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NICT

New Year's Greeting 2013

President of National Institute of Information and Communications Technology

Dr. MIYAHARA Hideo

I wish all of you a Happy New Year.

I hope that all of you had a wonderful New Year's Day with fresh sentiments.

Last year here at NICT, we successfully carried out our fiscal year plans including new initiatives. Looking at Japan, I think hopeful signs have slightly been emerging such as the rise in stock prices and correction of yen appreciation underway with the recent change of majority political party. Although there seems to be much debate even among economists on the interpretation of this situation, I, myself, have great hopes for the future.

However, progress is still insufficient despite the number of efforts made for a better future including new efforts towards recovery from the Great East Japan Earthquake and new business developments that apply social and technological advancements. As a core national institute in charge of research and development in the field of information and communications, NICT must firmly assess future directions, work on our research while further being aware of the expansion of research achievements to society, and endeavor to nurture new technologies so that they are put into practice and advance as the foundation for socio-economic development.

When I look back at each NICT laboratory and center's activities last year, I believe our researchers and staff delivered on all points and achieved significant results. In fact, we received mostly above AA and A rating results from Commission on Policy Evaluation and Evaluation of Incorporated Administrative Agencies, Ministry of Internal Affairs and Communications and NICT External Evaluation Committee evaluations. On just one point, however, in the Ministry of Internal Affairs and Communications External Evaluation Board's business operations category, we regrettably received a B. If I may add, this B rating is related to the fact that actual reduction in staffing slightly lagged behind our stated target of fiscal year 2011. It pointed out the measures we took, leastwise within presidential and executive jurisdiction, which were selected based on being deemed beneficial to NICT. As an independent administrative institution, I believe that at NICT, it seems to be required that the executive board, centered around the President, promote good governance and exercise proactive and flexible management. I envision that this will mark us in the world as a distinctive, independent research institute. This is what I hope to remind you along with my own ruminations.

As I mentioned above, each activity of research laboratories and centers was highly evaluated, and from my own view, achieved considerable results. Thus, with too many to count, I will refrain from introducing each one here and instead will mention overall efforts at NICT and matters that we must tackle hereafter.

I have always reminded our members that public accountability is crucial to introducing our latest research achievements to both experts and the broader public. Last fall, we held a two-day open house. Though we have been working hard at introducing research results in the past by participating in exhibitions, this was the first time for researchers to introduce research results at NICT Headquarters through talks, exhibits, and demonstrations.

At a research institute like NICT, it is all about maximizing the strengths of researchers to their full potentials. I believe, along with efforts to improve the research environment for this purpose, that increasing their motivation will lead to the improvement of all NICT research and development. In that respect, I think the open house had a substantial effect.

Three important points I think we must consider in promoting research on information and communications technology are as follows. First: how to respond to the issues of "Scalability"?—fast-paced, ever-expanding system scale. Second: the issue of ICT energy consumption; while ICT is undoubtedly important fundamental technology supporting all segments of social infrastructure, the issue of information system energy consumption has come to light. And third: system safety, reliability, or in the broadest sense, "Security"—a serious social issue, one that now must be treated as national security.

I believe these three factors must be considered in almost all areas of research at NICT, and we should make models using these factors in some cases as restrictive conditions and other times as objective functions and promote research. In other words, these three factors correlate with each other. If only one receives a remarkably high evaluation and the others fail to follow suit, the whole system ceases to work (while rather an abstract expression)—becomes unacceptable as an effective system—and as a result, it becomes useless. Thus, it is important to take a panoramic view of the whole system and promote total optimization. Integrated design skill is precisely what makes this possible. I have been saying this ever since assuming this position and believe that, most recently, all laboratories and centers have been implementing their research while bearing this in mind.

The result of this, I believe, is the inter-laboratory collaborative projects. Some of them have already been achieving research results. Moreover, these projects are not independent of each laboratory but carrying out research in close coordination. Workshops co-hosted between laboratories are also progressing as future opportunities to seek new collaborations, which I think are great undertakings.

The development of collaborative research, I feel, does not require a complicated environment—it is nurtured, rather, simply from daily interaction among researchers. Everything begins from a person-to-person encounter, which creates an opportunity. Thus, I suggest everyone cherish these "encounters" and "opportunities". Requisite "opportunities" come to everyone, but the sufficient condition on whether or not you can seize them hinges on constant effort.

Almost two years have passed since the Great East Japan Earthquake. While there are strenuous efforts being made towards rehabilitation and reconstruction on all fronts, we have to redefine fundamental reassessment of past disaster prevention countermeasures. Information and communications systems also suffered severe damage from the earthquake. And while information-communications systems have provided measures based on past experience, they were not able to adequately function.

In April of last year, with the help of Tohoku University, NICT established the Resilient ICT Research Center on the university's campus. The center aims for the realization of disaster-resistant information and communications technology and revitalization of regional economic activities in the disaster-stricken area through industry-academia-government-based collaborative research. The center received a supplementary budget for earthquake disaster recovery. This does not only indicate that we have a NICT research center on Tohoku University but that we must focus on how quickly we will contribute to the earthquake disaster reconstruction.

Ahead of the establishment of this center, the Center for Information and Neural Networks (CiNet) is up and running on Osaka University's campus and we will hold an opening ceremony in the near future. As this center has been processed under a joint NICT-Osaka University-ATR collaboration, we—NICT as a whole—must support both this center and the center in Tohoku University in the coming future. Next to this center (CiNet), the RIKEN is going to run, in collaboration with Osaka University, a life science systems oriented center (QBiC). I hope these undertakings grow as model cases of industry-academia-government-based interagency collaborative projects.

I believe infrastructure based on concrete collaborations like these are indispensable in order to bring the best researchers from around the world into NICT and so that NICT will be recognized as a world-renowned research institute.

Thus, amidst rapidly changing social conditions, NICT is launching flexible research projects and working on research and development on information and communications technology that must promptly be addressed. By gathering researchers of the related field in NICT, and advancing partnerships with research institutes of universities and private companies, I hope to respond swiftly to society's demands and meet expectations.

Lastly, let me conclude this New Year's greeting with my sincere wish that this year be a fantastic one for you all. Thank you.

