Current status and progress on International SKYNET Data Center (ISDC)

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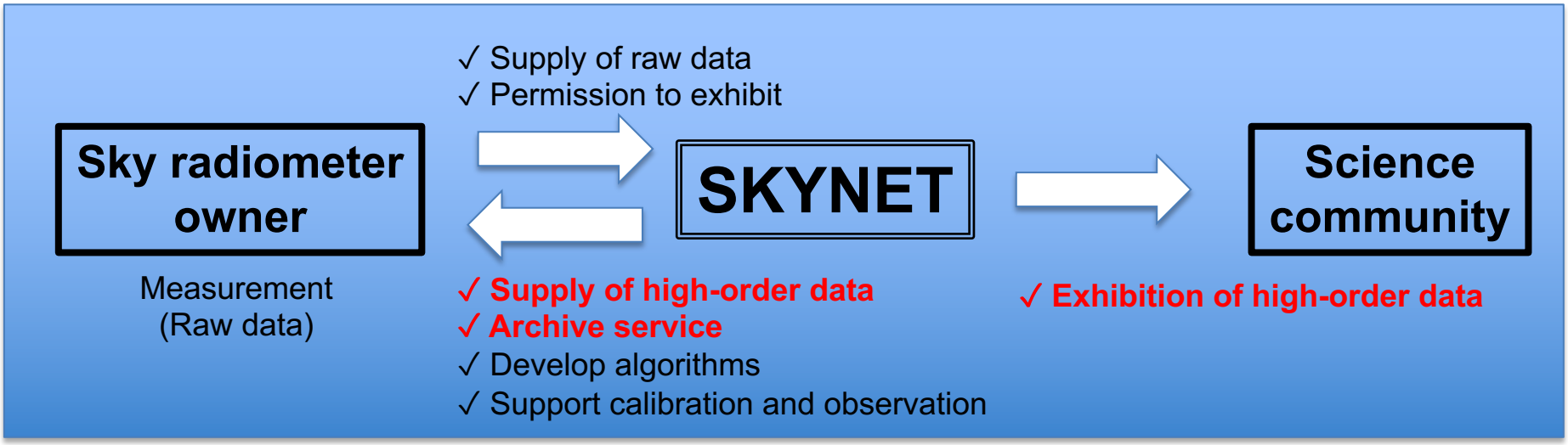
What does ISDC do?
(International SKYNET Data Center)



✓***ISDC* produces standard products on aerosol optical properties using raw data by sky radiometer,** using standard algorithms approved by the International SKYNET committee (ISC); ***ISDC* distributes the standard products via web**.

✓Measured raw data are transferred to *ISDC data server* established at NIES, Japan, for a unified data archive and distribution.

✓*ISDC* was established in 2014, by a joint effort of National Institute for Environmental Studies (NIES) and Center for Environmental Remote Sensing (CEReS), Chiba University.

Progress of SKYNET related to ISDC

●The international SKYNET committee (ISC) decided to update the standard products of SKYNET released by ISDC.

●It was also determined that these standard products should be generated from two different analysis schemes. One uses the skyrapack 5.0-based program (SR-CEReS) developed at Chiba University, and the other is the program developed at the European SKYNE (ESR) and the Meteorological Research Institute (MRI). It is an analysis scheme (ESR-MRI) that uses the programs together. As a result, the standard products should be generated by each scheme.

● With this update, the data policy has also been reviewed and revised.

➡ ISDC implemented these algorithms and updated the website that provides standard products.

Sky radiometer sites (~100 sites)

Raw (L1) data transfer to ISDC and L2 production (26 sites) *1

【Red】On-line sites (17 sites) 【Yellow】Off-line sites (9 sites)

【Black】Being prepared*2 or under consideration to start in the future*3

SKYNET recognized as a "GAW/WMO Contributing network" in 2017

*1 L2 product: Optical and microphysical properties (AOT, dV/dr…)

*2 MOU agreements between instrument owners and ISDC are underway.

*3 High-order organization agreements are considered to realize L1 data sharing with ISDC.

