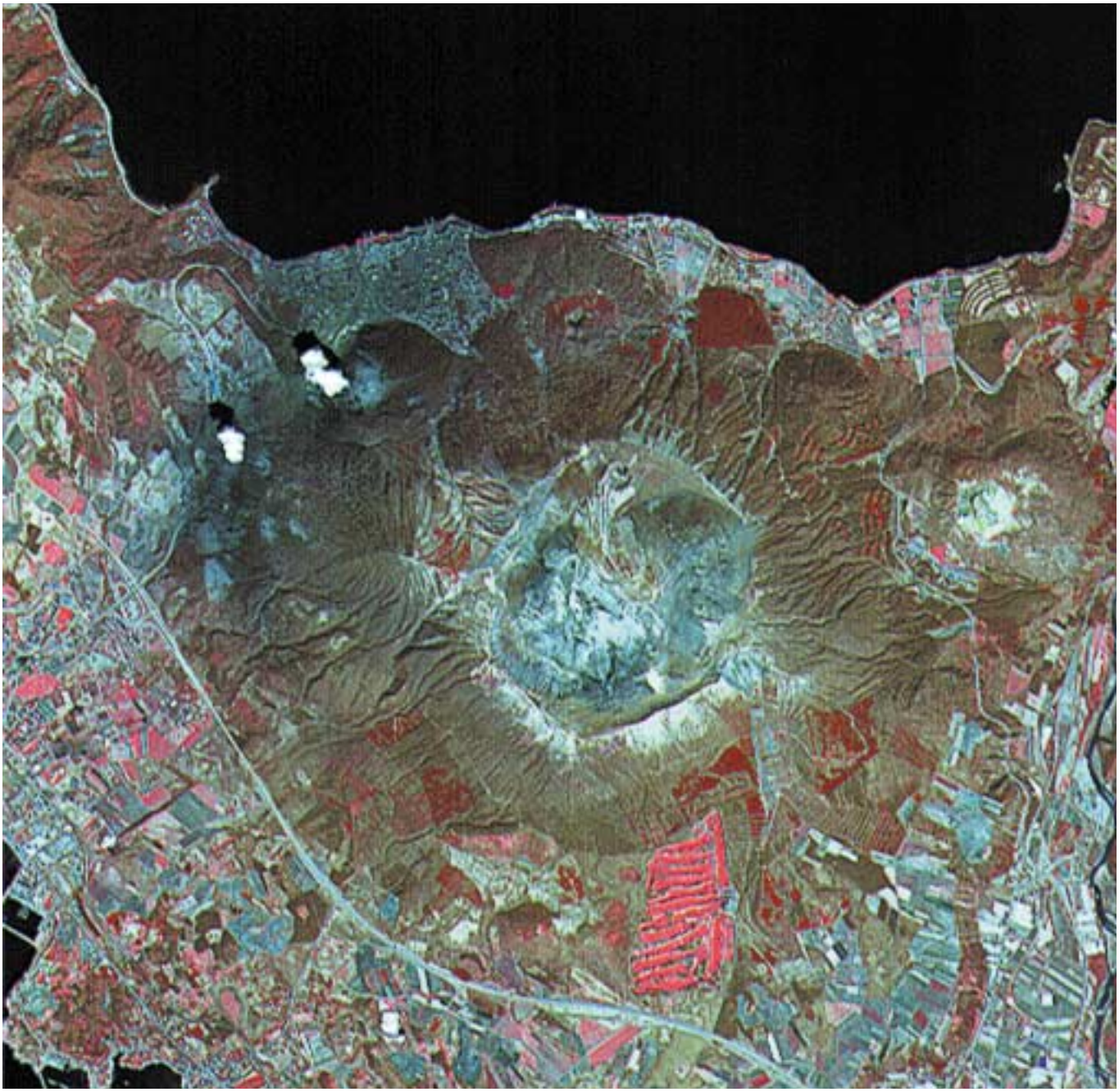
ERSDAC News No.64
2000. 6

— ASTER false color image of Usu volcano, Hokkaido, Japan —



Above is the false color image of the Mount Usu volcano as of 10:48 a.m. on April 30, 2000 ; which ASTER Visible and Near Infra-red Radiometer (VNIR) captured at an angle of 8.55 °East from nadir. In the center is seen Usu's summit caldera; Mount Showa-shinzan is also in view on the right portion.

