InterMARGINS Steering Committee

Japan

Dr. Wonn Soh
(chairperson)
Japan Marine Science and Technology Center
JAMSTEC
2-15 Natsushima
Yokosuka, 237
JAPAN
soh@jamstec.go.jp

Japan alternate member:

Dr. Kiyoshi Suyehiro
Chairperson
Japan Marine Science and Technology Center
JAMSTEC
2-15 Natsushima-cho
Yokosuka, Kanagawa 237-0061
JAPAN
suyehiro@jamstec.go.jp

Norway

Dr. Jan Inge Faleide
Department of Geology
University of Oslo
P.O.Box 1047, Blindern
N-0316 Oslo, NORWAY
Fax: +47-2285-4215
jan.inge.faleide@geologi.uio.no

Norway alternate member:

Dr. Juergen Mienert
Department of Geology
University of Tromsø
Dramsveien 201
N-9037 Tromsø
NORWAY
Fax +47-7764-5600
juergen.mienert@ibg.uit.no

People's Republic of China

Prof. Jin Xianglong
Director of the Key Lab of Submarine Geosciences
Second Institute of Oceanography of SOA
P.O. Box 1207
Hangzhou
Zhejiang 310012
P.R. CHINA
xljin@mail.hz.zj.cn

P.R. China alternate member:

Dr Mingbi Li
Second Institute of Oceanography of SOA
9 Xixihexia
Hangzhou
Zhejiang 310012
P.R. CHINA
limbsio@mail.hz.zj.cn

United Kingdom

Prof. Tony B. Watts
Department of Earth Sciences
University of Oxford
Parks Road
Oxford OX1 3PR
UNITED KINGDOM
tony@earth-sciences.oxford.ac.uk

United Kingdom alternate member:

Dr. Chris Franklin
Natural Environment Research Council
Polaris House
North Star Avenue
Swindon, Wiltshire SN1 2EU
United Kingdom
CFR@wpo.nerc.ac.uk

United States of America

Dr. Julie Morris
Washington University
Campus Box 1169
1 Brookings Drive
Saint Louis MO 63130-4899
U.S.A.
jmorris@levee.wustl.edu

GERMANY

Dr.Warner Brueckmann
Geomar Forschungszentrum
Wischofstrasse 1-3
D-24148 Kiel
Germany
wbrueckmann@geomar.de

Prof. Dr. Onno Oncken
GFZ Potsdam
Telegrafenberg C2
D-14473 Potsdam,
Germany
oncken@gfz-potsdam.de

Permanent Guest

Dr. Bilal U. Haq
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230
U.S.A.
bhaq@nsf.gov

InterMARGINS Office

fax : +81 45 770 5360
e-mail : im-office@jamstec.go.jp
web-site address : www.intermargins.org

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InterMARGINS

Newsletter No.6
February 2006

Contents

Introduction of New Chair Person

Chair person and secretariat of InterMARGINS have rotated off since 1st April, 2005. The chair person changed from Bob Whitmarsh of NOC,Southampton, UK to Wonn Soh JAMSTEC/Kochi, Japan. InterMARGINS office had been located in Europe was first moved to Asia by this rotation. It brings an opportunity that umbrella of InterMARGINS expands to wider research area including Asia and Oceania.

Our ship 'InterMARGINS' is going to sail herself from the Mediterranean Sea and the Atlantic Ocean to the Pacific and Indian Oceans. This suggests the paradigm shift from passive margin to active margin at the same time. Fruitful support by the researchers all over the world will help her to sail safety across the oceans. It anticipate to make InterMARGINS more global. Now, our ship will embark from the pier to the open ocean. We need you who row ship with us on a rough sea toward it.

Finally InterMARGINS appreciates Bob Withmarsh who handled this program as the chairperson for the three years.

Wonn Soh

InterMARGINS Office In Japan

Under the direction of the new chair person Dr. Wonn Soh, the InterMARGINS Office has gotton in its work for carring out the day-to-day responsibility.

Dr. Narumi Takahashi is a main staff, and in order to support him, Advanced Earth Science & Technology Organization (AESTO) has undertaken large portion of the work.