Research and Development of Phased Array Weather Radar

—Measuring the three dimensional fine structure of torrential downpours—

SATOH Shinsuke

Senior Researcher, Radiowave Remote Sensing Laboratory Applied Electromagnetic Research Institute

After completing a doctoral course, SATOH joined Communications Research Laboratory, Ministry of Posts and Telecommunications (currently, NICT) in 1995. He has engaged in research and development related to Global Precipitation Measurement/Dual-Frequency Precipitation Radar (GPM/DPR), Okinawa Bistatic Polarimetric Radar (COBRA), and phased array weather radar. Ph.D. (Science).

USHIO Tomoo

Osaka University Graduate School of Engineering, Associate Professor

After completing a doctoral course in 1998 and serving at Osaka Prefecture University, USHIO joined his current post in 2006. He has been engaged in research related to radiowave remote sensing, earth observation, lightning discharge, and environmental electromagnetic engineering.

MIZUTANI Fumihiko

Toshiba Corporation Specialist, Meteorological Systems Group, Radio Application Systems Engineering Department, Komukai Complex

MIZUTANI has been at his current post since completing a graduate degree program in 2003. He engages in product development operations such as weather radar systems and weather forecast systems. Master's (Science). Certified weather forecaster.

Introduction

Last year, unexpected, local phenomena such as local heavy rainfall (so-called torrential downpours), tornados, and downbursts have become social problems causing disasters around Japan. Although weather radar is effective at capturing these phenomena, it was inadequate to observe regional phenomena with C-band large weather radars*1 maintained by the Meteorological Agency and Ministry of Land, Infrastructure, Transport and Tourism (MLIT) all over Japan in terms of temporal and spatial resolution. Several years ago, the MLIT decided to set up small weather radars called X-band MP radar*1 around urban areas so they could observe precipitation distribution every minute aboveground. However, because rain is produced within clouds in the atmosphere and falls down to the ground, it requires 3D stereoscopic observation to capture premonitory phenomena and examine the developing process. Operational weather radars also implement 3D observation and use a 360-degree-rotating volume-scan method while changing its parabolic antenna's elevation angle a dozen times in sequence. However, in order to capture the 3D structure of rainfall, it takes more than 5 minutes to observe, furthermore the data using operational weather radar have partial interruptions. Local heavy rainfall from cumulonimbus clouds is a phenomenon in which the lead time between the start of rain and following downpour is only a few minutes and, with tornados and downdrafts, within several minutes up to the generation, development, and decaying of the phenomena. The occurrence of these phenomena is also limited to an extremely narrow area less than a few square kilometers. In order to mitigate and predict local meteorological disasters caused by small, short-lasting phenomena, the first step is to observe 3D stereoscopic structures of these phenomena in detail.

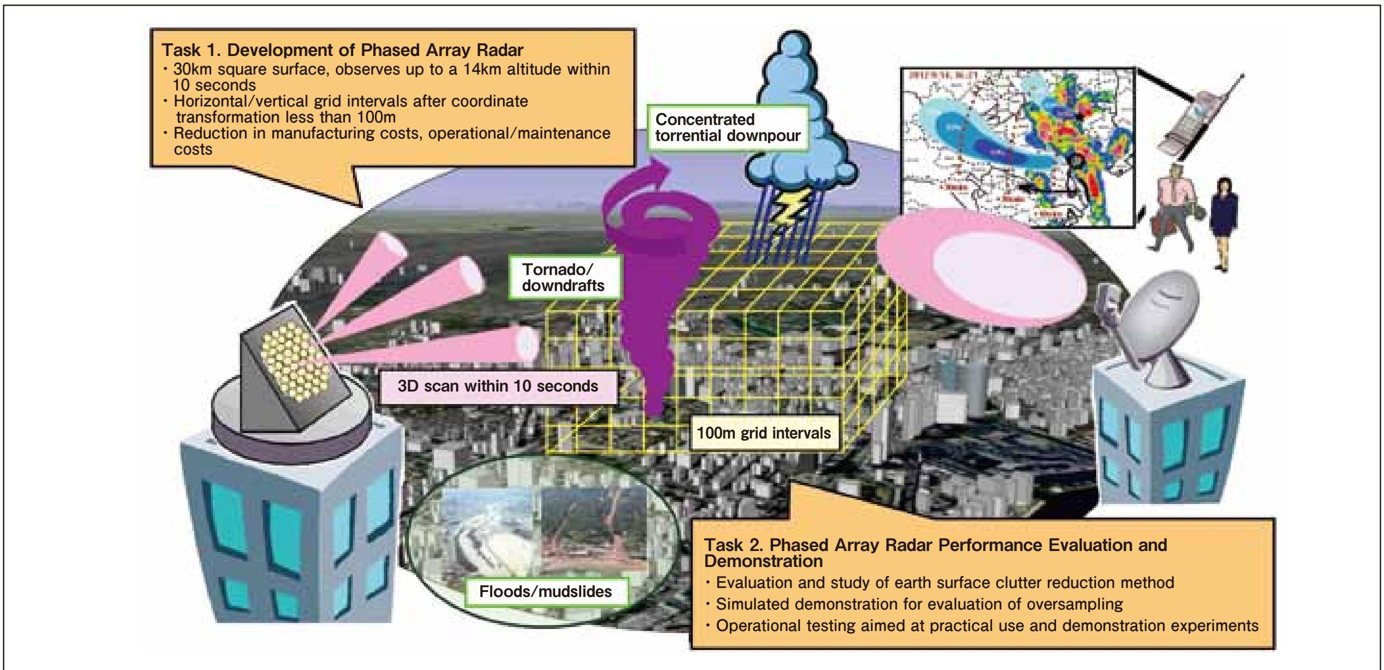

Figure 1　NICT commissioned research, "Research and development of next-generation Doppler radar"

*1 C-Band Weather Radar/X-Band MP Radar
Japanese weather radars use C-band (5GHz, approx. 6cm wavelength) and X-band (9GHz, approx. 3cm wavelength) frequency bands. Radars were once mainly large-scale C-band radars; however, in recent years, Doppler, which uses X-band that allows antenna miniaturization, and multi-parameter (MP) radars with observable dual polarization, are being introduced.