A whole month passed after the Usu volcano erupted on March 31. Smoke spewing from two craters on the north-west side of the volcano, however, signals that the volcanic activity shows no sign of abating [at this writing]. The lake-side spa resort area is blurred in dark gray on the image, indicating that entire sections of the area have been dusted with a layer of volcanic ash. [See pages 3—4 for related stories.]

Retiring from ERSDAC

Nobumitsu Itoh,
Former special advisor of ERSDAC

I retired from ERSDAC on June 30, 2000.

My experience at ERSDAC started April 1985. A period of 15 years and three month was the longest of my work experience and left me countless memories.

Thinking back in 1985, no domestic earth observation satellites existed in Japan at that time. We used to use LANDSAT TM data for data analyzing work until JERS-1 later launched. JERS-1 outlived its life designed and could collect a large quantity of data. The TERRA satellite, carrying ASTER, successfully launched on December 1999. Now that ASTER was through with the initial check out, it is going into the normal operation phase.

The facilities and equipment of ERSDAC have been souped up one after another time after time over this 15 years. Coupled with technological breakthroughs of the computer field, we have now an advanced and compact data center. Overall, ERSDAC has been on the right track and is growing well as a data supplier.

On the other hand, ERSDAC has another role as a data analysis center. On this front, a thick yearly report is compiled each year and the pile mounts up higher and higher year by year. ERSDAC has continued joint studies with its overseas counterparts-public facilities like ERSDAC--of not a few countries, for example: China, Saudi Arabia, Brazil, Australia, Indonesia. Those joint studies have yielded many significant results, in fact. However, most of the joint studies are farmed out outside and ERSDAC never go beyond the role or the stance of the coordinator or the orderer. Actually, there are a small number of researches that ERSDAC work on by themselves, but those tend to be wrapped up in just one year and become superficial, and the theme too is prone to change.

ERSDAC addresses sensor development challenges from the standpoint of the user, bearing a heavy load particularly in works to satisfy sensor specification requirements, simulation data acquisition, and sensor calibration. Besides those, their tasks encompass a variety of works such as to determine the theme of research (to be contracted out) each year, to draw out specifications, to review research reports once submitted, to attend international conferences, to plan and conduct educational activities, etc. It is true that these conditions make it hard to spare the time for study. At the same time, it is true that ERSDAC is in favorable circumstances to do so if they will, given leeway to chose the research theme to grapple with and enjoying abundant resources such as budget, equipment and facilities, and excellent staff members with expertise sent from organizations outside.

Professor Ogawa (Nagoya University) once sent a harsh message to our newsletter. It says, "No matter how sharp the outline is, or no matter how rich the image color is, it means nothing unless those data are used to bring out actual research results." I wish ERSDAC to listen to voices from outside like the message above, know their position, and work harder on research and development.

Mr.Itoh supervised ERSDAC operations from every angle as Executive Managing Director until 1998 June and as Special Advisor from July 1998 — June 2000.

1. ASTER focused the eyes on Usu volcano

The Mount Usu volcano, located on the southeast part of Hokkaido (Japan's northernmost main island) and looking Lake Toya to north, erupted on shortly after 1 p.m. on Friday, March 31, 2000. The magma steam explosion, originating from the northwest flank of Mount Usu, followed a drastic increase in number of volcanic earthquake occurrences, which had begun on March 27, 2000. The eruption happened first in 22 years: Usu's last eruptions began in 1977 and continued into the next year.

Since the first explosion, ERSDAC has continued surveillance of the Usu volcano, having ASTER make continuous observations of the area.