AESTO was established in 2000 as a professional organization dedicated to comprehensive promotion of the earth sciences through an integrative understanding of earth system sciences including, but not limited to, the atmospheric, hydrologic, oceanographic, geological, geophysical and biological/ecological disciplines. AESTO seeks to accomplish the main four objectives; Earth Sciences Research (ex. support of operation of

IMI, IODP), Information Distribution and Promotion, Supporting Research and Development on the Earth Sciences, and Dissemination of the Earth Sciences.

AESTO will support editing, publishing and mailing newsletter, opening bank account for subscriptions, updating and managing web site, supporting workshops, and managing circulation list of InterMARGINs.

Research Progresses in Chinese Marginal Sea

Chinese national principal research project on marginal sea is "Critical Issues for the Evolution of Chinese Marginal Sea and the Formation of Major Natural Resources" , which focuses on continental lithos phere breaking, interaction between ocean and continental, and the formation and evolution of marginal sea. The main research progresses of the project recently are summarized as follows.

(1) Seismic tomography of the lithosphere structure of the East Asia

Multi-wave and multi-parameter seismic tomography is an important method in the research of the lithosphere structure of the Chinese marginal seas. With this method, integrated with body wave tomography and surface wave tomography, the lithosphere structure of the East Asia is studied. The results show that the crust under the East China Sea become thinner from west to east while the top of the asthenosphere uplifts rapidly. The lithosphere in the Okinawa Trough area has obviously thinned, where a Low-velocity layer of upper-mantle has reached the Moho interface. Anisotropy is obviously in this area and there exit fast waves generally vertical to the Okinawa Trough. The intenseness of the anisotropy increases in the uppermost mantle. With the increase of depth, the horizontal flow reduced. All these characteristics show that the Okinawa Trough experienced sweeping melting and intense back-arc spreading. The lithosphere structure of South China Sea has the typical characteristics of youngoceanic basin. The low-velocity layer of upper-mantle is deep with large scale. But the anisotropy of the upper mantle is weak. There are no large scale horizontal flowing and mantle convection. Now the South China Sea is stable and inactive.

