



# ESA-JAXA Pre-Launch EarthCARE Science and Validation Workshop

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**Aerosol optical properties and validation  
plan by using sky radiometer**

**Kazuma Aoki: University of Toyama, Japan**

JAXA AOID 8: Interaction of cloud, water vapor and aerosol optical properties by using sky radiometer  
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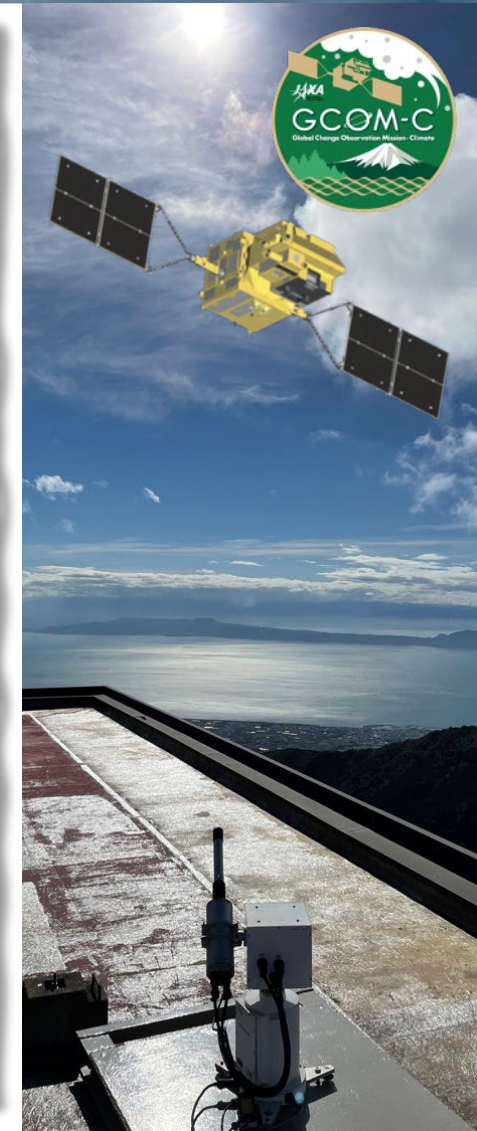


## Introduction

### Our Objectives:

We investigated the long-term monitoring of aerosol and cloud optical properties at ground-based and maritime measurements since 1990's by using the Sky radiometer (PREDE., Co. Ltd., Tokyo, Japan), based on JAXA RA (ex. GCOM-C/SGLI, EarthCARE).

One of the objectives was to understand the effect on earth climate change, and the other was to validate satellite and numerical models. In this presentation, we show the observation plan of solar aureole measurements that record of aerosol optical properties with temporal and spatial variability, as well as the new interpretation of “**Aerosol**” to snow, water vapor and cloud observations, after launch for EarthCARE.



