

ASTER Collection of World Geology - Semail Ophiolite, Oman -



Above is the false color composite (R,G,B=3,2,1) of Akhdar mountain ranges near Rustaq (Oman) which ASTER Visible Near InfraRed (VNIR) radiometer cap-

tured at 1:25 p.m. on July 31, 2000.

[See the lower section of the next page for related stories.]

Inaugural Address from New President

My name is Kengo Ishii. I was assigned as president of the Earth Remote Sensing Data Analysis Center on July 3.

Earth Remote Sensing Data Analysis Center (ERSDAC) was founded in 1981 after several times of harsh oil crises, aiming to promote research and development of the remote sensing technologies for non-renewable resources including oil and natural gas. At roughly the same time, Japanese Earth Resource Satellite (JERS-1) Program started. ERSDAC contributed to the success of JERS-1 project by serving in development of JERS-1 data applications.

The successor of JERS-1 is ASTER-Advanced Spaceborne Thermal Emission and Reflection Radiometer. Given greatly-improved capabilities and functions, ASTER launched last December on a US/NASA platform named Terra. Involved in ASTER project, ERSDAC is currently promoting data use of the already-acquired high-quality data of all over the world that ASTER has observed to date.



To look into the near future, Phased Array type L-Band Synthetic Aperture Radar (PALSAR), which is the successor of JERS-1 Synthetic Aperture Radar (SAR), is waiting to be launched in 2003 by Advanced Land Observing Satellite (ALOS) of the National Space Development Agency (NASDA), Japan. It is expected to make a major contribution to resources exploration and environmental study.

Based on the fruits that ERSDAC has obtained so far under the former president Hashimoto, I am determined to devote myself to contribute to Japan's economy and the global societies by applying remote sensing for resources exploration and to grapple with the global environment and other issues. At concluding my inaugural address, I would like to ask the parties concerned further guidance and cooperation.

1. T. Hashimoto retired, K. Ishii elected as new president

The 7th Board of Directors ad hoc meeting was held on July 3, 2000; where Toshikazu Hashimoto retired as president and Kengo Ishii, the former president of Information-Technology Promotion Agency, Japan, was assigned to be new president of ERSDAC.

Since his assignment of June 1994, the former president Hashimoto, who is warm-hearted and well-versed in remote sensing for resources and environment, has supervised ERSDAC operations from every angle and has made a great contribution to foster the organization. We deeply express our sincere acknowledgment to him.

(General Administration Department)

(From the cover page)

This image is sectioned in two geological units from around the center. In the lower (southward) half, Jebel Akhdar Structure to represent antiform is evidently divided into two parts-Pre-Permian metamorphic rocks at the axis of the structure and Early Cretaceous shelf carbonates of Middle to Late Permian where clear cuesta is the notable geographical feature.

In the upper (northward) half, the Jebel Akhdar Structure is directly covered by the Semail ophiolite, which thrusts up as nappe and is one of the largest ophi-

olites in the world, Oman Melange and Late Cretaceous.

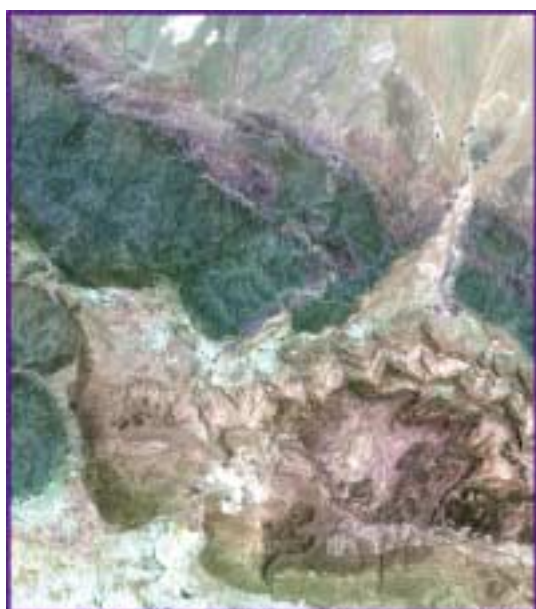
Semail ophiolite in Oman is 80 km wide and 500 km long-largest size in the world. It formed as Tethyan plate, which existed between Eurasian plate and Africa-Arabian plate, got deformed into small size and obducted when Eurasian plate and Africa-Arabian plate collided each other.

