China
Co-chair: V. Ramesh Babu, National Inst. of Oceanography, India

Surface Meteorological Conditions at Benthic Disturbance Site - INDEX Area During Austral Winter 1997
A. Suryanarayana, V.S.N. Murty, V. Ramesh Babu, B.S. Beena, National Institute of Oceanography, Goa, India

Watermass Structure at Benthic Disturbance Site (INDEX Area) and Anticipated Mining Effects On Hydrophysical Properties
V. Ramesh Babu, V.S.N. Murty, A. Suryanarayana, B.S. Beena, National Institute of Oceanography, Goa, India

Current Structure and Kinetic Energy of The Abyssal Waters in the Central Indian Basin
V.S.N. Murty, V. Ramesh Babu, A. Suryanarayana, B.S. Beena, National Institute Of Oceanography, Goa, India

10. PROCESSING TECHNOLOGY

Wednesday 10:30 Seminar Hall
Chair: R P Das, Regional Research Lab, Bhubaneshwar, India
Co-chair: Yasuhiko Okano, Univ of Tokyo, Tokyo, Japan

The Smelting-Rusting-Solvent Extracting Process to Recover Valuable Metals from Polymetallic Nodules
Xiang Zhong, Zequan He, Yujin Shen, Yongjun Mao, Shuguang Qu and Xianbai Li, Changsha Research Inst of Mining & Metallurgy, Hunan, China

An Evaluation of Mineral Processing Experimental Data for Cobalt-Rich Crust Development
Se Hun Park, Sohei Shimada and Yasuhiko Okano, Univ of Tokyo, Tokyo, Japan

Processing of Polymetallic Sea Nodules : An Overview
Premchand and R.K. Jana, National Metallurgical Lab., Jamshedpur, India

Manganese Recovery from Manganese Nodules
K. Sanjay, T. Subbaiah, S. Anand, R.P. Das, Regional Research Lab, Bhubaneshwar, India

Design of Flexible Configuration Nodule Processing Pilot Plants In The Context Of Evolving Metal Markets
P.K. Sen, T.R.P. Singh, Engineers India Limited, New Delhi, India

Studies on Removal of Impurities from Ocean Nodules Leach Liquor by Solvent Extraction
K. Bhattacharya, M.F. Fonseca, R. Sadanandam, S.K. Tangri, A.K. Suri, Bhabha Atomic Research Centre, Mumbai, India

Simultaneous Spectrophotometric Estimation of Iron, Copper, Cobalt and Nickel in Ocean Nodule Leach Liquor

Recovery of Nickel and Cobalt Values from Various Sources
I.G. Sharma, A. C. Bidaye, P.R. Menon, P.P. Shukla, A.K. Suri, Bhabha Atomic Research Centre, Mumbai, India

11. CLOSING SESSION

Wednesday 14:00 Seminar Hall
Chair: E. Desa, National Institute of Oceanography, India
Co-chair: Prof. H. Thiel, AWI für Polar- und Meeresforschung, Germany

Excursion

Wednesday 16:00

Visit to Old Goa churches and Panjim city.

GENERAL INFORMATION

PLACE AND DATE: Dona Paula, Goa, India; November 8–10, 1999

ISOPE OMS-99
National Institute of Oceanography (NIO)
Dona Paula, Goa 403 004, India
Fax +91-832-223340/229102
Tel +91-832-226253/221322
Gram: Oceanology, Panaji, India
E-mail rsharma@csnio.ren.nic.in or rsharma@darya.nio.org

NIO is located in Dona Paula area, a suburb about 6 km away from Panaji (also called as Panjim), the capital city of Goa state.

ACCESS TO GOA

By Air
Goa is well connected by Air with all international airports at Mumbai, Delhi, Chennai and Cochin. All flights to Goa arrive at the Dabolim Airport (close to Vasco-da-Gama city) about 30 kms from Panjim. Airport coaches and prepaid taxis can be taken to come to Panjim and Dona Paula. Book in advance during this tourist season.

By Rail
Train services are available from New Delhi, Mumbai (Bombay), Bangalore, Hyderabad and Cochin. Public transport and hired taxis are available to come to NIO (Dona Paula) from the nearest railway stations.

By Road
Panjim is connected by road with the major cities in western India. There are many private and government luxury and semi-luxury buses to these cities to Panjim.