The TERRA satellite, on which ASTER is mounted, orbits the earth and is back to the same point (relative to the earth) in a cycle of 16 day; however, ASTER is able to observe any target area on the globe in five days or shorter. This feat is enabled only with the pointing function—the telescope(s) tilt in the cross track direction. ASTER made the maximum use of this feature particularly in April (the earlier phase of ongoing Usu's volcanic activity) to conduct the Urgent Observation for the Mount Usu surveillance. ASTER employed for the observations not only the VNIR Only mode (daytime observation mode) and the Full mode (comprised of VNIR, SWIR, and TIR) but also the SWIR+TIR mode (nighttime observation mode) and carried out the task successfully. The data taken during a series of the observations were promptly provided to all parties concerned and also made on view to the public by posting at ERSDAC/GDS web site:

http//: www.gds.aster.ersdac.or.jp/

The listing below shows when and in which mode ASTER performed the observations in April.

April 3	Day	:	VNIR
April 5	Night	:	VNIR + SWIR + TIR
April 7	Day	:	VNIR
	Night	:	SWIR + TIR
April 12	Day	:	VNIR
April 14	Day	:	VNIR + SWIR + TIR
	Night	:	SWIR + TIR
April 19	Day	:	VNIR
April 21	Day	:	VNIR + SWIR + TIR
April 23	Day	:	VNIR
	Night	:	SWIR + TIR
April 28	Day	:	VNIR
April 30	Day	:	VNIR + SWIR + TIR
	Night	:	SWIR + TIR

As seen above, an ASTER observation was made every two or five days through April. The number of times comes to 14, including nighttime observation. It seems possible to say from this that two-three times of data-takes a week is promised should there be another volcanic eruption or other contingencies. But climatic conditions could be an obstacle to obtain a good image, naturally because ASTER is an optical sensor.

The ASTER/VNIR images that are aligned in figures 1—1 to 1—4 depict the Mount Usu and the nearby area in a time series below.

White spots or streams seen on those figures correspond either to the remaining snow, clouds, or steam

Figure 1—1 (E 20.54°): April 3, 11:05 AM

Figure 1—2 (W 17.50°): April 7, 10:41 AM

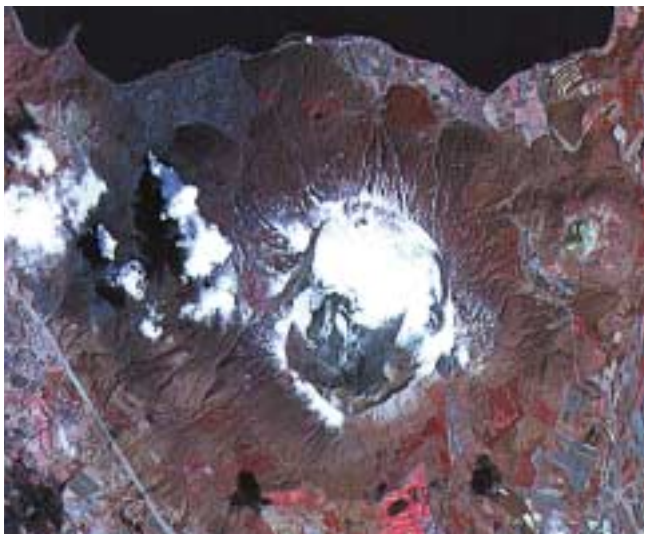


Figure 1—3 (E 20.56°): April 19, 11:05 AM

expelled from the crater. Dark red represents vegetation in most cases-primarily, evergreen coniferous trees as the spruce. Bright red indicates grassland or golf links.

In Figure 1—1 (on April 3); three black broad bands over white zone (representing the remaining snow) respectively extend in ESE, SE, and SSE direction from around the crater. The black-blanketed zone corresponds with the ash-fall areas. It is deduced that the volcanic ash has rained down in different directions on the ground each time of eruption, affected by the wind then blowing around the Mount Usu.

From Figure 1—2 (on April 7), it is recognized that the remaining snow has melted away for the most part; the traits of ashfalls are hard to identify; and that, however, a stripe of steam rises from a crater near Route 230.