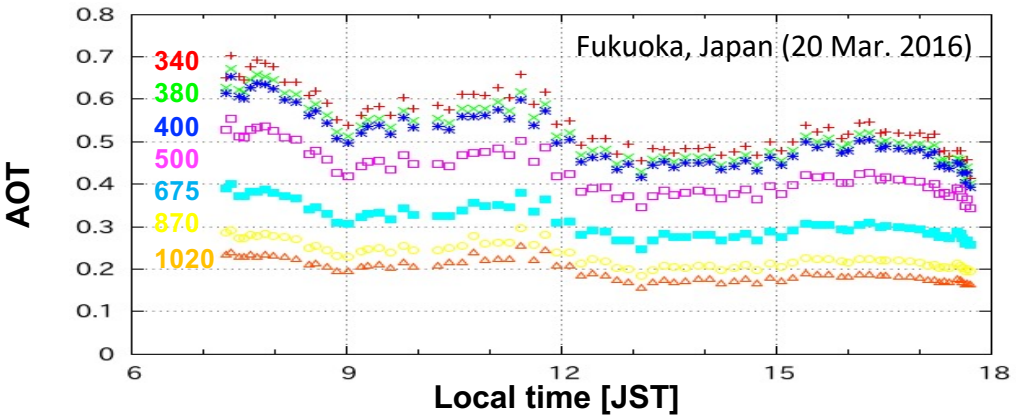
Standard product (Old system)

--- Data processing system ("Old" Chiba U. system) ---

✓ SKYRAD.PACK: ver4.2
✓ Cloud screening: ver 1.0 (Khatri and Takamura 2009)
✓ Calibration: Procedures implemented in this program (using "old calibration" data)
✓ Standard product:
AOT (0.315, 0.34, 0.38, 0.4, 0.5, 0.675, 0.87, 0.94, 1.02, 1.627, 2.2μm)
Turbidity (0.5μm), Angstron exponent (+Global irradiance)

--- Status ---

✓ Periods of analyzed data: From 2013 to the present (depending on observation sites)
✓ Standard product are downloadable from ISDC web–site (**https://www.skynet-isdc.org/)**



Standard product (New system_SR-CEReS)

◎ Implementation of SR-CEReS v01.00.00 developed by Chiba U.

--- Data processing system ---

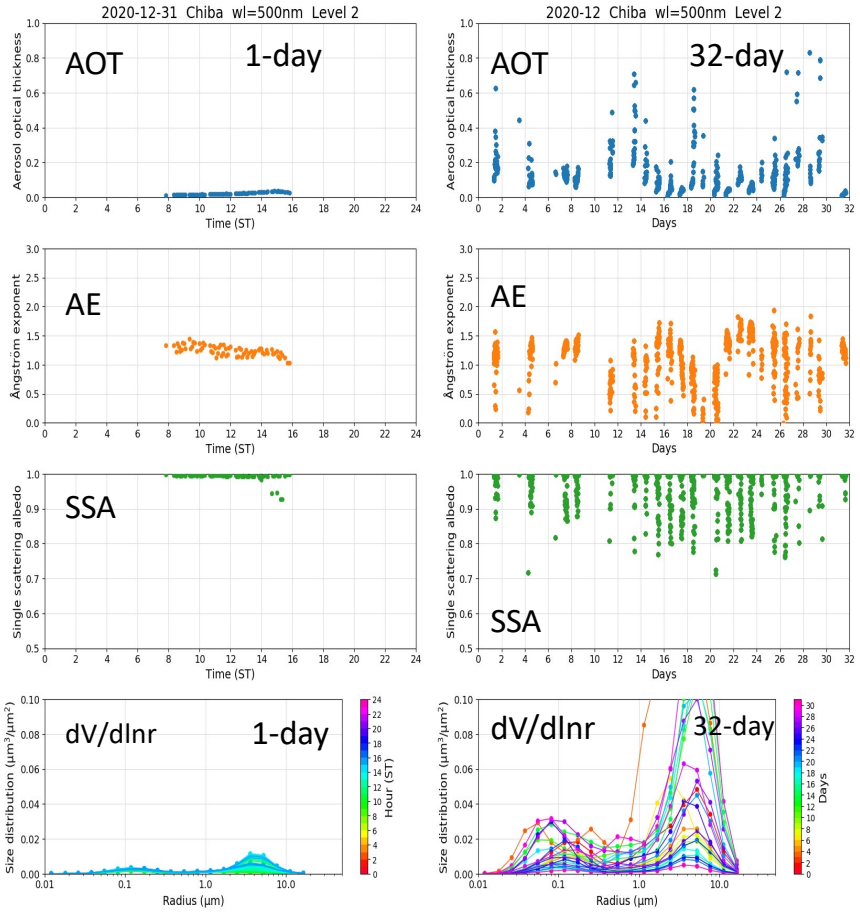
- ✓ Based on SKYRAD.Pack v5.0
- ✓ Cloud screening: ver 1.0
  (based on Khatri and Takamura 2009)
- ✓ Calibration: Implemented in this program
- ✓ Product:
  AOT (0.34~1.02 μm)
  SSA (0.34~1.02 μm)
  m(Re, Im) (0.34~1.02 μm)
  Aerosol size distribution (dV/dlnR)
  Angstrom exponent, Cloud flag