## What is the Sky radiometer



Ground-based

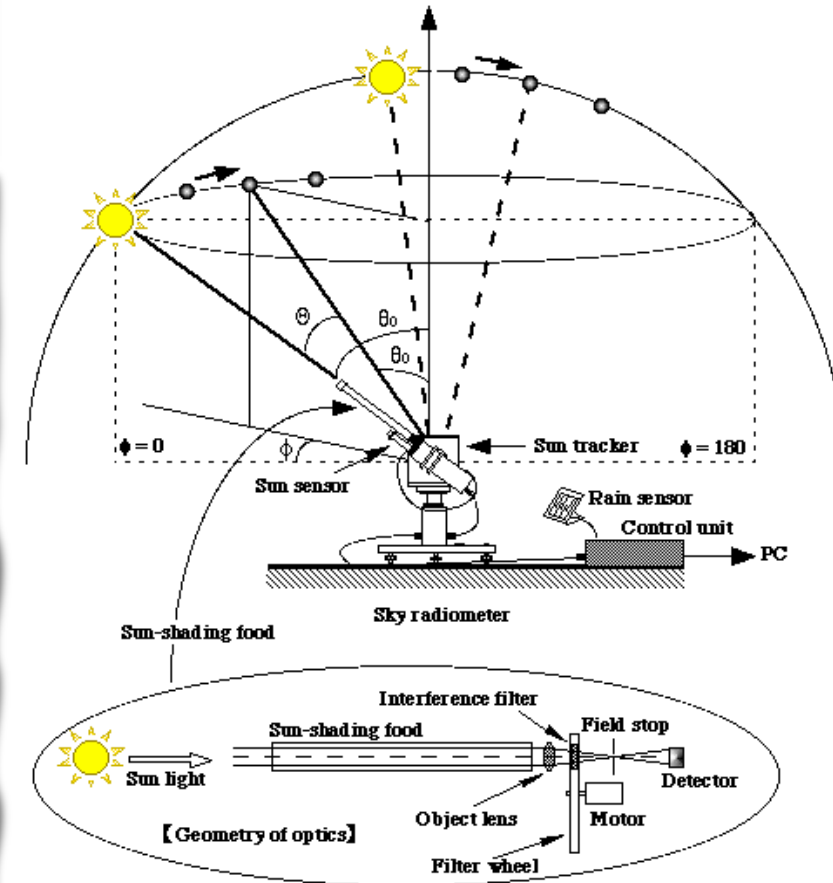
Ship-borne



SKYRADio-net website:

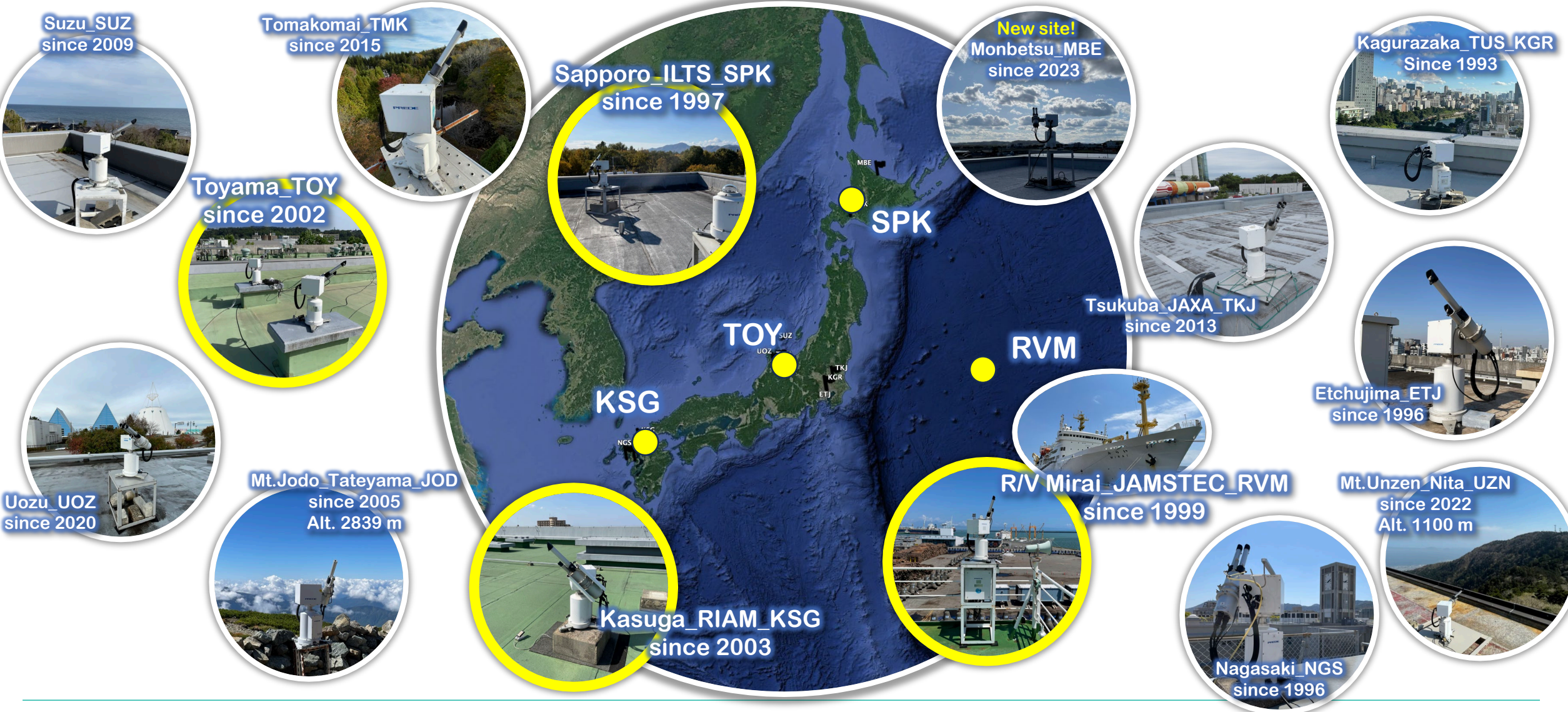
<http://skyrad.sci.u-toyama.ac.jp>

- We observed only in daytime under clear skies at each site.
- Every 10 min/once (aureole)
- Every 1 min/once (direct)
- **POM-01**: 0.315, 0.4, 0.5, 0.675, 0.87, 0.94, 1.02  $\mu\text{m}$
- **POM-02**: 0.315, 0.34, 0.38, 0.4, 0.5, 0.675, 0.87, 0.94, 1.02, 1.627, 2.2  $\mu\text{m}$
- AOD (0.355  $\mu\text{m}$ ) calculated from Alpha as validation data for EarthCARE.
- Data have been analyzed by an inversion software called **SKYRAD.pack** (Nakajima et al. 1996). Available ver. are SKYRAD.pack 4.2. L0, L1A & L2A.
- Under development using the GRASP algorithm. ([Momoi et al. \(Poster No.6\)](#)).
- Ref. ex. Aoki., 2013, Nakajima et al, AMT, 2020, Dubovik et al, 2021