In Figure 1—3 (On April 19), steam shoots high from a vent on the northwestern flank of Kompira-yama [mountain].

The whole image of Figure 1—4 (on May 7) is somewhat hazy, covered by a thin layer of cloud. But it is still distinctly identified that clouds float up above the west-side foot of the Mount Usu and that smoke heads in the NNE direction from two vents on the northwestern flank.

The temperature distribution on the Mount Usu and nearby area is shown in Figure 1—5, which comprised of two associated parts: on the left is a distribution map, indicating the area's temperatures with the colors of the rainbow (blue for lower, red for higher); and the other image on the right is the result of overlaying the area's topographical map with the gray-scale map (corresponding to the color map).

Two red dots in the encircled zone on the left each mark a family of craters of Kompira-yama [mountain] and west Nishi-yama. (All those craters have formed on this time of eruptions.) The temperature data used for the map may not be of good accuracy because the sensor calibration was not through at the time when the data were taken. But a high resolution of 3 ℃ or better is expected to come out in the end-after the calibration has completed. But at the same time TIR data cannot provide enough location information,

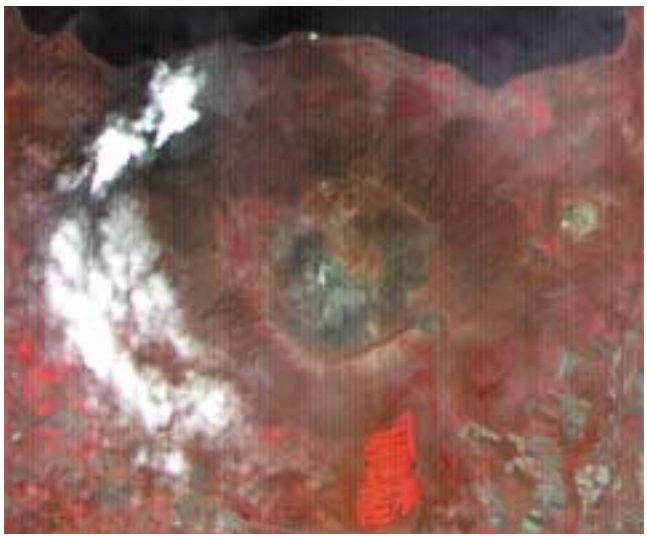


Figure 1—4 (E 2.85 °) : May 7, 10:53 AM

naturally because it is thermal—that is why the topographical map was overlaid with the temperature map (the gray-scale one). It is recognized from the image that white spots, which indicate high temperature areas, coincide with the Usu's peak and the craters where the eruptions have occurred. And surrounding areas of Usu's peak crater and Mt. Showa-shinzan are also relatively high in temperature. One important task, among others, of volcano monitoring from space is to keep track of temperatures of the target (as done as mentioned above) to help forecast the eruption.

The ASTER TIR covers five bands of spectrum and has the ground resolution of 90m—the best performance of all the resources/environment satellites in service now. The Mount Usu has showed off its violent power until recently, but it seems at last to start abating. Still and all, ERSDAC will continue to have ASTER eye up the Mount Usu until the safety around the region is secured.