--- Status ---

✓ Periods of analyzed data: From 2004 to the present (depending on observation sites)

✓ Standard product are downloadable from ISDC web–site (**https://www.skynet-isdc.org/**)

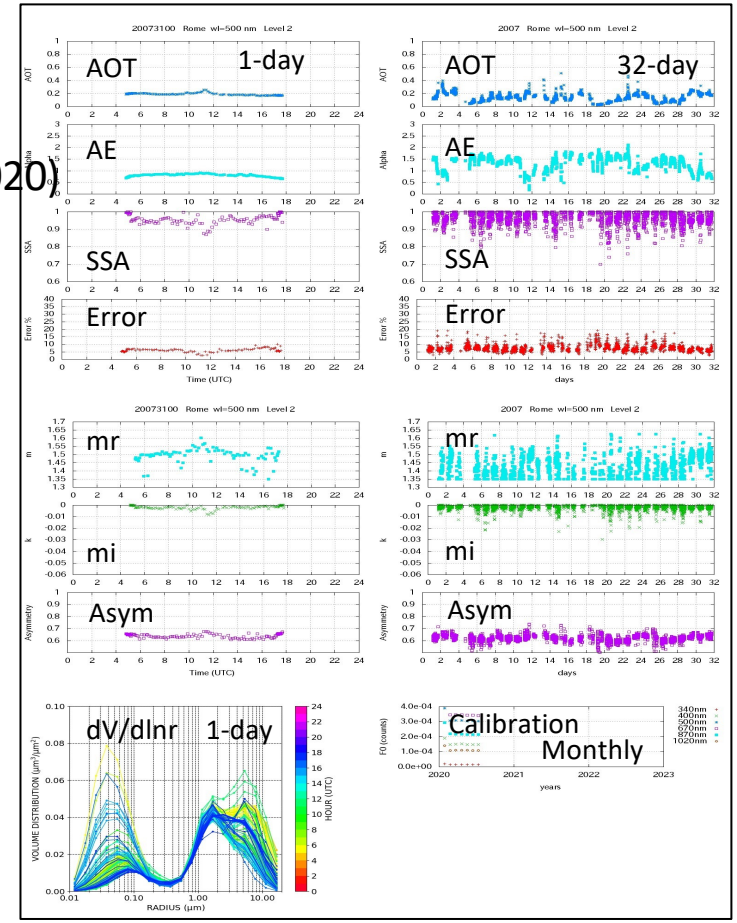
Quick-look
(Chiba, Dec.31, 2020)



Local time

Standard product (New system_ESR-MRI)

Quick-look ESR-MRI (Rome, July 31, 2020)