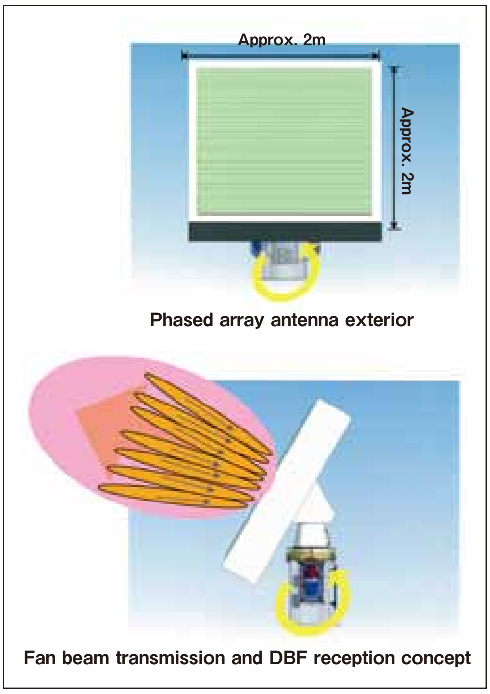

Figure 2 1D phased array and DBF conceptual diagram

Figure 3 Phased array weather radar installed at Osaka University

Development of phased array radar

At NICT, in 2008 we invited applications for "Research and Development of next-generation Doppler radar" commissioned research that aimed to observe 3D precipitation distribution in 100m resolution within 10 seconds, with both Toshiba Corporation and Osaka University receiving the commissioned research contract. To achieve this goal, with an industry-academia-government team consisting of Toshiba, Osaka University, and NICT, we decided to adopt a method to perform 3D volume observation without hiatus at one revolution by mechanically rotating 360 degrees in the azimuthal angle directions a 1D phased array antenna*2 that electronically scans in the direction of an elevation angle (Figure 2). Although 2D phased array radars are well-known for allowing uninhibited electronic antenna scanning in both azimuthal and elevation angle directions among phased array radars, they have difficulty in practical application cost-wise because 100×100-sized antenna elements become necessary to form 1 degree wide pencil beams required by weather radar with 2D arrays. Therefore, we decided to employ a 2m square X-band 1D array antenna that accumulates 128 slot antennas longitudinally, which allowed us to aim at the cost equivalent of an existing radar with parabolic antenna. With weather radar, in order to observe volume scattering from small targets—raindrops—you need to calculate the integral of data reflected from pulses submitted at least 10 times. To do this, observation time cannot be reduced just by electronically moving antennas quickly. As shown in figure 2, with our radar, we realized the significant reduction of observation time by having transmitted waves form broad fan beams in an elevation angle direction and during reception simultaneously forming a number of thin beams via the Digital Beam Forming (DBF)*3 method. As leading observation modes, seamless (an elevation angle number above 110) 3D observation is possible in 10 seconds at detailed observation mode of 25km radius observational range and in 30 seconds at standard observation mode of a 60km radius.

Figure 4 Phased array weather radar observational range

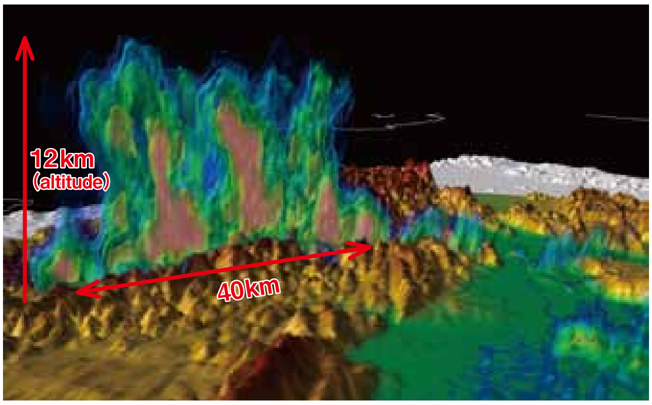

Figure 5 3D precipitation distribution on July 22, 2012 18:51:20

3D Visualization of test observation results

In May 2012, the phased array weather radar we developed was installed at Osaka University Suita Campus on the 13th floor rooftop of Building of Electrical Division (Figure 3). This location is an ideal observation site with 360-degree visibility and hardly any obstructions. Its observation range is shown in figure 4. We will introduce two cumulonimbus cloud precipitation cases from the test observation results started last June. In figure 5 showing precipitation that occurred in the north of Osaka Plain, Hokusetsu mountain range, on July 22, rain generated in 3-4

*2 Phased Array Antenna
An antenna that can electronically change beam direction by arranging a multitude of antenna elements and controlling the phases of received and transmitted radio waves in each element.

*3 Digital Beam Forming (DBF)
Technology that forms a number of antenna beams by digitally processing antenna element signals in an array antenna composed of a multitude of antenna elements. With this radar, we can receive a number of observation values simultaneously at a resolution of 1 degree by transmitting radio waves with wide beams of 5-10 degrees at an elevated angle and independently receiving radio waves returning with scattering of raindrops with a 128 slot antennas by synthetically processing these reception signals on software.