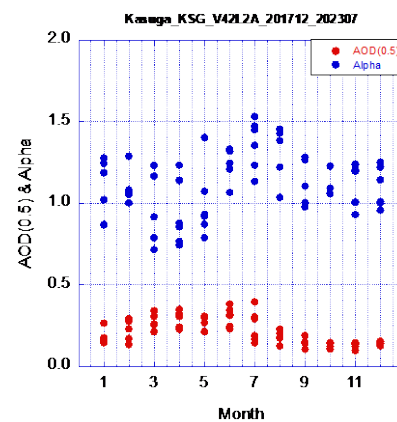
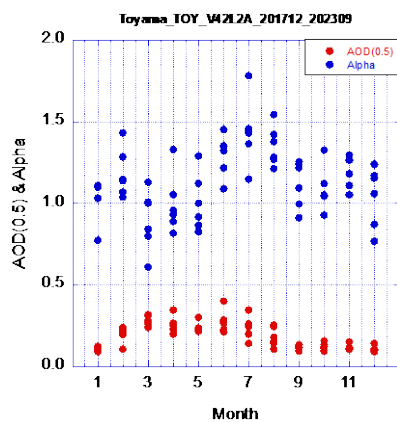
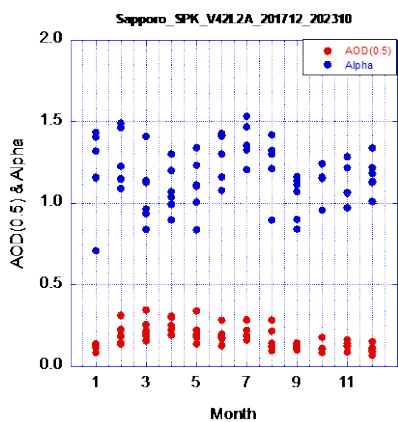
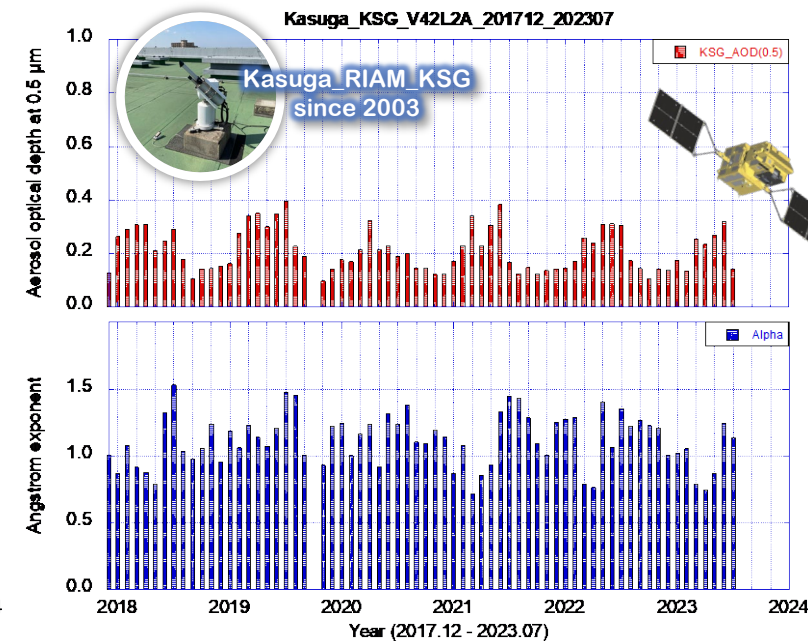
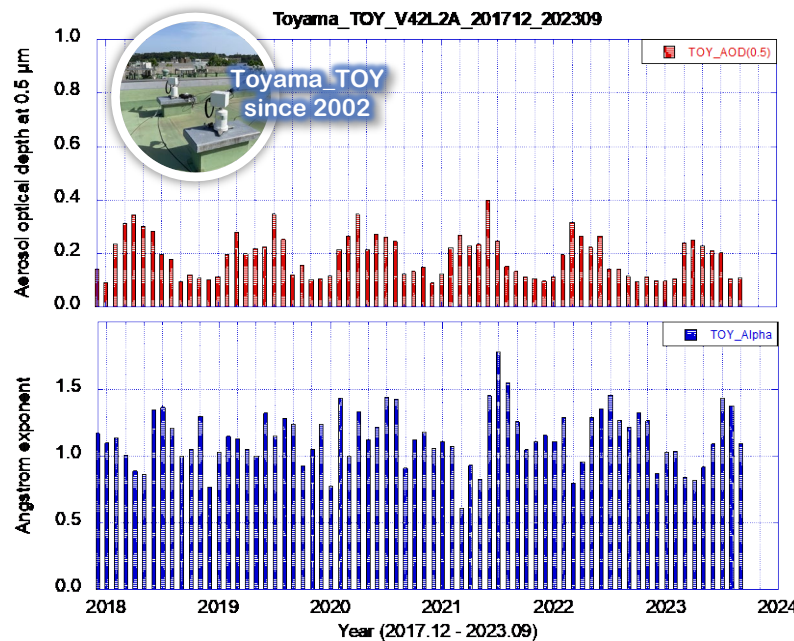
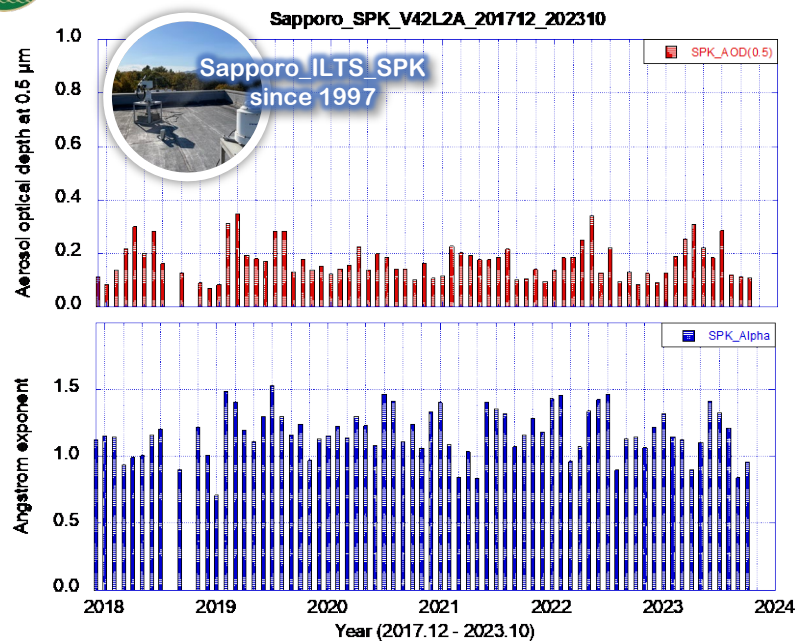