◎ Implementation of ESR-MRI, ESR-sunrad developed by ESR

--- Data processing system ---

ESR-MRI skyrad

- ✓ Based on SKYRAD.Pack v4.2 and MRI_v2
- ✓ Cloud screening: ver 1.0 (based on Momoi 2020)
- ✓ Calibration: Implemented in this program
- ✓ Product:
  - AOT (0.34~1.02μm)
  - SSA (0.34~1.02 μm)
  - m(Re, Im) (0.34~1.02 μm)
  - Asymetry factor (0.34~1.02μm)
  - Aerosol size distribution (dV/dlnR)
  - Phase function (0.34~1.02 μm)
  - Angstrom exponent, Error

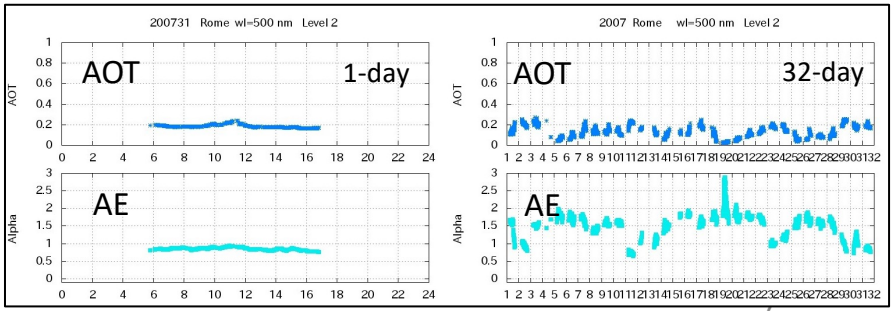
ESR-sunrad_0.9

- ✓ Use only direct sun measurements
- ✓ Cloud screening: ver 1.0 (based on Smirnov 2000)
- ✓ Product:
  - AOT (0.34~1.02 μm)
  - Angstrom exponent, Beta

--- Status ---

Same as SR-CEReS

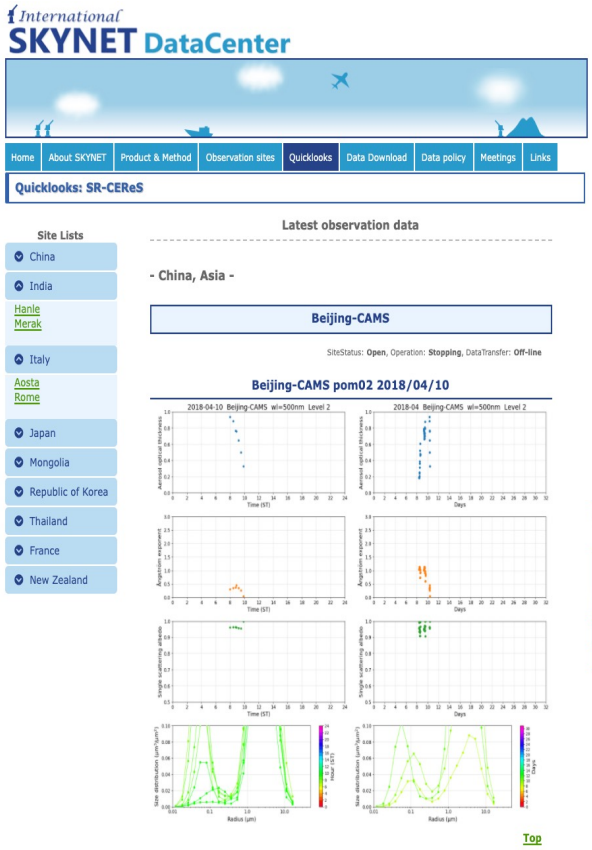
quick-look ESR-sunrad (Rome, July 31, 2020)