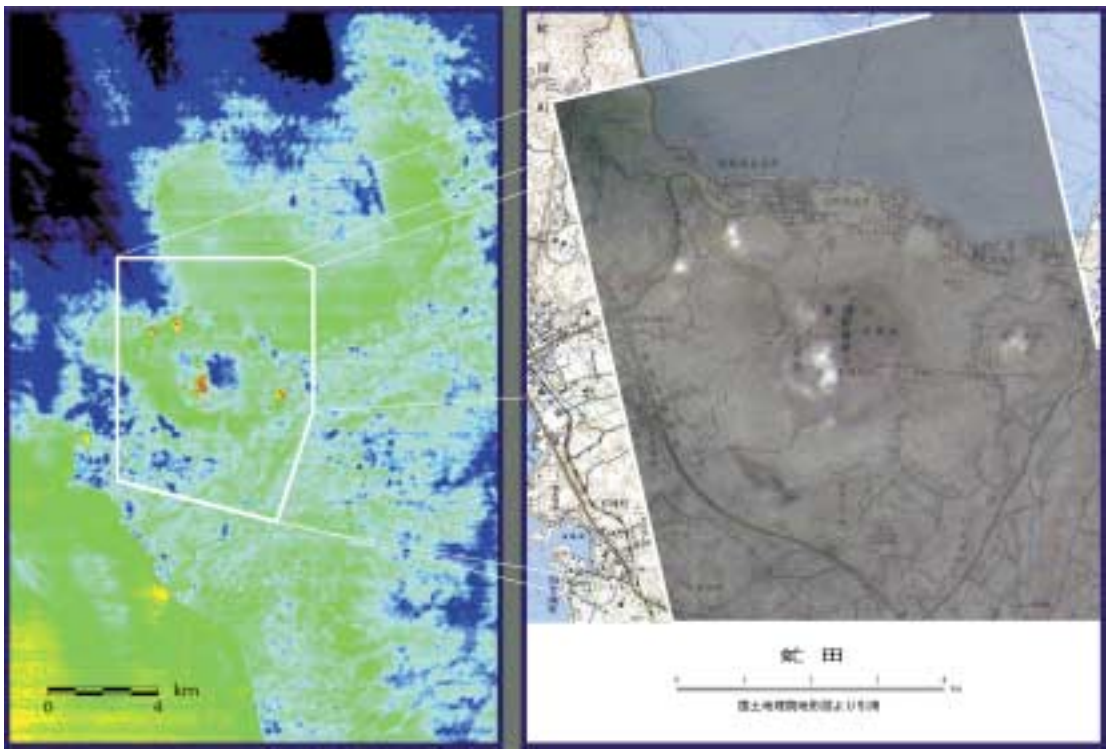


Figure 1—5 The temperature distribution map calculated by using ASTER TIR data.

2. 18th ASTER Science Team Meeting

The 18th ASTER Science Team Meeting was held 23—25 May 2000 at the TEPIA Aoyama hall, Tokyo. The meeting objectives were to discuss issues on checking and distribution of the data which it has collected since December 1999. The three-day meeting was composed of an opening plenary session on May 23, individual Working Group meetings May 24—25, and a closing plenary session on May 25.

Dr.Tsu (MITI/SNIRI) and Dr.Kahle (NASA/JPL), Japan/US ASTER Science Team Leader, opened the Meeting and welcomed the attendees. The ASTER Science Team Chairperson Dr.Yamaguchi (Nagoya University) presented examples from early ASTER images.

Then, reports were given on a version-up plan for the ASTER Level 1 product software package, results of ASTER data analyses, and the development status and the future operation plan of the ASTER Ground Data System (GDS). And it was reported that ASTER instrument calibration was finished and the ASTER operation was switched to the hands of GDS from the ASTER Instrument Team.

Reports that followed covered results from the first ASTER ground calibration comparison field campaign; the schedule of MASTER observations; and strategy for publication of fruits from studies using ASTER data, which included participation in academic meetings. The Geology Working Group (WG) Leader Mr.Urai from Geological Survey of Japan reported on the results from the ASTER Urgent Observation for the Mount Usu volcano (Hokkaido, Japan), which erupted March 31, 2000.

Following those reports, Dr.Yamaguchi presented issues that the Science Team should address in their discussion during the meeting. Based on this proposal, each WG separately debated their responsible issues in each meeting.

After the plenary session, a small committee was formed to coordinate the number of scenes for the data acquisition requests with scientific objectives and they discussed that issue. In the discussion, the processes were confirmed in which to review the newly-submitted Science Team Acquisition Request (STAR) requests from both Japan and US WG members and to submit a type of STARs that require a field campaign.