PARKING: Free parking.
LANGUAGE
The language for the conference is English. No translation service will be arranged. English is fluently spoken in Goa in addition to Hindi and Konkani.

CURRENCY EXCHANGE
Bank with foreign exchange counter is located in the NIO campus. The approximate exchange rates as of July 1999: 1 US$ = Rs. 43, 1 UK£ = Rs. 68, 1 Euro = Rs. 45, 100 Yen = Rs. 35.

AIRPORT to Hotels and NIO (see the map in this program)
Airport to Hotel Cidade-de-Goa by Hotel courtesy coach.
To go to other hotels or to come to NIO, take a pre-paid Taxi (~Rs. 400).

HOTEL ACCOMMODATION: Guaranteed reservation by AUGUST 30 only (must use the Reservation Form in this program.)
Accommodation is arranged at 2 hotels close to the venue for the delegates. Transport will be available between hotels and seminar venue for the convenience of the participants. The choice for accommodation is as follows:
a) Cidade-de-Goa Beach Resort: Located at Vainguinim Beach, only 1.5 km from NIO, this luxury hotel has offered single rooms (with CTV, refrigerator) at the rates of US $ 150 per night (including breakfast and taxes).
b) Prainha Cottages: Located at Dona Paula beach and adjacent to the symposium venue, this hotel has offered a single / double bed room at Rs. 1800 (US $ 45)+ 15% taxes (including breakfast). Both the hotels have a beach, restaurants, swimming pools and taxi facilities.

Voltage: The voltage for electrical power supply is 220 V.

CITY TRANSPORTATION
Pick up a local tourist information booklet at the registration desk. Local buses run regularly to all points of the city. Taxis are also available at Dona Paula.

EXCURSION, November 10
A short excursion will be organized on 10 November, to the Basilica of Bom Jesus and Se Cathedral. On the return, participants will get a chance to visit the shopping areas of Panjim city.

OTHER TOURS
Full day sight seeing tours can be booked from the hotels.

ADVANCE SYMPOSIUM REGISTRATION BY MAIL OR FAX (use the Registration Form)
All persons attending the symposium are required to register, pay the appropriate fee, and get a conference badge. Remember to send via airmail the Advance Registration (and Invoice) Form in this Program or a copy to reach before OCTOBER 8:

The fee includes Proceedings, Reception and 3 Lunch tickets.
Foreign Participants: ISOPE OMS-99, ISOPE, P.O. Box 189, Cupertino, California 95015-0189, USA: Fax 1-408-980-1787. In case one charges to a credit card via FAX, the card number should be typed in bold face or written clearly to be readable in the transmitted fax copy.

Registration fees (note US$50 surcharge after October 8 for on-site registration) are as follows:

<table>
<thead>
<tr>
<th>Category</th>
<th>Before October 08</th>
<th>After October 08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author, Co-authors, Panelist</td>
<td>200</td>
<td>250</td>
</tr>
<tr>
<td>Session or Symposium Chair, Co-Chair</td>
<td>200</td>
<td>250</td>
</tr>
<tr>
<td>New ISOPE member application (incl. Yr. 2000 membership fee and one year journal issues)</td>
<td>290</td>
<td>340</td>
</tr>
<tr>
<td>Spouses (no proceedings/no luncheon ticket)</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>Full-time Student with 1999 ID Card</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Domestic Participants: ISOPE OMS-99, NIO, Goa, India:

The advance payment should be made by cheque/draft drawn in favour of ISOPE-Ocean Mining Symposium, NIO, Goa and sent to Dr. V.N. Kodagali, ISOPE-OMS Secretariat, National Institute of Oceanography, Dona Paula, Goa 403 004, India (Fax +91-832-223340 / 2291102 or contact on email: kodagali@csnio.ren.nic.in, kodagali@darya.nio.org).

Late payment can also be made at the registration desk in cash: Rs 8,000.

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<tr>
<th>Category</th>
<th>Before October 08</th>
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<td>6,000</td>
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<td>6,000</td>
<td>8,000</td>
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<tr>
<td>Spouses (no proceedings/no luncheon)</td>
<td>No charge</td>
<td>No charge</td>
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<tr>
<td>Full-time Student with 1999 ID Card</td>
<td>2,000</td>
<td>3,000</td>
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<tr>
<td>Banquet and Three lunch tickets</td>
<td>1,000</td>
<td>1,000</td>
</tr>
</tbody>
</table>

* The Symposium registration fee includes the symposium reception, daily group lunch, tea breaks, and a symposium proceedings.