The next two images were captured respectively by

ASTER ShortWave InfraRed (SWIR) radiometer (R,G,B=8,6,4) and ASTER Thermal InfraRed (TIR) radiometer (R,G,B=10,12,14) for the same target area as the VNIR image on the cover page. Ophiolite at the upper part of the SWIR image (left) is composed of two geological units with one being colored in blue-violet and the other in indigo. Also for discrimination, the shelf carbonates at the lower part of the image is colored in light blue, taking advantage of spectrum absorption characteristics of near 2.3 micron meter range corresponding to carbonate rocks. With regard to the TIR image on the right, it is considered that color differences in the image reflects the amount of silicon dioxide (SiO₂) within rocks; the more amount of SiO₂ it con-

tains, the color turns red. From this image, it can be said as its features that the rock facies in the Pre-Permian metamorphic rocks are easily recognized and that the two separate geological units have different deformation histories each other. In addition, changing of rock facies is evident at the complex (or super-group) along thrust.

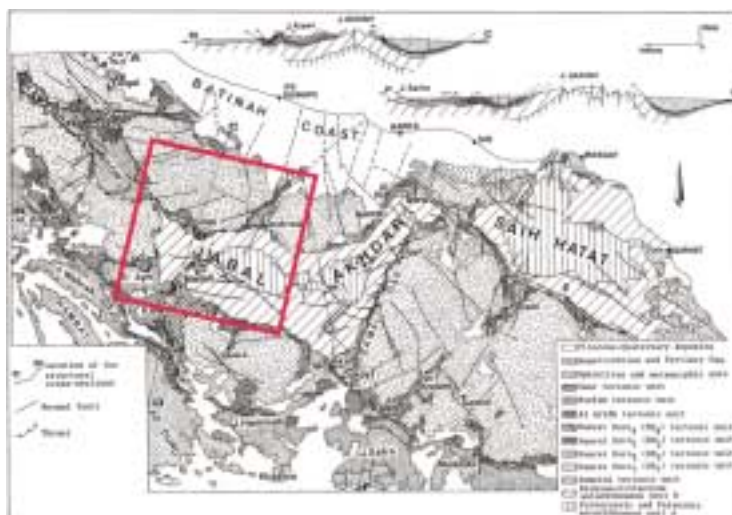
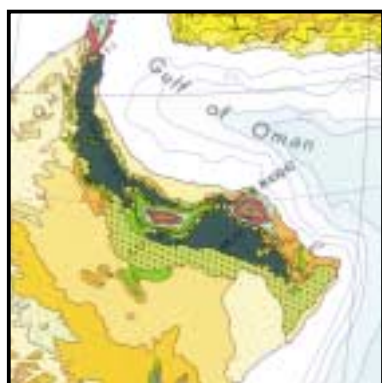
ASTER is expected to contribute to various types of studies in the earth science field, as having the ability to collect broad spectrum range of data from VNIR through TIR with multiple bands as proved above. (K. Matsuo, Department of Research and Development)



ASTER SWIR Image R,G,B=8,6,4



ASTER TIR Image R,G,B=10,12,14



Geological map around the target area extracted from ;

(Left : Regional area) Geological World Atlas, UNESCO (1976)

(Right : Local area) Bechennec, F., et al (1990), The Hawasina Nappes : stratigraphy, palaeogeography and structural evolution of a fragment of the south- Tethyan passive continental margin, The geology and Tectonics of the Oman Region, Geological Society Special Publication No.49.

2. Report on ASTER

- Right on Track and Initial Checkout Completed -

2.1 ASTER Status

Terra platform carrying ASTER is right on track, circulating around the polar orbit approximately 705 km above the ground. The data acquired by ASTER are coming down on the ground without a hitch. The data are being processed to level 1 (standard) data products through the Ground Data System (GDS) and then archived in it without trouble. Below are shown growth of the cumulative sum of the scenes collected by ASTER during the initial checkout period (see Figure 2-1) and a world area map of the data that ASTER has acquired until the end of August (see Figure 2-2). For area below 40 S, total amount of data taken is apparently limited because the area had winter season, during which the altitude of the sun is low.