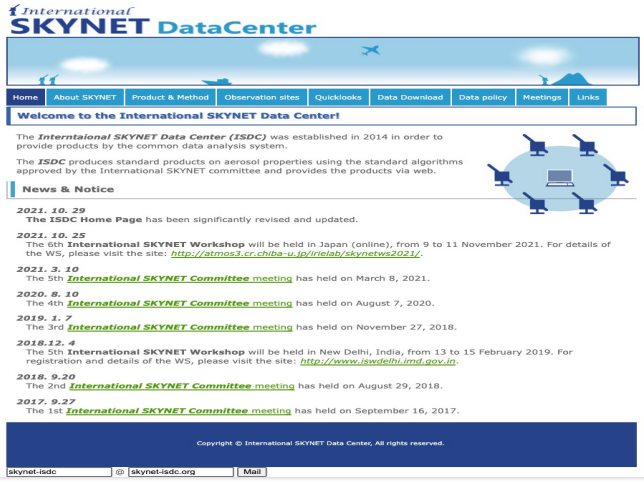
ISDC web page

◉ http://www.skynet-isdc.org/

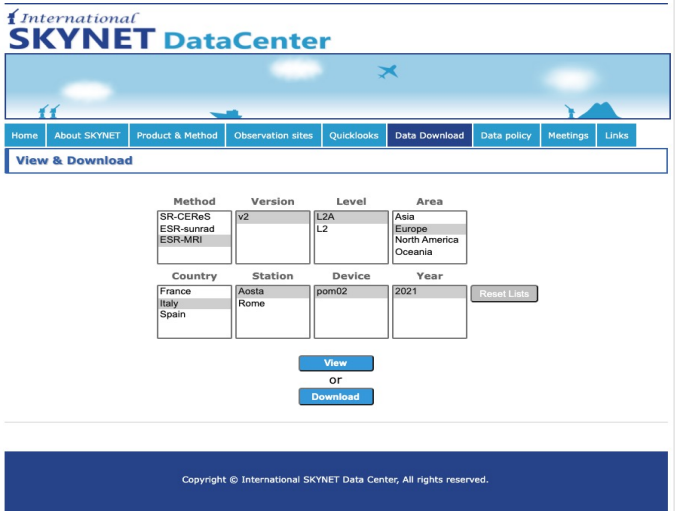
【Quick-looks】



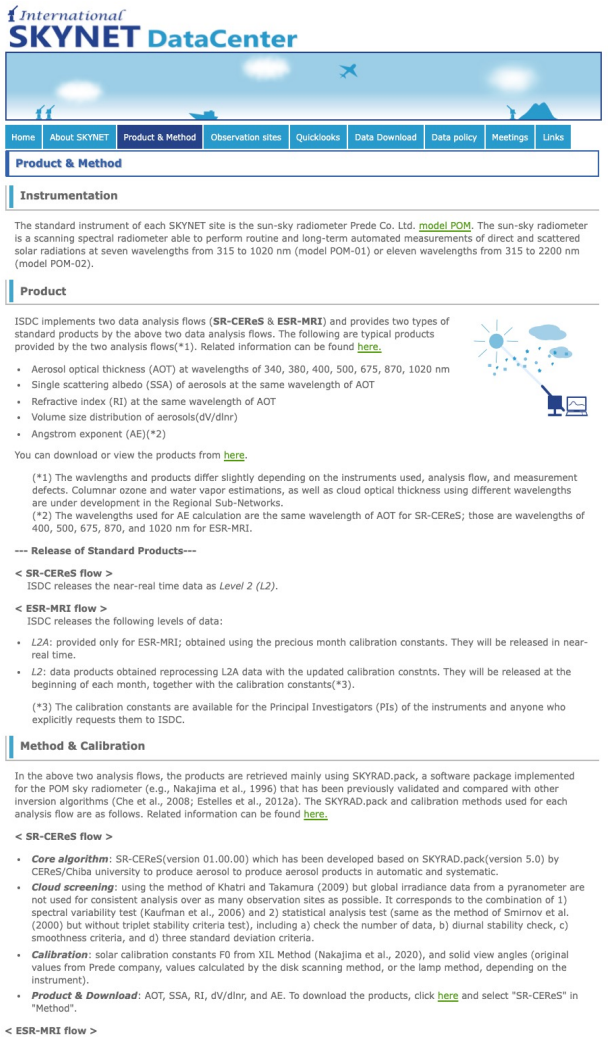
【Top page】



【Data download】



【Product & Method】



ISDC web page

- http://www.skynet-isdc.org/

International SKYNET DataCenter

Home | About SKYNET | Product & Method | Observation sites | Quicklooks | Data Download | Data policy | Meetings | Links