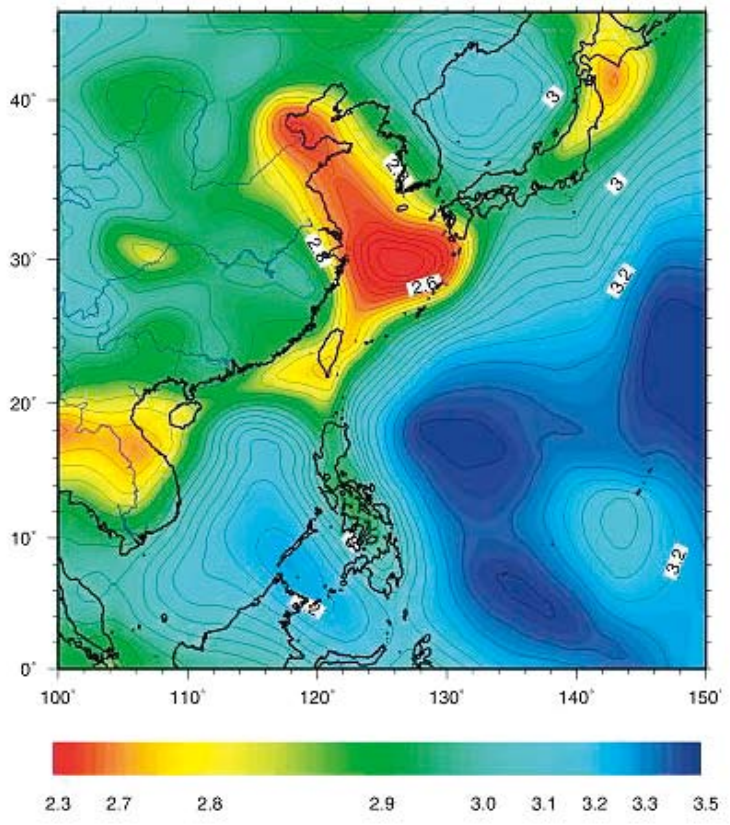


Fig.1. Group velocity of Ralyeigh wave at 14.6s period

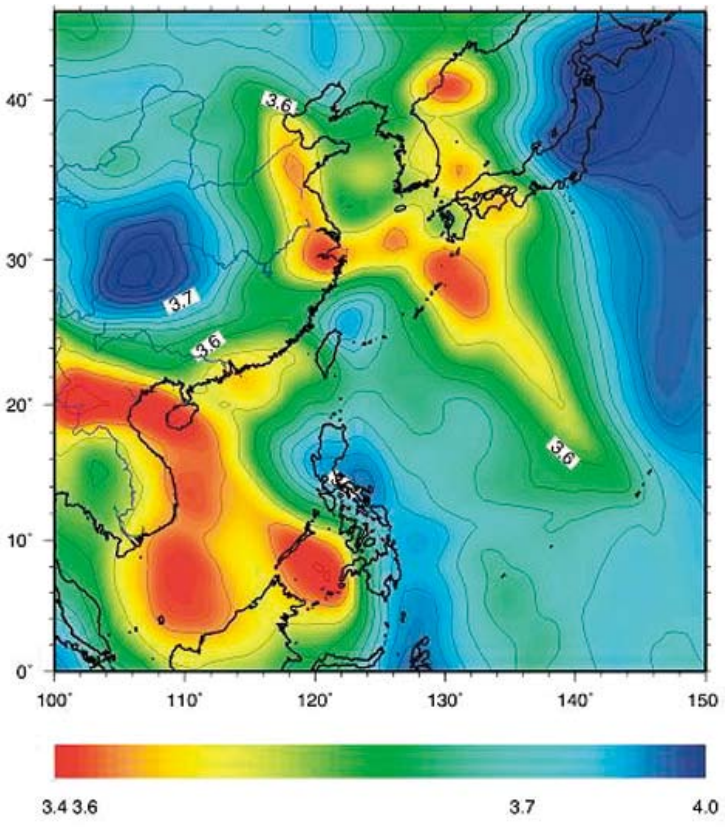


Fig.2. Group velocity of Ralyeigh wave at 146s period

(2) Crustal structure of thenorthern continental margin of South China Sea

With the natural seismic, ocean bottom seismometer, gravity, mag netic and geothermal data, et al, the velocity, consistency, magnetic and thermal-rheological structures cross sections in the northern continental margin, South China Sea, were inversed and simulated. The works on the Xisha Trough show that there is no high-velocity layer in the lower-crust beneath the Trough,and the magma intrusion is rare. The Moho interface uplifts in the middle of the Xisha Trough with great velocity changes, i.e. 6.8km/s in the bottom of crust and abruptly increase to 8.0km/s in the top of the mantle. The symmetrical continental velocity structures on both sides of the Xisha Trough suggests a homogeneous pre-rift continental setting. Before the rifting, the South China and the Xisha Block should belong to the same plate. The shortage of the high-velocity layer and the little magma intrusion draw a conclusion that the west part of the north continental margin is a non-volcanic margin.

Additionally, ocean bottom seismometer and onshore-offshore seismic experiment were carried out in the northeastern South China Sea, deep seismic phases like Pg, PmP and Pn are identified. The Moho depth of continental-oceanic transition zone decreased from 30km in the north to 25km in the south. There exists a 3km-thick low-velocity layer in the middle-crust. Combined with the ESP data surveyed jointly by China and USA in 1985, we can conduct that there are great differences in the crustal structure between the east and the west of the northern continental margin, and the crustal activities are more intense in the east.