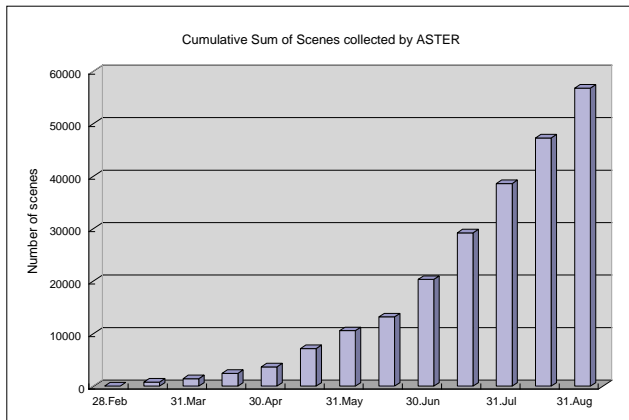


Fig.2-1 Cumulative sum of scenes collected by ASTER

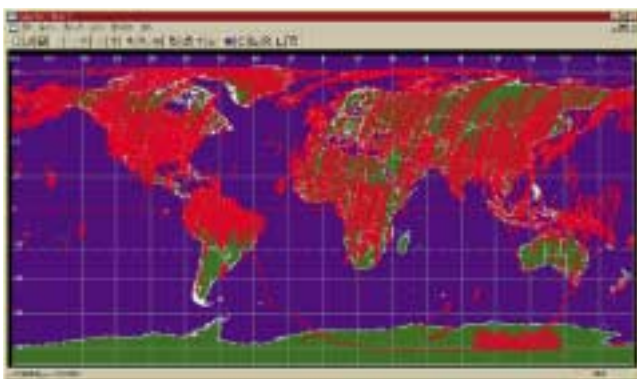


Fig.2-2 ASTER acquired-data area map

2.2 ASTER Initial Checkout Review Meeting

“ASTER Initial Checkout Review Meeting” was held at Tokyo International Forum, Tokyo on August 25, 2000. The purpose of the meeting was to review progresses, problems and the solutions of three projects of ASTER-ASTER

Instrument, ASTER Ground Data System, ASTER Science-in the course of the initial checkout which continued from the launch of December 1999 through August 2000.

At the outset, Dr. Watanabe (General manager of Technical Department, ERSDAC) clarified the objectives of this review. And then representatives from the three projects reported in detail on progresses for each project in the ASTER initial checkout period, by which it was revealed ASTER instruments are functioning very well and that ASTER data products are being generated without trouble.

Discussion and review followed each reporting, drawing a conclusion that ASTER Initial Checkouts were complete on a technical basis and ASTER is poised to go into the normal operation phase.

2.3 ASTER Initial Checkout Advisory Committee Meeting

The ASTER Initial Checkout Advisory Committee met at the PASTRAL hotel, Tokyo on September 19, 2000. The meeting objective was to have the ASTER Initial Checkout examined by experts from different fields who are not involved in ASTER project and have advice from them from their own perspective on a program-level basis.

The advisory committee consists of:

Dr. Nakayama (Prof., Hiroshima Institute of Technology),
 Dr. Shimoda (Prof., Tokai University),
 Dr. Nagura (Prof., Himeji Institute of Technology), and
 Mr. Katagi (NASDA).

(Dr. Nakayama was elected as Chairman by mutual election.)

First, ASTER Project Leader Dr. Tsu (Shikoku National Industrial Research Institute: SNIRI) outlined the whole course of the ASTER Initial Checkout that had continued since its launch. And then the ASTER Project Managers, Mr. Kudoh (JAROS) for ASTER Instrument Project, Dr. Watanabe (ERSDAC) for ASTER Ground Data System, and Mr. Kato (ERSDAC) for ASTER Science Project, in turn, gave detailed reports on progresses of each project in the course of the ASTER Initial Checkout. Then the committee examined those reports.