May 24:

On the second day, the following teams each met: Mission and Operation WG, Radiometric and Calibration WG, Geology WG, Ecosystem WG, and Oceanography, Limnology and Sea Ice WG. In each meeting, the validation results and analysis of the already-taken ASTER data were provided and future validation activities were discussed.

May 25:

On the final day of the meeting, the four other Working Groups—Level 1/ Geometric WG, Digital Elevation Model (DEM) WG, Atmosphere and Atmospheric Correction WG, and Higher Level Data Products WG—separately met. The summaries of the discussions were given by each WG Leader to the whole team in the closing plenary session that followed next.

In the closing session, a 3D motion picture of the Mount Fuji was demonstrated and could give a big favorable impact to the whole Science Team. Following that, Dr. Yamaguchi capped the meeting, saying:"More ASTER data are descending time after time. It is from now on that the Science Team could really play the active part. I expect you all to make good use of the data and make headway on your study."[Translated from Japanese.] The 18th ASTER Science Team Meeting adjourned.

The 19th ASTER Science Team Meeting is scheduled for the first week of November 2000, in Las Vegas, USA.

(M. Kato, Dept. of R&D)

Figure 2—1 : Plenary session

Figure 2—2 : STAR Committee discussing Japan/US STAR requests coordination

3. ASTER —from its launch to the present—

The first of the Earth Observing satellites, Terra, formerly called EOS-AM1, was launched on a launching vehicle Atlas IIAS on December 18th PST, 1999, just before a new millennium started.

ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer), formerly called ITIR (Intermediate Thermal Infrared Radiometer), is one of the instruments that Terra carries. It is quite fair to suspect that it is not a mere coincidence that an aster, a chrysanthemum-like flower, bloomed on Terra, meaning the Earth.

It was exciting as well as relieving for those who worked for this project to witness the successful launch of Terra, because it was almost 1 and half year delayed from its original plan and because there were some spacecraft accidents just before Terra's launch.

As to ASTER, it had passed 10 years since ASTER (ITIR) project started, and 6 years since ASTER GDS project started, when it was finally put on an orbit.

Terra is the flagship satellite in a series of Earth Observing System satellites. EOS-PM1 is coming up next and it was recently renamed as Aqua, meaning the water.

During the year 1999, NASA succeeded in launching Terra, deploying Solar Array and deploying High Gain Antenna. It then succeeded in obtaining an orbit 695km above the Earth, which is slightly lower than the final orbit. ASTER was eventually turned on on January 5th, 2000, after NASA's Christmas holidays and New Years Holiday to prevent Y2K Issue. Until the end of March, ASTER had been operated, controlled and monitored by US-based ASTER Team and ERSDAC-based ASTER Team in collaboration. The US troop was stationed in GSFC (Goddard Space Flight Center), the control center of all the five instruments aboard Terra. During the Initial CheckOut period, there were quite a few critical problems. High Gain Antenna turned out to be very unstable. The temperature of Base Plate of TIR went high due to detector cooling. It took so much time and efforts to obtain the final orbit in a Rendez-vous with Landsat. There were many other technical items. We had to face and solve all of those problems under the circumstances that there is a time lag between the US and Japan and that there is a communication barrier between English and Japanese.