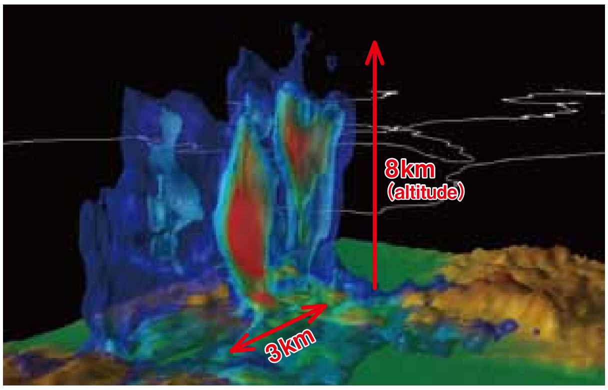

Figure 6　3D precipitation distribution on July 26, 2012 17:38:16

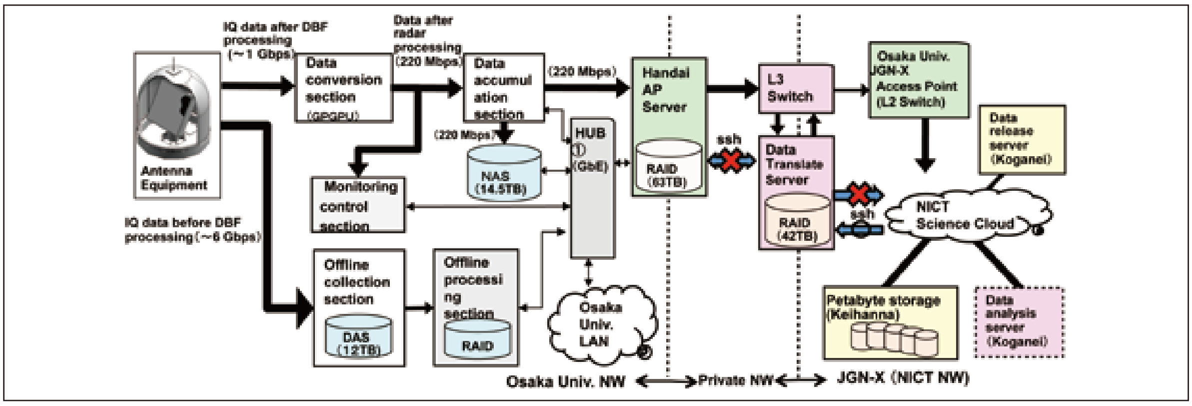

Figure 7　Data processing/usage system

convective clouds, which formed a line to the east and west, is observed developing and falling in turn. It's been observed that for each cumulonimbus, the horizontal scale is 10-15km and echo top altitude is 12km at the highest, as you can see in the figure with the precipitation area widening to 40km in a horizontal direction. Looking at the time variation of a series of short precipitation echoes in the east (right side of figure), they repeatedly grow and fade within the atmospheric boundary layer of 2-3km altitude (layer affected by land surface heated by solar radiation) and are thought to have different environmental conditions of some sort than the developed precipitation. In the July 26 case shown in figure 6, with one cumulonimbus cloud echo size at 3km square, 8km vertical, precipitation was observed for a few minutes falling to the ground like a waterfall while it rapidly grew after the first echo—also called the infancy of torrential downpours—appeared at an altitude of 4-6km. Meteorological analysis is still to come, but studying this type of observation case is expected to provide insight on what type of echoes rapidly develop and bring about heavy rainfalls. Moreover, if we can process this kind of 3D data in real-time, it is thought that this will lead to the broadcast of forecast information on local heavy rains in shorter periods of time.

Data processing/usage system

Performing observations with our radar in 30 seconds of a range at 60km (100m intervals), 360-degree azimuthal angle (1.2 degree intervals), and 90-degree elevation angle (elevation angles over 110) means forming large-dimension data at data rate approximately 70 times faster compared to the existing parabolic antenna radars which perform 3D observation of 15 elevation angles in 5 minutes. Actual observation data is composed of data transforming sections using GPGPU shown in figure 7 and in 10-second observation mode which has a maximum data rate of 220Mbps. When you observe continuously in this mode for 24 hours, just one day's worth of data—2.3TB—overflows a general USB-HDD. Also, IQ data before DBF processing to be saved for research purposes contains a data rate of 6Gbps. We plan to save this large amount of observational data to NICT ScienceCloud's petabyte storage (at NICT Keihanna) via the Handai-AP-Server connected to Osaka University's LAN and the Data-Translate-Server connected by JGN-X through an L3 switch. The advantage of using ScienceCloud is not just data archiving but that it can provide a convenient shared platform for outside users who use the large amount of data for analysis study, etc. Moreover, we hope to utilize ScienceCloud's multi-core processing for extensive calculations necessary for tasks such as 3D visualizations mentioned above.

Future prospects

The phased array weather radar that was developed in Japan for the first time has attracted attention from the US, a country with advanced radar system, and is considered to be fairly close to practical application. Although it has drawbacks as its ability of antenna sidelobe level is weak to the point that it might become contaminated with Earth surface clutter echo, MMSE Method[*4] is considered a hopeful solution to automatically regulate the antenna pattern developed this time by Osaka University. Also, we believe that a good deal of rain attenuation compensation is possible via observation from several radar units because the radar we developed does not have observation system for dual polarization that is widespread in X-band MP radars, even though some have raised concerns over the measuring accuracy of precipitation. To demonstrate this, we think it is essential to realize real time data processing via cloud computing, and we look forward to more collaboration with the four MLIT MP radars and local radars. In the future, we hope that much weather data will be accessible beyond organizational boundaries with the help of cloud computing.

*4 MMSE Method
Methods such as the Fourier method were traditionally used when forming antenna beams with DBF, but using the MMSE (Minimum Mean Square Error) algorithm to filter out unnecessary, strong clutter echoes from specific directions from ground, we developed the technology which automatically forms null points of antenna patterns in directions for the 1D phased array weather radar.

Cloud Observation using Spaceborne Radar

—Development of Cloud Profiling Radar onboard EarthCARE satellite—

SATO Kenji

Senior Researcher, Radiowave Remote Sensing Laboratory, Applied Electromagnetic Research Institute

After completing a master's program at graduate school, joined the Communications Research Laboratory, Ministry of Posts and Telecommunications (current NICT) in 1992. Transferred to Japan Aerospace Exploration Agency (JAXA) from 2009 to 2011. Engaged in development of High-Frequency ocean radar and space-borne cloud radar.

Earth Clouds, Aerosols and Radiation Explorer—EarthCARE

There are a number of models that predict the increase of surface temperatures associated with global warming. However, the predictions are not always in good agreement. One of the major causes for such discrepancy is the lack of observation data on global distribution of cloud and aerosol*1, particularly their vertical profile.

Cloud works as either accelerator or decelerator for global warming depending on its altitude, thickness, type, etc. Furthermore, cloud distribution, lifetime, and reflectivity regarding to sunlight/infrared may change due to the interaction with aerosol. Therefore, in order to accurately assess the impact of cloud and aerosol on global warming, three-dimensional observation of cloud and aerosol all over the world is essential. The meteorological satellites such as "Himawari," that use visible light and infrared can observe the cloud top, which means that two-dimensional cloud distribution can be obtained. However, It can hardly obtain the vertical structure of cloud such as ceiling (i.e. distance from the ground to bottom of the lowest cloud).