After having comprehensive discussion, the committee reached a conclusion that it is appropriate to see from expert's standpoint ASTER initial checkout phase was through.

In accordance with this perspective, Mr. Saeki (Director for Space Industry; Aircraft, Defense Products and Space Industry Division of the Ministry of International Trade and Industry: MITI) reported at the Space Activity Commission that ASTER operation entered the normal operation phase.

On the table at the moment is data-release; for which the methods and processes are being discussed with viewpoints framed in two categories of joint study and public distribution.

(H. Watanabe, Technical Department)

3. Trends in Remote Sensing Technologies

- The International Society for Photogrammetry and Remote Sensing (ISPRS), Amsterdam -

The 19th International Society for Photogrammetry and Remote Sensing (ISPRS) was held at “Amsterdam RAI Congress and Exhibition Centre” in the Netherlands from July 16-23, 2000. ISPRS is one of the largest international society in the remote sensing field and the general meeting is held each four years. The next meeting is scheduled for Istanbul in Turkey in 2004.

Participants in the Amsterdam meeting exceeded 2,600 (including about 100 from Japan) from 93 countries. Additionally, the number of presentations that were made every day of the meeting period at 5 - 6 sites amounted to 1000, given oral presentations and poster sessions counted in. Some examples are summarized below.

In the category of the sensor, a presentation of a new sensor called LH Systems ADS40 attracted many people. It is an airborne digital sensor that has the capability of 1 - 0.15m resolution. For a spaceborne-type sensor, L band syn-



Fig.3-1 Poster session of ISPRS 2000

thetic aperture radar PALSAR was introduced. PALSAR launch is scheduled for 2003 on ALOS.

In the category of resources, many presentations were interesting such as; a study on ground subsidence monitoring using SAR Interferometry in coal mining area, a study on monitoring of oil/gas pipelines introducing remote sensing data into a source of GIS, a study on geological structure identification or rock categorizing around iron ore using satellite data and airplane photography, or a study on estimation of rock mining amount at a mining site by preparing DEM (digital elevation model) from airplane data.

Apart from those research presentations, this meeting provided some technical tours to visit laboratories nearby. We optioned a tour to visit European Space Research and Technology Centre (ESTEC). ESTEC is one of major facilities of European Space Agency (ESA), conducting design, development and tests of satellite and sensors. After briefed by ESTEC staff, we were escorted to see an International Space Station (ISS) model and experimental facilities. At the end of the tour, we saw fabrication work of ENVISAT. ENVISAT is a large size platform that is scheduled to be launched in 2001, on which ten sensors including Advanced Synthetic Aperture Radar (C band synthetic aperture radar) will be mounted.

Overall, many presentations were in regard to studies using high-resolution satellite data. It seemed to me that researchers were seeking higher resolution satellite data. Also, there were many presentations on studies using SAR data or on Data fusion such as to combine optical sensor data with SAR data. Voices from researchers to place expectations on ALOS/PALSAR were heard.

(H. Fukasawa, Department of Research and Department)

- EUROPTO 2000, Barcelona -

The 7th EUROPTO2000 (Europe Remote Sensing Symposium) was held from September 25-29, 2000 in Barcelona.

Sessions were classified under nine chief groups below.

- Optics in Atmospheric Propagation and Adaptive Systems
- Remote Sensing of Clouds and the Atmosphere
- Laser Radar Technology
- Sensors, Systems, and Next Generation Satellites
- Image and Signal Processing for Remote Sensing
- Remote Sensing of the Land Surface
- Commercial Remote Sensing of the Ocean and sea Ice
- SAR Image Analysis, Modeling, and Techniques

Notably, “Terra Mission” session of “Sensors, Systems, and Next Generation Satellites” group spanned two days.

Representing ASTER team, Dr. Kahle (NASA/JPL), US Science Team Leader, made a presentation titled “ASTER early science outcome and operation status.” Status of the sensors on Terra was reported on the first day as well. In the second day sessions, ASTER team made the following presentations titled; “ASTER initial image evaluation,” “ASTER target observation scenario,” “Department of ASTER ground data systems and ASTER first data generation,” “In-flight performance of ASTER cryocooler.”