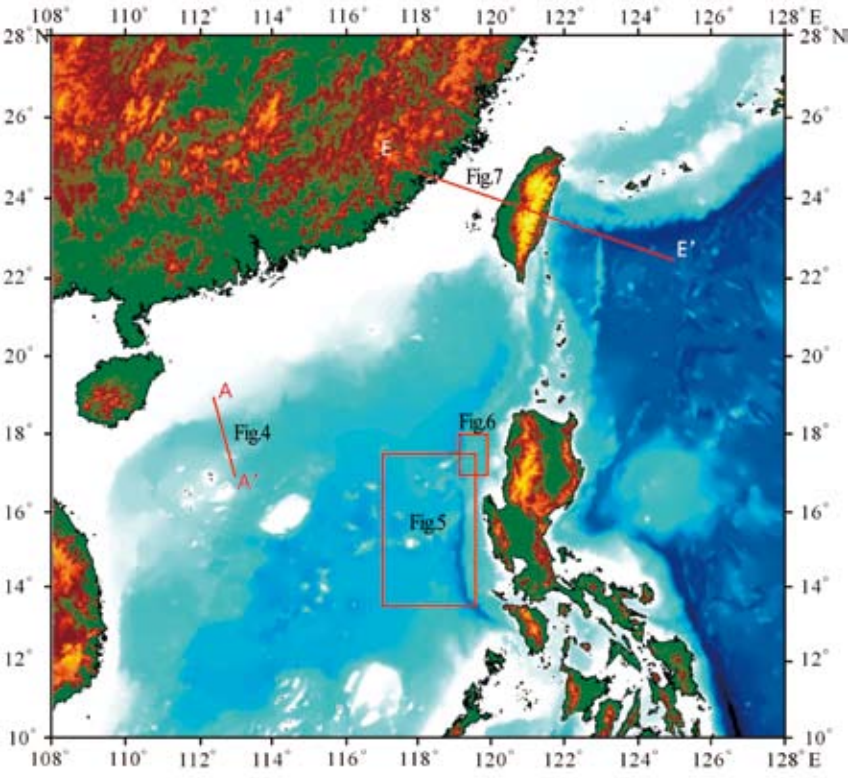


Fig.3. Map showing study area and location of profiles

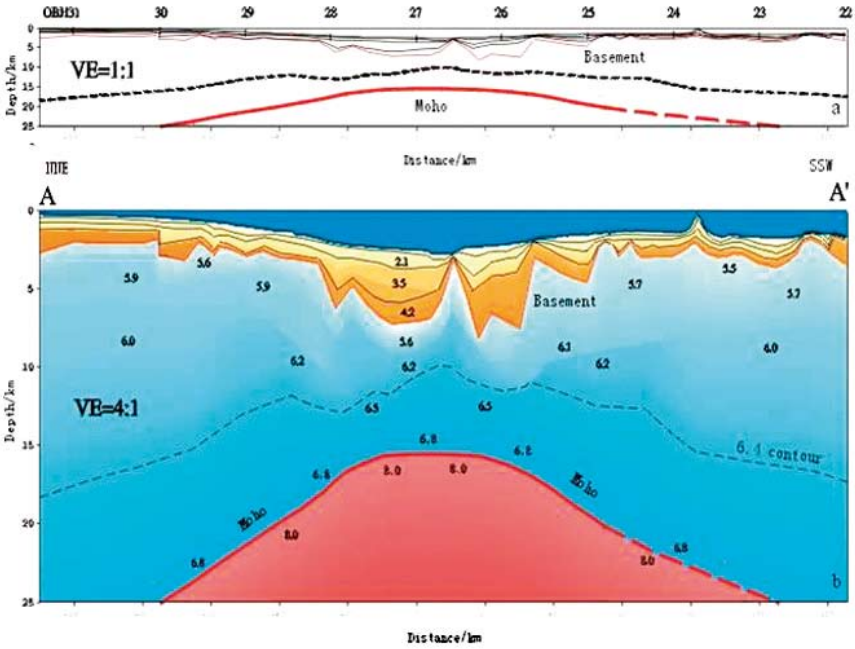


Fig.4. Velocity model of crustal structure across Xisha Trough(profile location refers to Fig.3)

(3) Layered deformation mechanism of tectonic extension in the northern margin of South China Sea

Based on the geothermal, rheology and gravitation methods, the rheological and thermal structuresof the lithosphere under thenorthern margin of South China sea were investigated. The result shows that it experienced mantle thermal action and crustal extension with the Moho temperature increased towards the ocean. The surface heat flow of the northern margin of South China Sea is higher than that of the stable continent. Most of heat flow Is originated from the mantle, with only small contribution from the crust.

The result also shows that the temperature of the upper crust is 150-300°C, lower than that of the lower crust, and the viscous coefficient of the upper curst is 2-3 orders of magnitude larger than that of the lower crust. It reveals that the upper crust is characterized by brittle deformation while the lower crust by ductile deformation. When continental marginal zone of the northern South China Sea is extended and scattered out toward ocean from northwest to southeast, brittle deformation happens in the upper crust while ductile deformation in the lower crust due to the different viscous coefficients and temperature.