REGISTRATION CANCELLATIONS

Request for cancellation of registration must be received in writing by October 12, 1999 to be granted a refund minus US$50 (Rs. 2000) processing charge.

REGISTRATION BADGE

Registration badges are required for admittance to all the symposium activities, including the reception and lunch.

ON-SITE SYMPOSIUM REGISTRATION

Participants who miss the advance registration may register at the Symposium Registration Desk, but there is a US$50 (Rs. 2000) surcharge. The registration desk will be open during the following hours:

Monday, Nov. 8  09:00-16:00
Tuesday, Nov. 9  09:00-14:00
ISOPE PUBLICATION ORDER
A copy of ISOPE OMS-99 Symposium Proceedings is included in the symposium registration fees. The proceedings volumes (250 pp. est.) can be ordered by mail at the rates of:

Mail order at $100 (ISOPE Member $80) including shipping charge.

All ISOPE PUBLICATIONS can be ordered from ISOPE, P.O. Box 189, Cupertino, California 95015-0189, USA: Fax 1-408-980-1787. Advance payment is required. MasterCard or VISA card, international money order or U.S. bank checks in US dollars payable to ISOPE will be accepted. Shipping and handling charges are included (also see the ISOPE Publication Order Information.)

PRESS - The press is invited to register at:

SYMPHOSIUM HEADQUARTERS
Registration Desk

SYMPOSIUM RECEPTION
19:30-21:30 MONDAY Cidade-de-Goa-Beach Resort

AUDIO VISUAL PRACTICE ROOM
Session Room

An overhead projector, 35 mm slide projector and screen will be set up from 08:00-17:00 (Monday and Tuesday) in the session room.

An overhead projector, 35 mm slide projector and screen will be set up in the session rooms. For any specific requirements for presentations, participants may contact Dr. B. Nagender Nath, ISOPE-OMS Secretariat, NIO, Goa, India (Fax: +91-832-223340 / 229102 or on e-mail nagender@csnio.ren.nic.in, nagender@darya.nio.org).

INTERNATIONAL PARTICIPANTS AND VISA APPLICATION

International authors, participants or attendees who need help (except financial) can contact: Dr. Rahul Sharma, OMS-99 Secretariat, NIO, Dona Paula, Goa, India (Fax: +91-832-223340 / 229102 or email: rsharma@csnio.ren.nic.in, rsharma@darya.nio.org).

Entry Visa. Some authors may be required to apply for an entry visa. Please get an application form at the Embassy/Consulate of India in your country. If the Consulate requires you to submit an official letter of invitation, please contact OMS-99 Secretariat, India.

About GOA
Goa is popular among domestic as well as foreign tourists for its enchanting beaches, and magnificent churches and temples. Located on the central west coast of India, Goa is famous for its natural beauty and cultural heritage. Its subtropical weather makes it an ideal place for swimming and water sports.

Being an international tourist destination, Goa has adequate facilities, such as domestic flights to all international airports in India, luxury hotels, conference, banking and telecom facilities.

Climate And Clothes. The weather in Goa during November will be warm (~30°C). Occasional rains may occur during this period.

About NIO
NIO, a national research laboratory under the Council of Scientific and Industrial Research, was established in 1966. The Institute is a premier
organization in the South East Asian region, conducting oceanographic research and developmental activities.

- Research is carried out under the major disciplines of Geological, Geophysics, Biological, Chemical and Physical Oceanography, Ocean Engineering, Marine Instrumentation, Marine Corrosion and Biofouling, and Marine Archaeology.
- Currently, it is the nodal agency for 2 of the major activities connected with Ocean Mining, that is (i) delineation of mine sites in the Indian Pioneer area, and (ii) environmental impact assessment studies for nodule mining.
Goa, Airport and Train to Dona Paula

Take domestic flights from New Delhi, Mumbai (Bombay), Chennai (Madras) and Cochin to Dabolim Airport 30 km from Dona Paula, Goa. Take the pre-paid Taxi (~ Rs. 400) to reach your hotel or NIO.