Attendees amounted to approximately 300 including ten plus from Japan. Enough time was set aside for coffee breaks and people enjoyed discussion or exchanged information here and there. We also were asked about ASTER status and came to learn people’s strong interest in ASTER.

(N. Doi, Department of Research and Department)

4. ASTER Symposium

4.1 Summary

An ASTER symposium was held in Sendai, Hiroshima and Nagoya, aiming to expand the users and the industry to use ASTER data.

The symposium started with speeches from guests. And then the project's outline and details and application examples of ASTER data were provided. The contents were, in order of presenting, a keynote speech titled "ASTER and EOS program;" presentations of ASTER three projects-ASTER instrument, ASTER Ground Data System, and ASTER Science; screen presentation of Terra/ASTER launch and a stereoscopic 3D movie of Mt. Fuji. After a break, members of ASTER Science Team, which provides guidance for ASTER science project, showed examples of remote sensing data application in the fields of environment, urban planning, agriculture and forestry, disaster monitoring, etc. Table 4-1 shows guests and lecturers and lecture themes.



Fig.4-1 Mt. Fuji 3D film show

4.2 Sendai

The ASTER symposium was held at Sendai Hotel from 13:00-17:00 on September 12, 2000. It was co-sponsored by Tohoku Aerospace Development Promotion Conference and supported by Tohoku Bureau of International Trade and Industry, JAROS, USEF and Tohoku Intelligent Cosmos Promotion Council.

The number of attendees amounted to a total of 79. Figure 4-2 shows a balance between all sorts of organizations to which the general attendees belong, categorized into public sector (government and municipal offices and other public bodies), private sector, universities, and others.

As for public sector, attendees from agriculture, forestry and fishery-related organization of Miyagi Prefecture occupied most. For private sector, most were either from manufacturers in various fields or general contractors [zenekon].

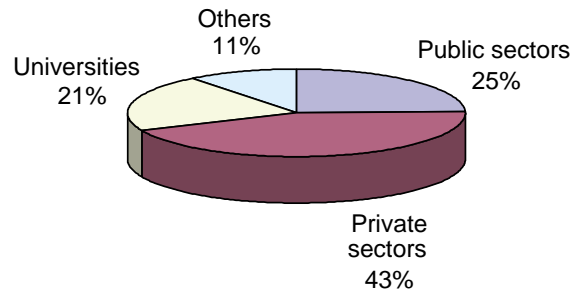


Fig.4-2 A balance between all sorts of organizations to which the attendees belong, Sendai

4.3 Hiroshima

The ASTER symposium was held at Hotel Granvia Hiroshima from 13:00-17:00 on September 14, 2000. It was co-sponsored by Chugoku Technology Promotion Center and supported by Chugoku Bureau of International Trade and Industry, JAROS and USEF, and cooperated by Hiroshima Institute of Technology.

The number of attendees amounted to a total of 157. Figure 4-3 shows a balance between all sorts of organizations that general attendees of them belong to.

In the public sector, many of them attended from local bureau of central agencies, agricultural and forestry of Hiroshima Prefecture, NTT and its associated organizations and Chugoku Electric and its associated organizations (regarded as public in the pie chart above). In the private sector, people from the machine and electric industry stood out most in manufacturing industries. Also, many were attended from general contractors.

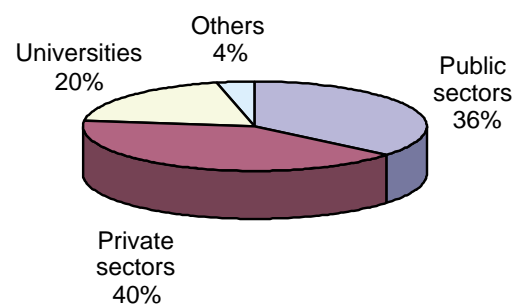


Fig.4-3 A balance between all sorts of organizations to which the attendees belong, Hiroshima

4.4 Nagoya

The ASTER symposium was held at Hotel Nagoya Garden from 13:00-17:00 on September 21, 2000. It was co-sponsored by Chubu Center for Space Industry, Science and Technology and supported by Chubu Bureau of International Trade and Industry, JAROS and USEF.