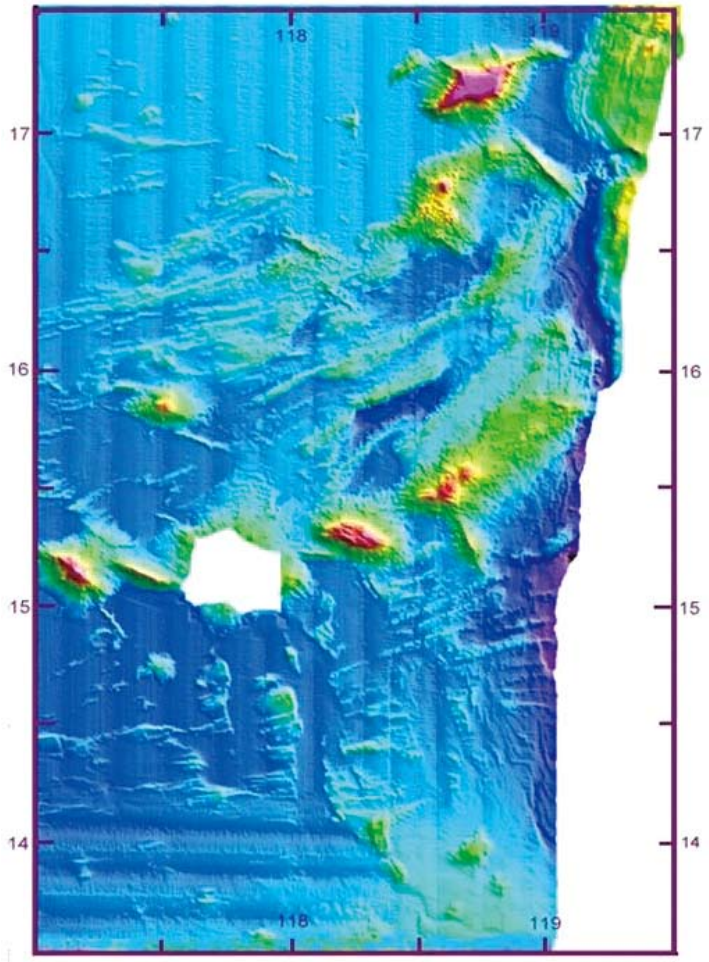


Fig.5. Image of seafloor topography showing relict spreading axis (location refers to Fig.3)

(4) Spreading Pattern of Eastern Subbasin of South China Sea

Based on the multibeam echo sounding survey, and combined with multi-channel seismic profiles and magnetic data, three NE-trending linear structural zones are identified in Eastern Subbasin of South China Sea. They are distributed in both sides of relict spreading center, the Scarborough seamount chain, representing a morphological indication of the basement faulting. These three zones correspond respectively to three spreadingepisodes: the magnetic anomalies 6c-6a (24-21Ma), 6a-5e (21-19Ma), and 5e-5d (5c) (19-16Ma). Instability, subsection and asymmetry characterize the seafloor spreading of the subbasin. There are 3°-5° abrupt changes in the spreading direction between different spreading episodes,asymmetrical spreading becomes more obvious towards the eastern part of the subbasin, and spreading rate in the southern part is remarkable higher than the northern part. Around 21Ma (Magnetic anomaly 6a), there was an important event of spreading acceleration, with the full raterapidly increasing from 30.54km/Mato 42.88 km/Ma, corresponding to the sudden changes in the spreading characteristics of basement faulting,sedimenttation, volcano activities, etc. Compared with the spreading models of other marginal seas and oceanic ridges, it is showed that the spreading pattern of the Eastern Subbasin of South China Sea is of low rate spreading, and its spreading characteristics and rate can be correlated to 26°S ridge (spreading rate 35km/Ma) in south Atlantic. The spreading of the Eastern Subbasin of South China Sea was mainly controlled by tectonic extension, and its formation mechanism is mainly of continental rifting and then led to seafloor spreading. The instability and episode of spreading are the particular characteristics of small marginal sea basins, reflected the effect of relative movement of surrounding continental blocks and variation of boundary stress on their spreading process.