# Sky radiometer Observation in main Japanese site





# Long-term record of Aerosol optical properties in SPK, TOY & KSG: 2017.12 - now



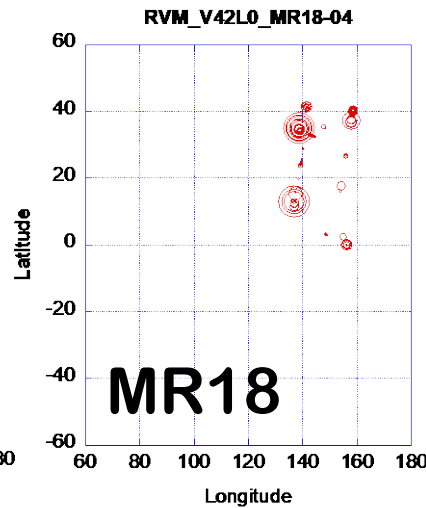
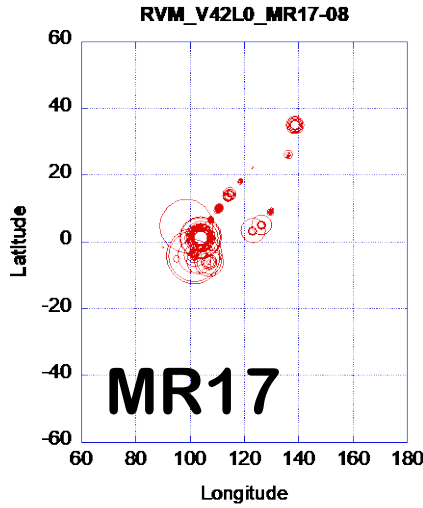
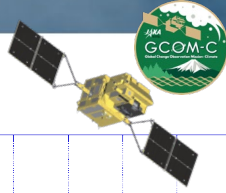
We show the observation of **GCOM-C priopd (Dec 2017 to now)** that aerosol optical properties with temporal and spatial variability. The optical thickness has a clear seasonal cycle at Japan site, with a spring to early summer maximum and an autumn to winter minimum. Ångström exponent seems large variability, with a summer maximum and an spring minimum.



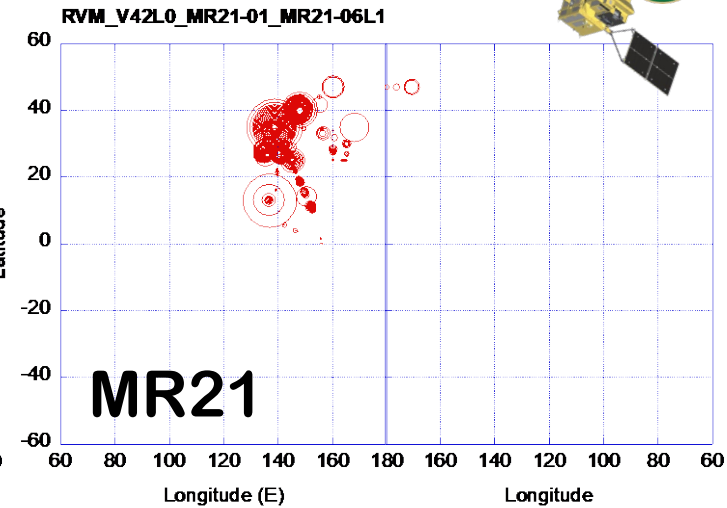
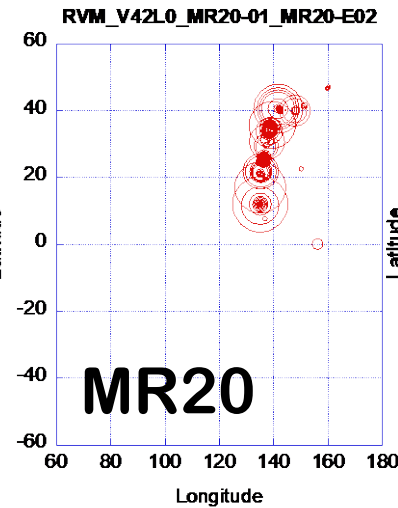
# R/V Mirai (MR17-08 to MR23-05) Aerosol optical properties over the Ocean