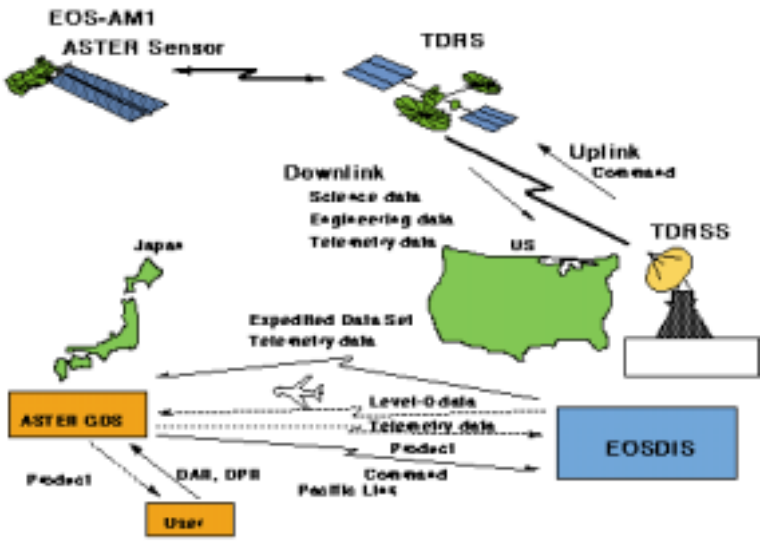


Figure 3 US-Japan Relation in ASTER Project

As far as my memory is right, the very first ASTER image came down on the Earth at the end of January. It was an image of San Francisco River in Brazil acquired by VNIR during its functional check. The image was transferred from the spacecraft to TDRS (Tracking Data Relay Satellite), from TDRS to TDRSS (Tracking Data Relay Satellite System) in White Sands, from TDRSS to GSFC, and from GSFC finally to SISS (Software Implement Support Subsystem) of GDS in Japan. We can never forget the very first moment when we actually took a look at the image. The image was, however, upside down, and we were told it by NASA later on. It was even more impressive when we received TIR image of Rift Valley in Ethiopia. Acquisition of TIR image with multi-band was expected to be extremely difficult. However, the TIR image we received was tremendously spectacular. It maintained a high quality in its decorrelation-stretched image and it showed a clear distinction of various rocks. I would like to add that SWIR image was not obtained soon enough not because of any anomaly in SWIR but because of a simple matter of timing.

ICO Phase 1 ended at the end of March. The Instrument Team, JAROS, was responsible for checking all the ASTER instrument functions during this period. The review of ICO-1 and transition of ASTER operation from JAROS to ERSDAC were carried out in ICO-1 Review Meeting held in Tokyo on March 30th. All the IOT (Instrument Operation Team) members gathered including those who were working in GSFC during ICO-1. Having no one in GSFC made it difficult to work together with NASA. On the other hand, the workforce unified in Tokyo to confront the challenges. The emphasis of the checkout was also shifted from the spacecraft mission to the ground data system. The focus is now on data exchange with EOSDIS (EOS Observing Satellite Data and Information System), mainly with EDOS, GSFC DAAC and EDC DAAC, and on finalization of L1 processing system in cooperation with the ASTER Science Team. The volume of acquired data has increased from 300 scenes/day in May to 700 scenes/day in June by Global Mapping Data Acquisition Request from the ASTER Science Team. The maximum data volume that GDS can generate is 780 scenes/day and it is just around the corner.

It is no need to mention that the success of the spacecraft launch and the initial checkout so far owes not only to partnership amongst JAROS, ERSDAC and ASTER Science Team but also to cooperative support from NASA. I would like to express my deepest appreciation to all the US colleagues who worked for ASTER, and I believe that their Japanese has greatly improved!

ASTER GDS Project Manager
Hiroshi Watanabe

4. Overseas partners in joint research projects (2)

KACST, Saudi Arabia

(1) About KACST

Since 1992, ERSDAC has collaborated with King Abdulaziz City for Science & Technology (KACST) in joint researches.

KACST, established in 1977 and renamed from in 1985, is a scientific organization of the Saudi Arabian Government. It is directly governed by the Supreme Committee, which is composed of the country's influential ministers with the Saudi Arabia's King in the chair. KACST are given a great power in strategy planning and budgeting with the country's science technology.

KACST is comprised of three segments : Administration, Scientific Research Support, and Research Institutes. The Research Institutes consist of three centers (Centers) and seven research institutes (Institutes), including Space Research Institute (SRI), which Saudi Center for Remote Sensing (SCRC)—the ERSDAC counterpart—falls into.

SCRC receives and archives satellite data from LADSAT, SPOT, RADARSAT, and others, and distributes those data in Middle East. Moreover, they work on development of satellite data utilization methods.