(5) Manila Trench Subduction Zone

Recently, more and more studies focus on the indentation of accretionary wedges by subduction of seamounts or ridges on the oceanic plate along trenches, because they have great significance for deepening the insight into the structural styles, stress mechanism and plate kinematics of subduction zone. Based on the multibeam morpho-tectonic analysis of the middle part of Manila Trench accretionary wedge and its indentation tectonics and correlated with other geological and geophysical data, the tectonic zones in Manila Trench accretionary wedge and the responding of subduction seamounts in the accretionary structure have been studied. It is believed that the formation of Manila Trench subduction zone mainly led to the ceasing of the spreading in Eastern Subbasin of South China Sea. Besides, the oblique subduction (stress direction NW 55°) of SouthChina Sea plate is ongoing, which is actually a NWW-trending obduction of Luzon micro-plate that results from the NWW-trending displacement of Philippine Sea Plate.

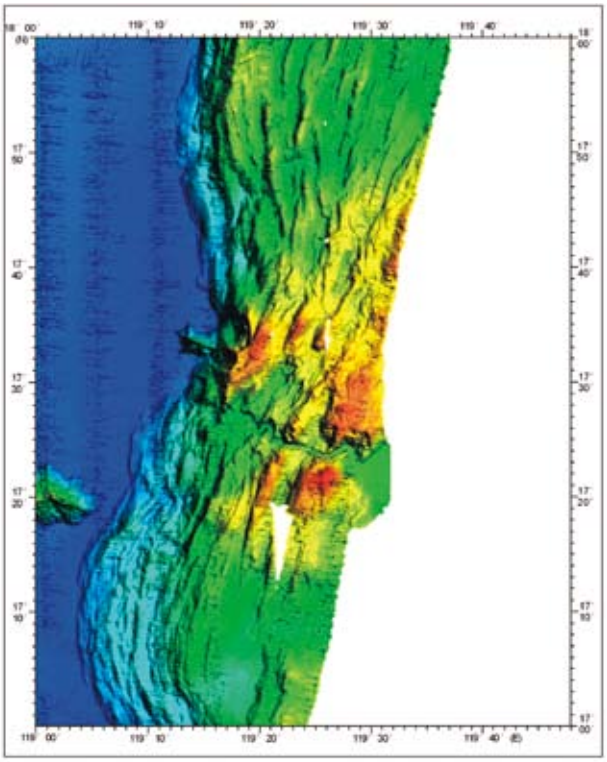


Fig.6. Topographic image of Manila Trench accretionary wedge and seamount subduction (location refers to Fig.3)

(6) Dual subduction structure in Taiwan region

The seismic imaging section from onshore Southeast China, the middle of Taiwan to Philippine Sea reveals the structure of the subduction and collision between the South China continent and the Philippine Sea Plate in Taiwan area. The Philippine Sea subduction slab of high velocity in seismic imaging extends downward to 400km depth from east to west withwhich is actually a NWW-trending obduction of Luzon micro-plate that high angle. While the South China continent subduction slab of high velo city extends downward from west to east with low angle, collided and interdicted by Philippine Sea subduction slab in Taiwan region, which make the lithosphere thickness in the east of Taiwan increased to 150km.

Integrated analyses on the dynamic mechanism show that the shallow part of the onshore South China and the Taiwan were influenced by the eastward movement results from the NWW-trending displacement of Philippine Sea Plate Of the South China's lithosphere and the collision with the Philippine Sea Plate.A series ofover thrust-nappe structures of piggyback propogation formed on the top of the crust, which induced the intensive deformation and thickening of the lithosphere in Taiwan. Meanwhile the onshore South China and Taiwan experienced a reduction of lithosphere led by deep hot mantle uplifting, due to the sinkage of the subduction Philippine Sea slab.

This project was supported by National Major Fundamental Research and Development Project of China (Grant No. G20000467). Project participants mainly include Second Institute of Oceanography, SOA; Institute of Oceanology, CAS; Institute of Geology and Geophysics, CAS; South China Sea institute of Oceanology, CAS; Guangzhou Marine Geological Survey, MLR; Tongji University, China University of Geosciences. The chief scientist is Prof. Jiabiao Li (Second Institute of Oceanography, SOA), E-mail: jbli@zgb.com.cn

Jiabiao Li
Second Institute of Oceanography of SOA
9 Xixihexia Hangzhou Zhejiang
310012 P.R. CHINA
jbli @ zgb.com.cn

