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Summary of JAXA EarthCARE 1st Research Announcement (Validation) and Plan of the JAXA's validation activity for JAXA EarthCARE Products

概要 Overview

This document covers results of Japan Aerospace Exploration Agency (JAXA) EarthCARE 1st Research Announcement (RA) (Validation) in JFY2013-JFY2014 and current plan of the JAXA's validation activity for JAXA EarthCARE Products.

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Earth Observation Research Center

Japan Aerospace Exploration Agency

Table of Contents

1. Scope 5
2. JAXA EarthCARE 1st RA (Validation) overview 5
3. Results of JAXA EarthCARE 1st RA (Validation) 7
4. Plan of the JAXA's validation activity 8
5. JAXA contact point for more information 9

1. Scope

This document covers results of Japan Aerospace Exploration Agency (JAXA) EarthCARE 1st Research Announcement (RA) (Validation) in JFY2013-JFY2014 and current plan of the JAXA's validation activity for JAXA EarthCARE Products.

2. JAXA EarthCARE 1st RA (Validation) overview

In the 1st EarthCARE RA (Validation), the JAXA announced for the research proposals that contribute to the validation of JAXA EarthCARE Standard and Research Products. The research announcement covered a 2-year research period from JFY 2013 to JFY 2014. As long as they are for nonprofit and peaceful purpose, all categories of domestic and foreign organization could apply this RA.

The objectives of the EarthCARE mission are to evaluate the radiative forcing of clouds and aerosols, which are great uncertainties in climate change prediction, and to observe the interactions between clouds and aerosols. JAXA EarthCARE defines the success criteria (Table 1) as outputs that clarify the baselines of mission accomplishment. In addition, EarthCARE defines the list of the products and their accuracy criteria. Therefore, the RA invited research to confirm these targets through collaboration with JAXA.

Table 1. JAXA EarthCARE/CPR Project Success Criteria

Minimum Success (Decision : at the end of Commissioning and Cal/Val Phase evaluation : at 6 months from launch)	Full Success (Decision : at the end of planned operation evaluation : at 3 years from launch)	Extra Success (Decision : at the end of planned operation evaluation: at 3 years from launch)
• Complete Commissioning and Cal/Val Phase and publish an image data of the observed vertical cloud profile*	• Accomplish with the standard accuracy requirement of CPR-only standard product and produce a dataset which covers over 90% of nominal operation for more than 2 years** • Capable to release more than one research product of CPR • Accomplish with the standard accuracy requirement of a synergy product	• Accomplish with the target accuracy requirement of a CPR standard product , OR • Accomplish with the target accuracy requirement of a synergy product***, OR • Capable to use with data of other satellites, with good integrity

* In Commissioning and Cal/Val Phase, the confirmation of the CPR flight hardware and the ground processing are conducted. Uncorrected absolute value (i.e. relative value) of consecutive Level1 (quicklook) data that last more than one orbit is defined as an image to be published for the minimum success.
** The requirements of the satellite attitude accuracies are to be accomplished for Doppler products.
*** On the premise that the performance requirements of ESA sensors are satisfied for synergy products.

This RA invited researches that contribute to the validation preliminary study and the preparation of the implementation plan for the validation activity after the launch, because the RA period corresponded to the pre-launch phase of the EarthCARE satellite. Following themes were targets of the RA.

(i) Utilization of the existing observation network

The methods to validate EarthCARE products by using long-term/broad coverage data were invited. By using data from observation sites and networks with instruments such as radars, lidars, sky cameras, sky radiometers, sunphotometers, pyranometers, infrared radiometer, and microwave radiometers, JAXA called for validation research proposals that quantitatively evaluate the product accuracies, as well as the effect of cloud inhomogeneity and errors induced from satellite sampling on the validation.

(ii) Campaign observation

After the launch, JAXA is planning to conduct campaign observations that aim to compare the satellite products in a more direct way, and called for research proposals that contribute to this activity. In this RA, the propositions of the observation instruments were required. Validation research by, for example, radars, lidars, sky cameras, etc and by in-situ instruments onboard balloons or unmanned aerial vehicles was assumed. JAXA was not planning to conduct aircraft observations, although collaboration with aircraft observations conducted by other organizations was possible. Furthermore, marine observations by research vessels were also one of the possibilities.