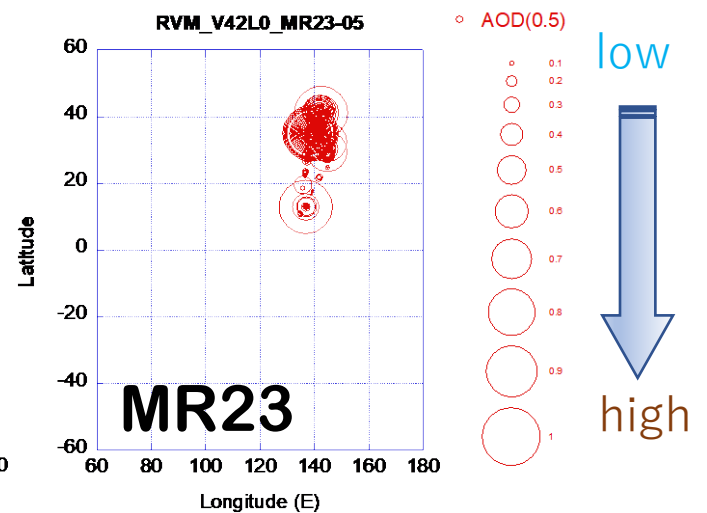
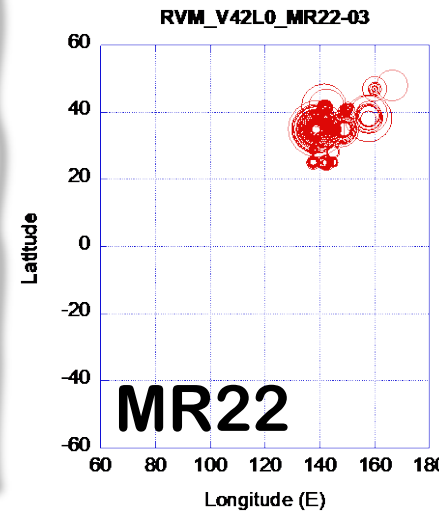
R/V Mirai\_JAMSTEC\_RVM since 1999