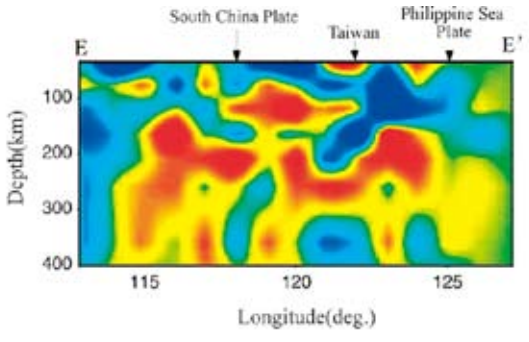


Fig.7. Image of seismic tomography from South China, through Taiwan to philippine sea (location refers to Fig.3)

InterMARGINS Steering Committee

InterMARGINS community normally holds two steering committee meetings each year. In 2005, the spring and fall committees were held in Vienna on April 26 and San Francisco on December 7, respectively. The main activities are summarized in this report.

The first important event to note is that Germany obtained a new position as an associate member of InterMARGINS (representative organization: GEOMAR). This was approved by a unanimous vote at the fall committee. The InterMARGINS community welcomes participation by other countries worldwide.

The second event was the transfer of the InterMARGINS office from the UK to Japan. Chairperson Dr. Soh intends to maintain transparent operation and open discussion for the duration of the new office. In addition,an audit of the administration of our budget will take place in February and ensure transparency. The results will be reported at the next steering committee.

The InterMARGINS community has a new strategy for the promotion of workshops and meetings. Topics should be intimately related to international margin research and make a balance of (a) local and global issues (b) active and passive margin science and (c) focusing on specific targets and making wide range in field areas. An international call for proposals for workshops and meetings is always open on our web site (http://www.intermargins.org) and the office compiles the proposals twice a year, April 1 and October 1. Compiled proposals are examined by the steering committee and their acceptance is determined by voting among the member countries. Our office received two proposals by October 1, 2005. One is to promote climate-tectonic drilling in Southeast Asia and the other to support "The 12th International Symposium on Deep Structure of the Continents and their Margins." They are in discussion. The office welcomes proposals from all over the world.

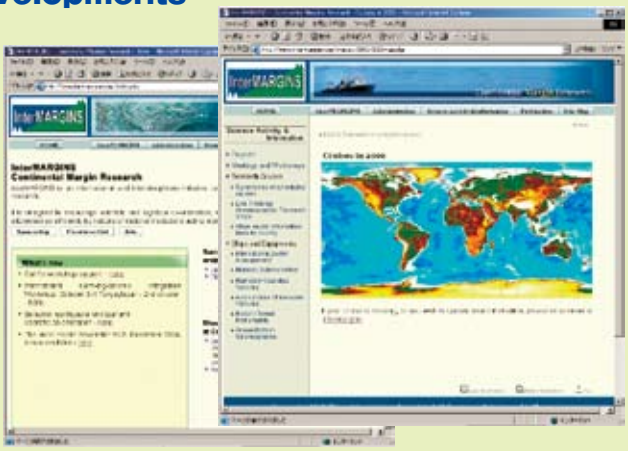
Improvement of our web site was also discussed at the spring committee. The web site is useful not only for information on cruises related to InterMARGINS, but also for promoting and endorsing image and photo data, a means to provide educational materials, and so on. The current web site can cope with increasing content and allows searches for specific items.

Further, we have been discussing ways to promote other InterMARGINS activities, such as: construction of a database system, education and outreach, and collaboration with other scientific communities. These issues will continue to be discussed and our community will identify the best ways to expand our activities.

Narumi Takahashi
InterMargins Office, JAMSTEC
3173-25 Showa machi,Kanagawa-ku,
Yokohama 236-0001 JAPAN
narumi @ jamstec.go.jp

The InterMARGINS web site: latest developments

We have undertaken the development of the InterMARGINS web site since the chair person has changed to Wonn Soh, JAMSTEC/Kochi in April 2005. The most significant development on the InterMARGINS web site has been the renewal and the functional enhancement of the interactive communication . Concerning the renewal, in order to achieve only three clicks for overviews and to easy-to-use, we recategorized all the Information into main five parts; “(about) InterMARGINS,” ” Administration,” “Science Activity & Information,” “Publication,” and “Sitemap.” Sections of “Objectives,” “Program Plans,” ” Sponsorship,” “jobs,” and “Circulation List” are placed in the “(about) InterMARGINS.” Sections of “Constitution,” “Contacts by Country,” and issues of the “Steering Committee” are placed in “Administration” which may be often referred to the Secretariat. For scientists, “Science Activity & Information” is the most important part which contains “Projects,” “Meetings and Workshops,” “Research Cruises,” and “Ships and Equipments.” Newsletters can be found in “Publication.” We adopted the latest style in look . Through the renewal, we could give this web site the flexibility and extensibility in terms of the menu structure for the coming future. Concerning the functional enhancement of the interactive communication, we