Data policy

Data policy for Data Providers (PDF)

Data policy for Data Users (PDF)

Template of MOU for Participation in SKYNET(PDF , DOCX)

--- Notice to Data Users ---

The processed data you are about to download are produced by ISDC. Each site has a Principal Investigator(s) (PI), responsible for deployment and maintenance of the instrument of data collection. The PI has priority use of the data collected at the site. The PI is entitled to be informed of any other use of that site data. The PI(s) and Co-Investigator(s) of this site is displayed in the header of the site page. If you intend to use the following data, please consult with him/her/them via e-mail.

--- Recommended guidelines for data use and publication ---

- ***Using SKYNET data:***
  Please consult with the PI(s) of the data to be used.
- ***Referencing:***
  Always cite the appropriate key SKYNET papers for any publications.
- ***Publishing SKYNET data from a "few" sites:***
  Please consider authorship for the PI(s) and/or the following acknowledgement: We thank the PI(s) for (its/their) effort in establishing and maintaining (site name(s)) sites.
- ***Publishing data from "many" sites:***
  A general acknowledgement is typically sufficient and may read: We thank the PI(s) and their staff for establishing and maintaining the (site names(s)) sites used in this investigation.
- If the SKYNET data are a principal component of the paper, then co-authorship to PI would be appreciated to be offered.

Data policy for Users

Agreement for International SKYNET Data Center (ISDC) data users (Data Policy).

The following document describes the data produced by the ISDC and governs their rules of use.

a) Data products

ISDC develops two data analysis flows **for all the sites**:

- **SR-CEReS** uses as core the Skyrad5.0.pack.
  Aerosol Products: Aerosol optical depth (AOD), Angstrom exponent, single scattering albedo, volume size distribution, refractive index.
  Gas Products: None.
  Calibrations: solar calibration constants F_0 from XIL Method (Nakajima et al., 2020), and solid view angles $\Delta\Omega$ (original values from Prede company, values calculated by the disk scanning method, or the lamp method, depending on the instrument).
  Cloud screening: using the method of Khatri and Takamura (2009) but global irradiance data from a pyranometer are not used for consistent analysis over as many observation sites as possible. It corresponds to the combination of 1) spectral variability test (Kaufman et al., 2006) and 2) statistical analysis test (same as the method of Smirnov et al. (2000) but without triplet stability criteria test), including a) check the number of data, b) diurnal stability check, c) smoothness criteria, and d) three standard deviation criteria.

- **ESR-MRI** uses the SUNRAD.pack, Skyrad_MRI_v2.pack and Skyrad4.2.pack.
  Aerosol Products: AOD and Angstrom exponent from SUNRAD.pack; single scattering albedo, volume size distribution, refractive index, phase function, asymmetry factor from Skyrad_MRI_v2.pack.
  Gas Products: None.
  Calibrations: F_0 from Improved Langley Method (ILM, Campanelli et al, 2004, 2008) using as core the Skyrad4.2.pack and $\Delta\Omega$ (original values from Prede or from disk scanning depending on the instrument).
  Clouds screening: performed using a procedure based on the methodology developed by Smirnov et

Data download & format

Observation data

Chiba pom02 [2020/01/01-2020/12/31] download(zip)