The number of attendees was a total of 97. Figure 4-4 shows

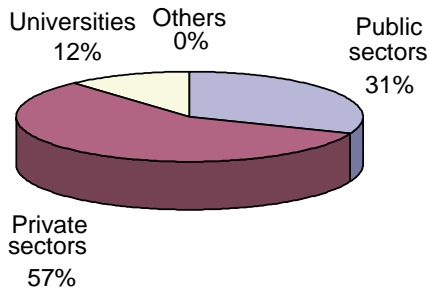


Fig.4-4 A balance between all sorts of organizations to which the attendees belong, Nagoya

a balance between all sorts of organizations that general attendees of them belong to.

In the public sector, the majority was occupied by attendees from the ceramic industry, reflected by characteristics of the industrial structure of Nagoya district. The same is true with the private sector: many of the general attendees were from the ceramic industry. In addition, many people attended from the aerospace industry.

(Y. Shiokawa, Project Planning Division)

Table 4-1 Speakers and Themes of Each Area

| | Sendai | Hiroshima | Nagoya |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Guest | Mr. SHIMODE Deputy Director-General, Industry Department, Tohoku Bureau of International Trade and Industry | Mr. AKIYAMA Director-General, Industry Department, Chugoku Bureau of International Trade and Industry | Mr. NAITO Director-General, Industries Commerce and Distribution Department, Chubu Bureau of International Trade and Industry |
| | Prof. KAWAMURA Tohoku University | President Dr. SAKURAI Hiroshima Institute of Technology | Prof. OGAWA Nagoya University |
| Key Note Speech | Prof. FUJISADA Science University of Tokyo | Dr. TSU Shikoku National Industrial Research Institute | Dr. YAMAGUCHI Nagoya University |
| Introduction of ASTER | Mr. KATO & Mr. MATSUO ERSDAC | Mr. MARUYAMA & Mr. DOI ERSDAC | Dr. WATANABE & Mr. FUKASAWA ERSDAC |
| Lecture | Mr. AWAYA Forestry and Forest Products Research Institute " Forest monitoring by ASTER " | Dr. SUGITA Yamanashi Institute of Environmental Science " Study on grasping plant kinds at the foot of Mt. Fuji " | Prof. YASUOKA University of Tokyo " Remote sensing of land ecological system and monitoring of aridland, wetland and agricultural land " |
| | Dr. JINGUJI National Institute for Resources and Environment " IT application of disaster risk management and role of remote sensing, utilization of remote sensing information on volcano eruption " | Mr. SATO Geological Survey of Japan " Monitoring of Usu volcano using ASTER " | Mr. URAI Geological Survey of Japan " Monitoring of Usu volcano using ASTER " |
| | Dr. KISHINO The Institute of Physics and Chemical Research " Monitoring of coastal environment using ASTER " | Prof., Dr. SUGA Hiroshima Institute of Technology " Monitoring of environment in sea area using satellite remote sensing " | Dr. KISHINO The Institute of Physics and Chemical Research " Monitoring of coastal environment using ASTER " |
| | Dr. MURAKAMI Geographical Survey Institute " Utilization of DEM and ortho-image prepared from ASTER " | Dr. TAMURA National Institute for Environmental Studies " Application of remote sensing data to global environmental issued " | Dr. MATSUNAGA Tokyo Institute of Technology " Outlook of urban area land coverage and thermal environment monitoring " |

Description of ASTER Associated Terms - HDF -

HDF (Hierarchical Data Format) is a general-purpose format to store scientific data. It was developed by National Center for Supercomputing Applications, University of Illinois, NCSA, USA. An advantage of optioning HDF is that it is a standardized format commonly available and supports Sun4 (SunOS, Solaris), SGI-Indy&Origin (IRIX), HP9000/735(HP-UX), CRAY (UNICOS), IBM SP2, COMPAQ (DEC) Alpha (Digital Unix & Open VMS), and others although the current version is mainly for Unix type machines.

In the fields of the satellite data world, NASA adopted an HDF-type format named HDF-EOS, which is enhanced in the efficiency of displaying EOS data with ECS (EOSDIS Core System) rules, data type, and meta-data (geographical data [point, grid and swath], etc.) added. ASTER products will also be distributed in the HDF-EOS format (and the CEOS format as well).