have been developing the CGI program to collect the research cruise information. We think that the major role of the InterMARGINS is to accommodate scientists with the means to exchange the various information which is useful for continental margin research. Please don’t hesitate using this program to send us your cruise information. Not only research cruise, but if you have information which you would like to contribute to any sections of the InterMARGINS web site, we will be happy to receive it.

Kazutoshi Horiuchi, Webmaster InterMARGINS Office,AESTO, Japan, horiuchi@aesto.or.jp

National Contacts

AUSTRALIA

Dr. Dietmar Mueller

Dept. of Geology & Geophysics
University of Sydney
Bldg. F05
Sydney NSW 2006,
Australia
dietmar@es.usyd.edu.au

Dr. Phil Symonds

Australian Geological Survey
Organisation
GPO Box 378,
Canberra A.C.T, 2600,
Australia
Phil.Symonds@agso.gov.au

BELGIUM

Prof. Dr. Jean-Pierre Henriet

Renard Centre of Marine Geology
Department of Geology and Soil
Science
Ghent University
Krijgslaan 281 s.8
B-9000 Gent,
Belgium
jeanpierre.henriet@rug.ac.be

CANADA

Dr. Keith E. Louden

Department of Oceanography
Dalhousie University
Halifax, NS,
Canada
Fax: +1-902-494-3877
klouden@is.dal.ca

FRANCE

Dr Eric Deville

IFP
4 rue Bois Préau
92506 Malmaison
France
eric.deville@ifp.fr

Dr Sylvie Leroy

CNRS UMR 7072
UPMC
4 place Jussieu
75252 Paris Cedex
France
sylvie.leroy@lgs.jussieu.fr

Dr. Jean Mascle

Géoazur
BP 48
06230 Villefranche sur mer,
France
mascle@obs-vlfr.fr

IRELAND

Dr Brian O' Reilly

Dublin Institute for Advanced
Studies 5 Merrion Square
Dublin 2,
Ireland
bor@cp.dias.ie

Professor Pat Shannon

Department of Geology
University College Dublin
Belfield Dublin 4,
Ireland
p.shannon@ucd.ie

MOROCCO

Dr. Nadia Mhammdi

Institut Scientifique
Dept "Physique du Globe"
BP 703 Av Ibn Batouta, Rabat Agdal
10 000 Maroc
mhammdi@israbat.ac.ma

NETHERLANDS

Prof. Sierd Cloetingh

Instituut voor Ardwetenschappen
Vrije Universiteit
De Boelelaan 1085
NL-1008 MC Amsterdam,
The Netherlands
Tel: +31-20-548-4741
Fax: +31-20-462-457
cloeting@geo.vu.nl

NEW ZEALAND

Dr. Stuart Henrys

Institute of Geological and
NuclearSciences Ltd
Gracefield Research Centre
69 Gracefield Road
PO Box 30-368
Lower Hutt, New Zealand
s.henrys@gns.cri.nz

PORTUGAL

Dr. Luis Pinheiro

Departamento de Geociencias
Universidade de Aveiro
Campo Universitario Santiago
3800 Aveiro, Portugal
lmp@geo.ua.pt

RUSSIA

Prof.A.G.Rodnikov

Geophysical Center of the Russian
Academy of Sciences
Molodezhnaya, 3
Moscow GSP-1
Russia
rodnikov@wdcb.ru

SOUTH KOREA

Dr. CHEONG Tae-Jin

Korea Institute of Geoscience and
Mineral Resources
South Korea
cheong@rock25t.kigam.re.kr

SPAIN

Dr. Eulalia Gracia

UTM-CSIC
Centre Mediterrani d' Investigacions
Marines i Ambientals (CMIMA)
Passeig Maritim de la Barceloneta,
37-49
08003 Barcelona,
Spain
Fax: +34-93-230-9555
egracia@utm.csic.es

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