(iii) Cross comparison with other satellite data

Research proposals on validation by cross comparison of the EarthCARE sensors with other satellite sensors were invited. For example, the products from CPR onboard CloudSat satellite, CALIOP onboard CALIPSO satellite, VIIRS/CERES onboard Suomi NPP satellite, MODIS/CERES onboard Terra/Aqua satellite, AVHRR onboard NOAA satellite, SGLI after the launch of GCOM-C satellite were assumed for this cross comparison.

(iv) Other validation observation, data acquisition

Research proposals that were not listed above in (i) to (iii), such as other validation activities and acquisition and maintenance of observation data, were also welcome. The topic must directly contribute to the EarthCARE validation.

3. Results of JAXA EarthCARE 1st RA (Validation)

By 1st Research Announcement (Validation), JAXA selected 14 validation Principal Investigators (PIs) (11 PIs from Japan, and 3 PIs from USA), and JAXA organized the JAXA Validation Team. The Validation Team Leader was Prof. Yasushi Fujiyoshi (Hokkaido Univ.). The JAXA also organized the validation sub-groups, CPR Echo/Doppler sub-group (Leader : Yuichi Ohno, NICT), and Cloud/Aerosol/Radiation sub-group (Leader : Prof. Takashi Y. Nakajima, Tokai Univ.).

Table 2. A list of PI in JAXA EarthCARE 1st RA (Validation)

Name	Title	Institution	Country
Nobuo Sugimoto	Study on validation of ATLID products and ATLID-CPR and ATLID-MSI synergy products using ground-based lidar and radiometer networks.	National Institute for Environmental Studies (NIES)	Japan
Simone Tanelli	Validation of Scientific Data Products from EarthCARE's Cloud Profiling Radar	Jet Propulsion Laboratory, California Institute of Technology	USA
Andrew J. Heymsfield	Evaluation of Ice Cloud Retrieval Algorithms for the JAXA/NICT Spaceborne Cloud Profiling Radar	University Corporation for Atmospheric Research	USA
Yasushi Fujiyoshi	In situ observations of vertical profiles of air quality using gliders	Hokkaido University	Japan
Masayuki Yamamoto	Validation of EarthCARE product using vertical wind measurement by wind profiler radars	Kyoto University	Japan
Itaru Sano	Validation of the retrieved aerosol products based on other satellite and ground measurements	Kinki University	Japan
Kaoru Sato	A study of possible validation methods of EarthCARE based on observations with fine-resolution from the PANSY radar in the Antarctic and A-train satellite	University of Tokyo	Japan

Masataka Shiobara	Preliminary study for ground truth of EarthCARE products from the polar sites operated by NIPR	National Institute of Polar Research (NIPR)	Japan
Makoto Koike	Feasibility studies on validations of satellite-derived cloud and aerosol properties using in-situ and ground-based radar/lidar measurements around Japan and in the Arctic	University of Tokyo	Japan
Tadayasu Ohigashi	Development of a method deriving microphysical quantities for cloud droplets and ice crystals using a new-type hydrometeor videosonde	Nagoya University	Japan
Kazuaki Yasunaga	Toward in-situ observation to validate ATLID and CPR for oceanic aerosols and clouds	Toyama University	Japan
Toshiaki Takano	Validation plan of CPR/EarthCARE for estimating radiation budget and the feasibility study	Chiba University	Japan
Masahiko Hayashi	Size distribution of aerosol and cloud particles by in-situ observations using UAV	Fukuoka University	Japan
David M. Winker	Validation of EarthCARE Data Products using Satellite and Airborne Measurements	NASA Langley Research Center	USA

4. Plan of the JAXA's validation activity

The 2nd Research Announcement including the validation study is under consideration to start from April 2019. In this RA, JAXA is planning to seek proposals for research after the launch, while the basic scope will be the same as in the 1st RA (section 2). Some validation plans may be conducted considering the collaboration with the ESA. JAXA will closely cooperate the validation activity with National Institute of Information and Communications Technology (NICT), and the NICT's W-band ground based radars developed for calibration and evaluation of EarthCARE/CPR will be key instruments. JAXA is also considering the validation cooperation with other JAXA missions (GCOM-C, GOSAT2) and Japan Meteorological Agency (JMA)'s satellites (e.g., Himawari-8). Such validation cooperation will be considered in the 2nd RA.

5. JAXA contact point for more information

For more information for the validation activity in the JAXA EarthCARE mission, please contact following,

JAXA Earth Observation Research Center (EORC)
Address: 2-1-1, Sengen, Tsukuba, Ibaraki, 305-8505 Japan
E-mail: ec-eorc@ml.jaxa.jp

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