Earth Clouds, Aerosols and Radiation Explorer (EarthCARE) which aims to improve climate models and accuracy of global warming prediction by observing three-dimensional global distribution of cloud and aerosol from satellite and quantitatively evaluating their contribution to the global radiation balance, is currently in progress as an international joint project among NICT, Japan Aerospace Exploration Agency (JAXA), and European Space Agency (ESA).

Engineering Model of Cloud Profiling Radar (CPR)

In collaboration with JAXA, NICT is now developing Cloud Profiling Radar (CPR) onboard EarthCARE satellite. The Engineering Model (EM)*2 of CPR was completed and opened to the media on November 27, 2012 (Figure 1).

Figure 1　Engineering Model of CPR (photo provided by JAXA)

*1 Aerosol
Minute solid or liquid particle floating in the atmosphere such as industrial smoke, forest fire smoke, kosa (i.e. yellow sand flied from the Yellow River region in China). There are various sources of aerosol; Some kind of aerosol is generated naturally as well as the result of human activities.

*2 Engineering Model (EM)
An engineering model is manufactured for various development tests in almost the same manner as the Flight Model that will be launched into space. Generally, after confirming that the required functions and performance are satisfied in the tests using the engineering model under more severe conditions than actual flight environment, the flight model is manufactured.

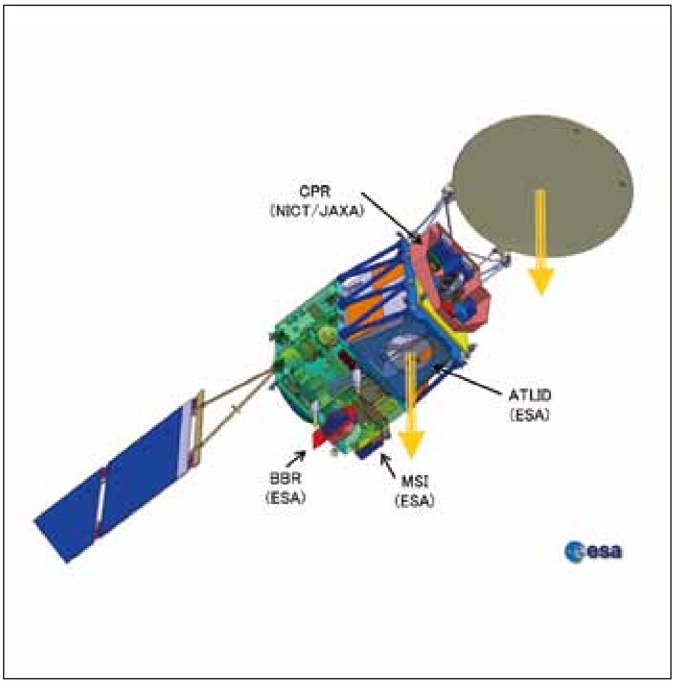

Figure 2 EarthCARE satellite overview

CPR can observe the vertical structure of clouds by transmitting radio waves with frequency of 94GHz (approximately 3mm wavelength) using large parabolic antenna with aperture of 2.5m ϕ toward the Earth from the orbit whose altitude of approximately 400km and by receiving echo reflected by cloud particles. Sensitivity of the CPR is the highest in the spaceborne radars. CPR is also the first spaceborne weather radar that has Doppler velocity measuring function*3, which means that CPR can measure vertical velocity of the particles within cloud. Detailed cloud conditions observed by the CPR are expected to greatly contribute for better understanding of such as cloud microphysics.

CPR is one of the main scientific instruments onboard EarthCARE satellite. Besides CPR, there are three other instruments that are developed by ESA on the EarthCARE satellite; Atmospheric Lidar (ATLID) which mainly observes vertical profile of aerosol, Multi-Spectral Imager (MSI) which observes the horizontal distribution of cloud and aerosol, and Broad-Band Radiometer (BBR) which observes the energy flux at the top of atmosphere (Figure 2). . Performing simultaneous observation of these four instruments, three-dimensional distribution of aerosol, cloud and light rain can be obtained (Figure 3), which is never realized using only one instrument. The target launch of EarthCARE satellite is in 2015.