Train connections to Goa from New Delhi, Mumbai, Chennai, Cochi. Get off at Karmali, Margao or Vasco-da-Gama stations, and take local bus or hired taxi to come to Dona Paula or to your hotel.
ISOPE MEMBERSHIP APPLICATION

Please send me an ISOPE membership application form:

Name ___________________________________________
Organization _______________________________________
Dept. _____________________________________________
Address ___________________________________________
Postal Code ____________, Country __________________
Fax No. ___________________________________________

Send to:
ISOPE Membership Department
ISOPE, P.O. Box 189, Cupertino, California 95015-0189, USA:
Fax 1-408-980-1787.

Prospective authors are invited to submit abstract to:

ISOPE-2000
Seattle

Seattle, USA, May 28–June 2, 2000

ABSTRACT DEADLINE: August 30, 1999

Send 2 copies of your abstract in 300-400 words to: (1) One of the TPC members (session organizers) or (2) ISOPE-2000 TPC, ISOPE, P.O. Box 189, Cupertino, California 95015-0189, USA: Fax 1-408-980-1787.
NOTE
HOTEL RESERVATION FORM (must use this form)

NIO, Goa, India
November 8-10, 1999

Rooms in two hotels are blocked for the Symposium. For guaranteed reservation, this form must be received via either fax or mail only and no later than AUGUST 30 by:

Dr. V. Ramesh Babu
(email: rbabu@csnio.ren.nic.in, rbabu@darya.nio.org)
ISOPE OMS-99 Secretariat
National Institute of Oceanography
Dona Paula, Goa 403 004, India
Fax +91-832-223340 / 2229102

| First (Fore) Surname: ________________________ & Middle: ________________ |
| Circle: Male  Female;         Title       Mr.   Ms.   Mrs.   Prof.   Dr. |
| Company: _________________________________________________ |
| Address  __________________________________________________ |
| _________________________________________________________ |
| Country  _____________________ Postal (ZIP) Code _____________ |
| Fax No. ___________________________ |
| Arrival:  November __ Time _____;  Depart.:  _____  __,  Time ____ |

<table>
<thead>
<tr>
<th>Hotel Choice: Cidade-de-Goa</th>
<th>Check</th>
<th>Rate Per Night</th>
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</thead>
<tbody>
<tr>
<td>a) includes breakfast and taxes.</td>
<td></td>
<td>US $ 150</td>
</tr>
<tr>
<td>b) includes breakfast but add 15%.</td>
<td></td>
<td>Rs. 1800</td>
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<tr>
<td></td>
<td>Single Double</td>
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<tr>
<td>Praihna Cottages</td>
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<td>(US $ 45)</td>
</tr>
<tr>
<td></td>
<td>Single Double</td>
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</tbody>
</table>

Methods of Payment. No advance deposit is required. Pay directly to the Hotel as you check in. Credit cards (Visa, MasterCard only) or cash payments are accepted. Cancellation must be notified in advance in writing to ISOPE OMS-99 Secretariat so that the room can be released to others on the waiting list.

Name of the person to share: ____________________________

* Rates include gratuity and tax. If your 1st choice is consumed, you will be automatically moved to next available category room.

Note: Exchange rate is about Rs. 43 to 1 US dollars as of July 1999.

Signature: ___________________ Date: ____________, 1999

Photocopy, Complete, and Send This Form
Reservation after AUGUST 30 is subject to room availability.
Find Forms for the Hotel Reservation and Advance Registration inside this program.

Venue Address:
ISOPE OMS-99
National Institute of Oceanography
Dona Paula, Goa 403 004, India
Fax +91-832-223340
E-mail rsharma@darya.nio.org

Plan to Attend Other ISOPE Meetings

ISOPE–2000 Seattle, USA
May 28–June 2, 2000
Abstract Deadline: August 15, 1999
For Call For Papers, Fax to 1-408-980-1787 USA

ISOPE–2001 Stavanger, Norway
June 17–22, 2001

ISOPE PACOMS-2000 to be announced.
ISOPE EUROMS-2001 Europe
Venue and date to be announced.
Prospective authors are invited to submit abstract to:

ISOPE-2001
Stavanger

Stavanger, Norway, June 17-22, 2001

Send 2 copies of your abstract in 300-400 words to: (1) One of the TPC members (session organizers) or (2) ISOPE-2001 TPC, ISOPE, P.O. Box 189, Cupertino, California 95015-0189, USA; Fax 1-408-980-1787.