MR19: no results

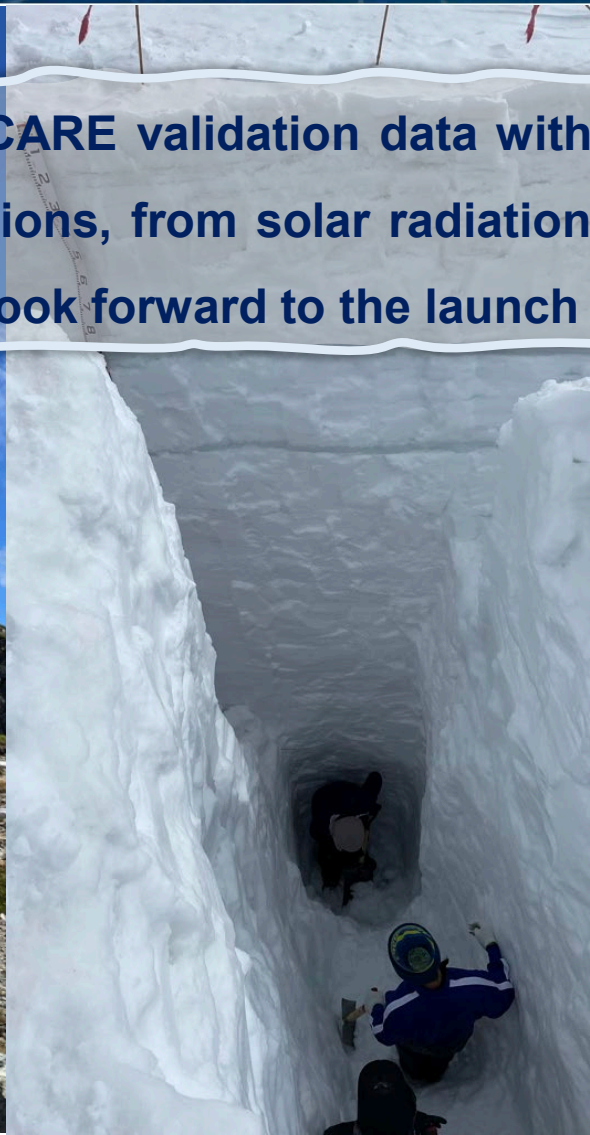
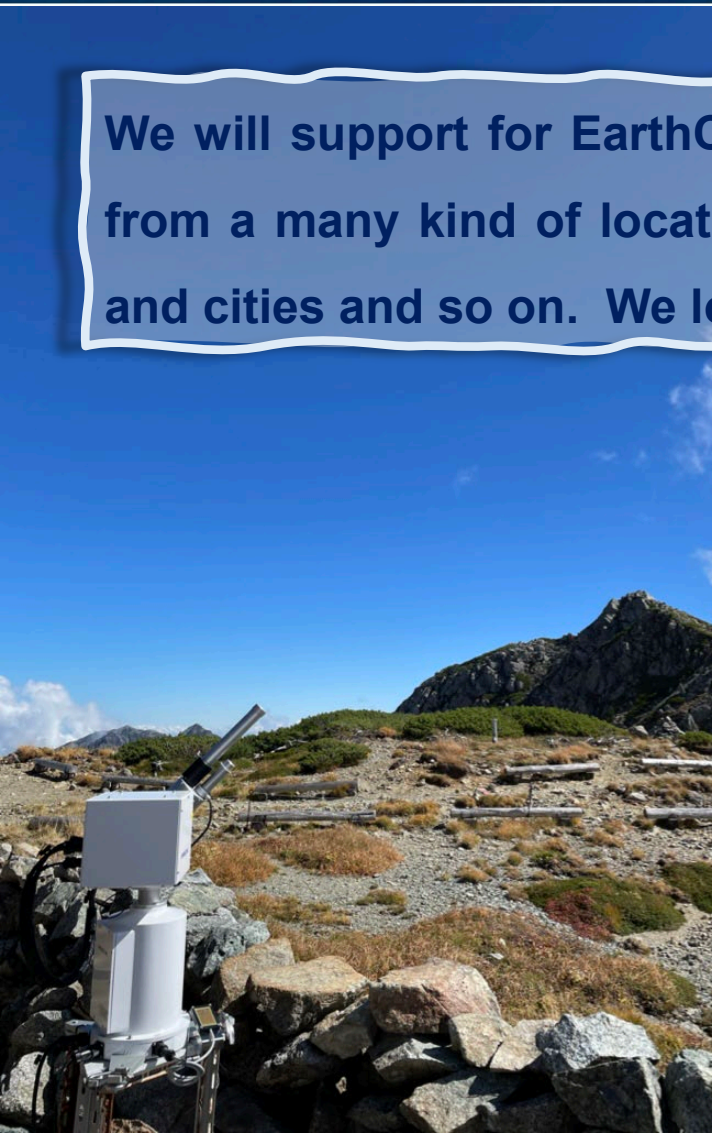


We show the observation of GCOM-C priopd (2017 to 2023 R/V Mirai Cruise) that aerosol optical properties over the Ocean. The optical thickness has a clear, higher the closer to land, lower the further away. Especially close to land, where seems large variability of both AOD and Alpha.



## Summary

We will support for EarthCARE validation data with a research focus on aerosol to cloud interaction from a many kind of locations, from solar radiation observations to land, over the ocean, mountains and cities and so on. We look forward to the launch next spring.



Thanks.