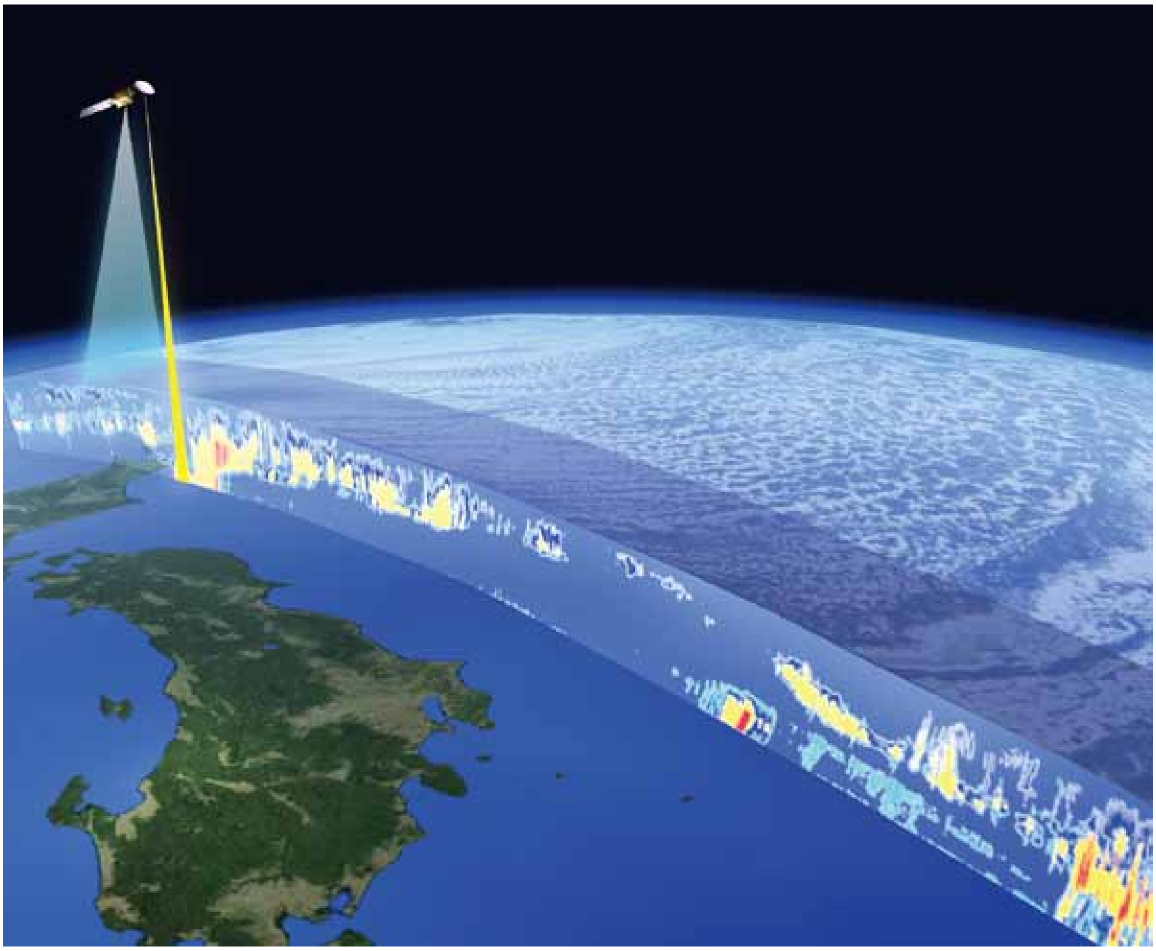

Figure 3 Conceptual image of CPR and ATLID simultaneous cloud profile observation

Very small part of the radar beams (yellow beams) emitted from CPR is reflected by cloud particles. This illustration schematically represents the vertical profile of reflected power from cloud particles received by CPR along the satellite' s path. The received power increases by the change in colors: white→aqua→blue→yellow→red. ATLID can hardly observe under thick cloud (blue beams) like CPR, but it can complementary observe extremely thin cloud and aerosol, which are difficult to observe by CPR.

*3 Doppler velocity measuring function
A function that measures relative velocity between radar and targets. Because falling velocity is different among cloud, rain and snow, it becomes easy to identify them by measuring their falling velocities with Doppler velocity measuring function.

Contributions of NICT to CPR development

NICT has been continuing research and development about airborne and spaceborne weather radar for over 30 years. In the early days, our main target is precipitation. As the result it led to the world's first spaceborne precipitation radar: Precipitation Radar (PR) onboard Tropical Rainfall Measuring Mission (TRMM) satellite (launched in 1997), and its following; Dual Frequency Precipitation Radar (DPR)*4 onboard core satellite of Global Precipitation Measurement (GPM) which is currently under development. At the same time of these developments, NICT continued research about higher sensitive, higher frequency radar in order to observe cloud as well as precipitation, and airborne cloud radar "SPIDER" was completed in 1997. Based on the experience of the development and observation with SPIDER, NICT began to study about spaceborne cloud radar; such as radar system design and performance analysis. After completing preliminary research about identified key technologies and components to realize spaceborne cloud radar, NICT started to practical design and development of EarthCARE/CPR in 2007 in collaboration with JAXA.

As for the development of the CPR EM, NICT contributes mainly to develop EM of Transmitter/Receiver Subsystem (TRS) (Figure 4) and EM of Quasi-Optical Feed subsystem (QOF) (Figure 5). The TRS, is the most important subsystem in CPR. TRS has functions that generate, amplify and transmit 94GHz signal as pulses with the peak power of over 1.5kW. TRS also has the functions that receive, amplify and send very weak echo reflected from cloud particles to Signal Processor Unit (SPU). The QOF is not only a primary feeder to large parabolic antenna but also diplexer that separates transmission and reception signals. QOF realizes extreme low loss feeding by introducing the methods that are often used for optical instruments; such as mirrors and wire-grid polarizer*5.

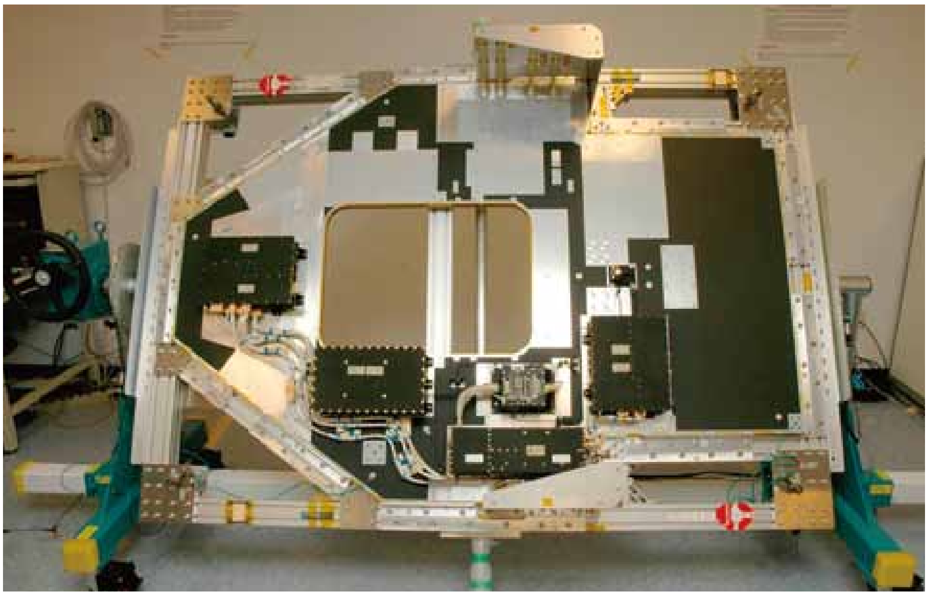

Figure 4 Engineering Model of Transmitter/Receiver Subsystem (TRS)