Technically speaking, EOSView is the only software to let HDS-EOS data displayed. However, standard-type software to let HDF data displayed is effective for HDF-EOS data as well. Only, the geographic sub-setting function, which is the characteristic of HDF-EOS, is not available. A variety of software and utilities for HDF-EOS-data displaying are provided at Illinois University (with NCSA affiliated) and NASA/JPL (Jet Propulsion Laboratory), public organizations, and Fortner, a private company.

For analysis work and others for HDF data, the following site offers a variety of utilities for free:
http://hdf.ncsa.uiuc.edu/tools.html#hdf_browser/

5. Announcements

ERSDAC Activities

| | | | |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------------------------------------------------|
| Jul. 3 | The 7th Board of Directors Meeting held | Aug. 8 | Sensing Geology Dept. Mr. Guo Zujun visited |
| Jul. 14 | 1999 ERSDAC Project Symposium held | Aug. 25 | The 1st General Research Committee held |
| Aug. 2 | PetroChina Company Limited, Tuha Oilfield Company, Deputy Director (Exploration Department) Mr. Yang Zhenxiang, PetroChina Co., Ltd., Research Institute of Petroleum Explorations and Development, Engineer, Remote | Sep. 12 | ASTER Initial Checkout Review Meeting held |
| | | Sep. 13 | ASTER Symposium Sendai held |
| | | Sep. 14 | ASTER Initial Checkout Examination Meeting held |
| | | Sep. 21 | ASTER Symposium Hiroshima held |
| | | | ASTER Symposium Nagoya held |

- General Research Committee in 2000 -

The first General Research Committee was held at Toranomon Pastral, Tokyo on August 8, 2000. This year fell on an election year to reelect the committee members. Following introduction of new members, Prof. Nakayama, Hiroshima Institute of Technology, was elected as Chairperson from among the committee.

The committee agreed that this year's Research Projects

aim to identify social needs and technical issues left unsolved to grasp "Tomorrow's Remote Sensing to Satisfy Social Needs" and that the committee continue discussion and overseas/domestic researches on issues to realize (1) expansion of application area of satellite data and (2) application of satellite data to global environment preservation.

(K. Hirose, Project Planning Division)

- 1999 ERSDAC Project Symposium -



1999 ERSDAC Project symposium was held at Heart Inn Nogizaka, Tokyo on July 14, 2000 attracting approximately 130 attendees.

Reports were mainly focused on ASTER, which launched in December 1999 by NASA, and main reported themes were the operation status of during the initial checkout period after launching, introduction of the initial images, explanation on ASTER data acquisition method, etc., Research and development of the remote sensing technologies for non-renewable resources and, in addition, Development of PALSAR that is being developed by cooperation of MITI and NASDA as a successor satellite to JERS-1 Synthetic Aperture Radar (SAR).

The proceedings of the Symposium are outlined in the list below.

1. Data processing and analysis technology, application research, oversea collaborative research
 - Satellite Imagery Interpretation in Search for Hydrocarbon Prospective Area on the Thrust-faulted Structurally Complex Zone in the Neuquen Basin, Argentina
 - Technology of Hydrocarbon Prospects Extraction and Evaluation of Potentiality in Tu-Ha Basin, China
 - Study on landslide Detection in Indonesia using JERS-1/SAR data
 - Study on Extraction Technique of Natural Resource in Promising Area using Geographic Information System in Republic of Bolivia
2. Current Status of ASTER Project
 - Current status after ASTER launching through the present (July)
 - Introduction of ASTER initial images
 - ASTER data acquisition method
 - Research and development on data processing technology
 - Study on mission operation technology
3. Development and operation of ASTER Ground Data System (GDS)
4. Research and development of PALSAR ground data system

Many of questions from attendees are with regard to ASTER data, indicating that ordering ASTER data is an interest for many people. Then, a get-together meeting was held to deepen exchange among engineers and researchers of the remote sensing field and the successful symposium was closed.

(S. Matsumura, Project Management Department)

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