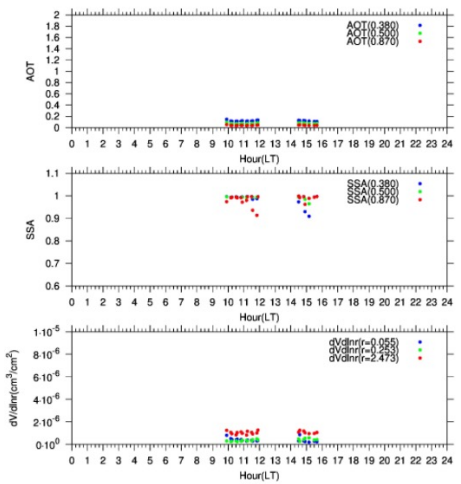
Jan	01 02 03 04 05 06 08 09 10 15 16 17 19 20 21 22 29 30 31
Feb	01 02 03 04 05 06 07 08 09 10 11 12 13 14 17 18 19 20 21 22 23 24 25 27 28 29
Mar	01 03 05 06 09 11 12 13 15 16 17 18 19 20 21 22 24 25 26 27 30
Apr	02 03 04 05 06 07 08 09 10 11 14 15 [illegible]
May	01 02 03 05 07 08 11 12 13 14 15 24 25 28 29 30
Jun	02 03 04 05 07 08 09 10 11 12 15 16 17 20 21 26 27
Jul	02 08 12 13 19 20 26 28 31
Aug	01 02 03 04 05 06

↑ Download 1-year data

2020/01/01

[skyradio_Chiba_200101.nc] ←Download 1-day data

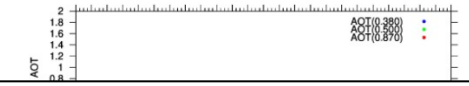
Top



2020/01/02

[skyradio_Chiba_200102.nc]

Top



Netcdf format
(e.g., ncdump ****yymmdd.nc)

```
netcdf skyradio_Chiba_200101 {
dimensions:
        wavelength = 7 ;
        time = 23 ;
        radius = 20 ;
variables:
        float wavelength(wavelength) ;
                wavelength:units = "micrometer" ;
        float time(time) ;
                time:units = "hour (LT)" ;
        float radius(radius) ;
                radius:units = "micrometer" ;
        float dn(time) ;
                dn:units = "day number since Jan. 1st(LT)" ;
        float aot(wavelength, time) ;
                aot:units = "(dimensionless)" ;
                aot:long_name = "aerosol optical thickness" ;
        float ssa(wavelength, time) ;
                ssa:units = "(dimensionless)" ;
                ssa:long_name = "single scattering albedo" ;
        float rr(wavelength, time) ;
                rr:units = "(dimensionless)" ;
                rr:long_name = "refractive indices(re)" ;
        float ri(wavelength, time) ;
                ri:units = "(dimensionless)" ;
                ri:long_name = "refractive indices(im)" ;
        float vol(radius, time) ;
                vol:units = "cm3/cm2" ;
                vol:long_name = "dV/dlnr" ;
        float ae(time) ;
                ae:units = "(dimensionless)" ;
                ae:long_name = "angstrom exponent" ;
        float cf(time) ;
                cf:units = "(dimensionless)" ;
                cf:long_name = "cloud flag (0:clear, 1:cloud)" ;

// global attributes:
                :location = "Chiba" ;
                :date = "20200101" ;
                :code = "SR-CEReS v01.00.00" ;
data:

 wavelength = 0.34, 0.38, 0.4, 0.5, 0.675, 0.87, 1.02 ;

 time = 9.57, 9.83, 9.9, 10.17, 10.23, 10.5, 10.57, 10.83, 10.9, 11.17,
    11.23, 11.5, 11.56, 11.83, 11.9, 14.5, 14.57, 14.83, 14.91, 15.17, 15.5,
    15.67, 15.83 ;

 radius = 0.012, 0.018, 0.026, 0.038, 0.055, 0.081, 0.118, 0.173, 0.253,
    0.37, 0.541, 0.791, 1.156, 1.691, 2.473, 3.617, 5.289, 7.734, 11.31, 16.54 ;
```

Summary & future work

◎ ISDC implemented three algorithms that are SR-CEReS, ESR-Skyrad, and ESR-Sunrad and updated the website (http://www.skynet-isdc.org/).

◎ Currently, data processing is being performed at about 26 sites. It is expected that the number of sites will increase in the future.

◎ Updated ISDC website has been already published and you can visit there and use it.

◎ As future work,
- Support for providing data to WMO (providing and registering metadata information et c…)
- Improve the website. Please contact me if you have any requests.

Many persons cooperated in implementing the algorithm in the ISDC system and updating the website.
ISDC would like to take this opportunity to thank you !!