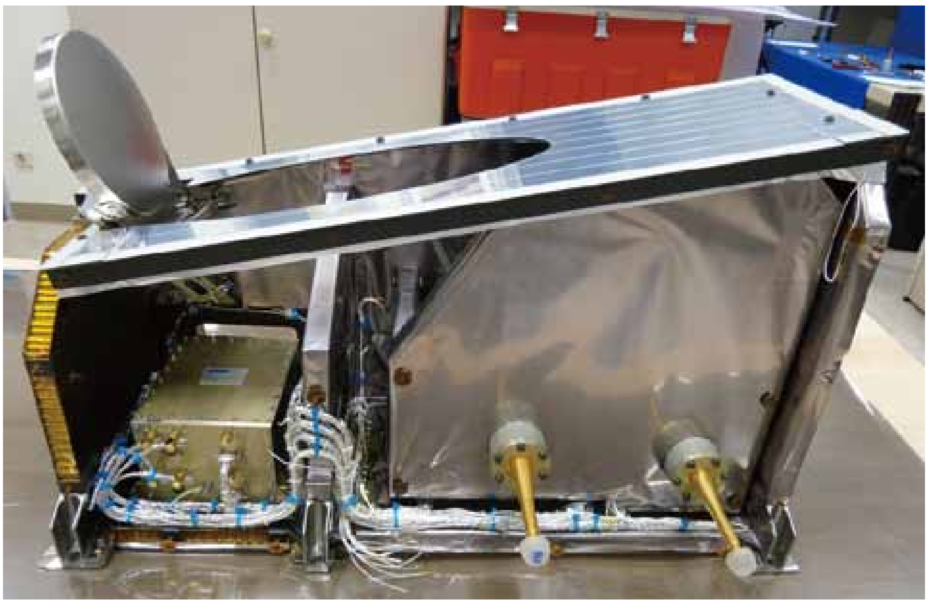

Figure 5 Engineering Model of Quasi-Optical Feed subsystem (QOF)

Future prospects

CPR development is now proceeding to the manufacturing phase of Flight Model (FM) that will actually be launched into satellite orbit. CPR FM will be manufactured by JAXA. Manufacturing of TRS FM and QOF FM will also be transferred from NICT to JAXA (the EMs developed by NICT will be refurbished and used as part of the FM). NICT will support the manufacturing of CPR FM by JAXA. Furthermore, NICT focus on the development of processing algorithms of data acquired by CPR, and the establishment of calibration/verification methods for CPR after launch, as the preparation for the EarthCARE satellite's launch.

*4 Dual-Frequency Precipitation Radar (DPR) onboard core satellite of Global Precipitation Measurement (GPM)
Global Precipitation Measurement (GPM) is an international joint project that aims to observe global precipitation (rain and snow) every 3 hours using a core satellite and constellation satellites. In collaboration with JAXA, NICT has been developing Dual-Frequency Precipitation Radar (DPR) onboard GPM core satellite. The DPR itself has already been manufactured and is currently conducting integration test with the GPM core satellite. The GPM core satellite will be launched in 2014.

*5 Wire-grid polarizer
A device that changes the orientation of oscillation in the electromagnetic waves using regularly aligned wire (wire-grid). In CPR, it is used to convert between linear polarization and circular polarization.

Report on "Keihanna Info-Communication Open Laboratory Symposium 2012"
—Future view of ICT on the 10th anniversary—

On December 3, 2012 at Hotel New Hankyu Osaka, the Keihanna Info-Communication Open Laboratory Symposium 2012 was held under the theme, "Future view of ICT". This year, marking the 10th anniversary of the Research Promotion Council of Keihanna Info-Communication Open Laboratory (hereafter, the Council), the symposium was held to summarize past activities and discuss future directions, receiving 92 visitors.

First, as a keynote talk, YOSHIDA Susumu, Professor of Kyoto University gave a comprehensive overview of challenges and visions of Japan in the field of ICT. Next, FUKADA Koji, President of YUMEMI Inc. discussed his passion for work from the perspective of a business entrepreneur, which was quite motivating particularly for the younger visitors. Following this, YAMANAKA Naoaki, Professor of Keio University and HAGITA Norihiro, Board Director of ATR Social Media Research Laboratory Group spoke on the Council's activities of the past 10 years. Afterwards, a panel discussion entitled "Vision of ICT society and the role of the Council" was held with TAKAHASHI Yukio, Executive Director of NICT Outcome Promotion Department, as chairman, and panelists that included NINOMIYA Kiyoshi, Executive Director of Kansai Research Institute, SHIMADA Junichi, Professor of Japan Advanced Institute of Science and Technology Graduate School, along with Prof. YAMANAKA and Dr. HAGITA.

This symposium—as a place for researchers to gather and conduct research beyond corporate frameworks—is a great opportunity for participants to learn the Council's extremely effective functions, responsible for helping develop ICT into the future, and ended as an event that will continue to provide a place for researchers to gather and engage one another.

●Panel discussion that drew a lively exchange of views from participants

Report on "Workshop on Optical / Broadband Network and Related Solutions and on Disaster Relief Systems, Network Resiliency and Recovery of ITU-T"

On December 10, 2012, a workshop on Optical / Broadband network and related solutions was held in Istanbul, the Republic of Turkey. In light of the promotion of policies aimed at expanding broadband networks throughout the entire country by 2023—the Turkish government's 100th anniversary—the event was conducted with approximately 180 participants including officials from both the Japanese and Turkish governments, telecommunication operators, manufacturers, and research institutes in order to introduce optical communication technology in Turkey in which Japan is promoting its standardization, and to establish business cooperation in ICT between Turkey and Japan.

As for NICT, Dr. HARAI Hiroaki, Director of Network Architecture Laboratory, Photonic Network Research Institute, presented on Optical Packet & Circuit Integrated Network Technology, introducing the world's first 100 Gbps optical packet-switching technology and stable optical packet and circuit integrated nodes developed by NICT.