(2) The collaborative research project with ERSDAC

The joint research project between ERSDAC and KACST is divided into two phases: Phase 1 (1992—1997) and Phase 2 (1997—the present), each broken down below.

Phase 1 (1992—1997) : Entrusted by MITI
1992 : Samran
1993 : Khnaiguiyah
1994 : Eastern Khnaiguiyah and Samran
1995 : Central coast region of The Red Sea
1996 : Northern coast region of The Red Sea
1997 (overlapped) : Southern coast region of The Red Sea
Phase 2 (1997—present) : Entrusted by
1997(overlapped) : Hail
1998—1999 : Coastal region of the Aqaba Bay
[All years are fiscal, ending in March.]

In 1997 (October), the First Saudi-Japanese Symposium "Remote Sensing Application" was held in Riyadh, Saudi Arabia, to summarize the fruits of their joint research studies until then and to further the exchange of technologies. Eleven people attended it from Japan (including four from ERSDAC).

Saudi Arabia is an oil-producing country, producing the largest amount in the world. And land surfaces of Arabian Peninsula (a great part of the peninsular is occupied by Saudi Arabia) are exposed for the most part since it is mostly either desert or vegetation-scarce land. Those facts lead an undoubted conclusion that Saudi Arabia is an excellent target for remote sensing. With expectations boosted on practical applications of JERS-1-related research results and ASTER data application study in the future, ERSDAC will continue as ever a close relationship with KACST/SCRS.

(Y. Shiokawa, Project Planning Div.)

Figure 4—1 : The staff for 1998 survey

Figure 4—2 : Aqaba Coast / Field survey 1998

5. Announcements

ERSDAC Activities

April 5 ● Mr. Bold (Ministry of Agriculture and Industry, MONGOL) visited

April 10 ● Mr. Abudou (Ministry of Mines and Energy, MALI) visited with 14 others

April 24 ● Mr. Salvadol (Mines and Geoscience Bureau, PHILIPPINES) visited with three others

May 10 ● The 1st Technical Committee 2000 held

May 10 ● Mr. Siagian (Ministry of Mines and Energy, INDONESIA) visited with three others

May 11-12 ● ASTER early images exhibited at annual meeting of Remote Sensing Society of Japan (Tsukuba)

May 17-18 ● EOS annual meeting held at Tokyo

May 29 ● Mr. Norubu (Butan) visited with ten others

June 12 ● The 44th Board of Directors Meeting held

June 14 ● The 31th Advisory Committee held

Figure 5－1 : Mr. Gorpiz (Phillipines Institute of Volcanology and Seismology) reporting Mayon's volcanic activities

Figure 5－2 : JICA/RESTEC interns lectured on ASTER GDS

－The 7th Session of the Asia-Pacific Regional Space Agency Forum Asia-Pacific Regional Space Agency Forum (APRSAF)－

The 7th Session of the Asia-Pacific Regional Space Agency Forum/APRSAF was held 19－21 June 2000 at Institute of Industrial Science, Univ. of Tokyo, with the theme of "Easy Access to Space Benefit." under the sponsorship of National Space Development Agency of Japan (NASDA) and Institute of Space and Astronautical Science (ISAS). The conference objectives were to promote communication and cooperation between foreign organizations involved in space development and domestic organizations using space technologies. The ERSDAC Project Planning Division Manager Y. Maruyama gave a report titled "Use of Earth Observation Data for Exploration of Natural Resources" in the second day's Part 3 session, "Earth Observation Data Application in the Field of the Administration."

－Personnel Shifts－

Kenji Tatsumi	: Assistant General Manager, Technical Department	(1 st April)
Hidekuni Kikuchi	: Manager, PALSAR GDS Divison, Technical Department	(1 st April)
Mitsugu Yamashita	: Researcher, Research Division, Department of Research and Development	(1 st June)
Kyuji Yasuda	: General Manager, General Administratation Department	(20th June)
Toshikazu Hashimoto	: retire from President	(30th June)
Nobumitsu Itoh	: retire from special advisor	(30th June)

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