Report on the 9th NICT/EMC-net Conference on Method of Emission Measurement

NICT/EMC-net Head Office / Electromagnetic Compatibility Laboratory, Applied Electromagnetic Research Institute

On December 5, we held the 9th NICT/EMC-net Conference on Method of Emission Measurement (hosted by NICT/EMC-net) in the international meeting room on the 4th floor of the Research Hall at NICT Headquarters. NICT/EMC-net is an organization that aims to promote better understanding of EMC-related technology and help improve EMC-related technology in Japan through the exchange of views and information at this research conference among conference members and NICT staff on various challenges in electromagnetic compatibility (EMC). At this Conference on Method of Emission Measurement moderated by the head of the conference, WADA Osami, Professor of Kyoto University, KAMI Yoshio, Emeritus Professor of The University of Electro-Communications, gave a talk entitled “Considering transmission-line circuit theory from Maxwell’s equations”. Two more talks subsequently followed, first entitled “Basis examination on a method to identify the electromagnetic noise from LED light bulbs by using photodetector” by WU Ifong, Researcher of NICT Electromagnetic Compatibility Laboratory, and another entitled “Report on CISPR/A Bangkok meeting” by ISHIGAMI Shinobu, Research Manager of the same laboratory. Enthusiastic question and answer sessions followed each talk, with approximately 40 individuals active on the front lines of EMC-related research in attendance.

We hope to continue spreading information on EMC research at NICT through conferences and symposiums into the future and stimulate information exchange among academia and industry.

●Talk by KAMI Yoshio, Emeritus Professor of The University of Electro-Communications

On the following day, December 11, because the Republic of Turkey is prone to earthquakes, a workshop was held, organized by International Telecommunication Union(ITU), on Disaster Relief Systems and Network resilience and Recovery restoration. At this workshop, we introduced an outline of NICT’s Resilient ICT Research Center and its ongoing research activities.

●Presentation on Optical Packet & Circuit Integrated Technology

●Workshop venue on Optical / Broadband Network and Related Solutions

Holding the Disaster Crisis Management ICT Symposium 2013

–Application and practical use of communication and sensing technology against earthquake disaster–

Organized by: ICT Forum for Safety and Security, National Institute of Information and Communications Technology (NICT)
Supported by: Cabinet Office; Ministry of Internal Affairs and Communications; Ministry of Education, Culture, Sports, Science, and Technology; Ministry of Land, Infrastructure, Transport and Tourism; Ministry of Defense

Program

10:40～11:20	**Keynote lecture 1** "Issues from East Japan great earthquake disaster, present measures (from a viewpoint of local government ICT)" IMAI Takehiko (Chief of information policy department, Sendai City)
11:20～12:00	**Keynote lecture 2** "Research activity for disaster-resilient ICT system" NEMOTO Yoshiaki (Director General of Resilient ICT Research Center, NICT)
13:00～13:40	**Presentation 3** "Development of small size airborne SAR system" MURATA Minoru (NEC Corporation)
13:40～14:20	**Presentation 4** "Development of Tsunami early detecting system using GPS buoy" TERADA Yukihiro (Kochi National College of Technology)
14:20～15:00	**Presentation 5** "Portable ICT system technology to enable immediate restoration of the suffering service at the time of a large-scale disaster" SAKANO Toshikazu (NTT Network Innovation Laboratories)
15:20～16:20	**Panel Discussion** Topic: Application and practical use of communication and sensing technology against earthquake disaster Moderator: IGUCHI Toshio (Director General of Applied Electromagnetic Research Institute, NICT)

Date/Venue

Friday, February 8, 2013
10:30AM Start (Registration begins at 10:00AM)
PACIFICO Yokohama Annex Hall
1-1-1, Minato Mirai, Nishi-ku, Yokohama

Admission free

With lessons learned from the Great East Japan Earthquake, we will hold a symposium with lectures from disaster-stricken local governments, intellectuals and researchers to highlight the role of ICT as a disaster countermeasure.

At this symposium, we hope to examine the technology development and research system that is necessary for future earthquake disaster measures and the road-map for practical application of technologies through a panel discussion after lectures with academic experts who specialize in empirical needs of disaster prevention and researchers who work to develop systems of disaster prevention.

Inquiries

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NICT Information and Communications Security Symposium 2013

–Present and future of information security technology–

Organized by: National Institute of Information and Communications Technology (NICT)
Supported by: Ministry of Internal Affairs and Communications, Information Security Policy Council, Association of the Institute of Electronics, Information and Communication Engineers(IEICE) Technical Committee on Information Security (ISEC), Association of the Institute of Electronics, Information and Communication Engineers(IEICE) Information and Communication System Security (ICSS)

Program

Part I: Security and Privacy Issues of the Smartphone Era	
13:10～13:50	**Invited lecture 1** "Privacy Issues in Smartphones and How to Address Them" TANAKA Toshiaki (Executive Director, KDDI R&D Laboratories Inc.)
13:50～14:30	"Privacy Protection and Risk Management Platform in the Smartphone Era" MATSUO Shin'ichiro (Director of Security Architecture Laboratory, NICT)
Part II: The Forefront of Network Security Research and its Social Development	
14:50～15:30	"A New Horizon in Cybersecurity with nicter/DAEDALUS/NIRVANA" INOUE Daisuke (Director of Cybersecurity Laboratory, NICT)
15:30～16:10	"Threats and Countermeasures in IPv6 Environment" ETO Masashi (Senior Researcher, Cybersecurity Laboratory, NICT)
Part III: Next-Generation Encryption for Privacy Protection and its Security	
16:30～17:10	**Invited Lecture 2** "The Forefront of Next-Generation Public-Key Cryptography Technology" TAKAGI Tsuyoshi (Professor, Kyushu University)
17:10～17:50	"The State-of-the-Art Evaluation of Cryptographic Techniques at NICT" MORIAI Shiho (Director of Security Fundamentals Laboratory, NICT)

Date/Venue

Thursday, February 14, 2013
1:00PM Start (Registration begins at 12:30PM)
Shinagawa Front Building Meeting Room
2-3-13, Kounan, Minato-ku

Admission free

Ensuring information security is becoming an urgent national critical issue of today; we are at risk of Advanced Persistent Threat targeting government agencies as well as malware infections (such as bots) to personal computers of individuals acting as platforms of crimes.

At this symposium, we, NICT Network Security Research Institute, will introduce the outcome of our researches such as cyber attack detection/analysis technologies, next-generation cryptographic technologies and applied practical security technologies, aiming for embodying a direction of our future research development of better information communication security technologies that NICT should set forward from now on with exchanging opinions with the participants.

Information for Readers

The next issue will feature the compact-broadband VLBI technology, the satellite communications technology that uses WINDS, and research/facilities of satellite ranging and orbit determination at the Kashima Space Technology Center.

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