

SKYNET放射計測と検定

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環境リモートセンシング研究センター
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放射計の較正に関する専門家会合
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SKYNET atmospheric radiation and weather observation network - Mozilla Firefox

ファイル(F) 編集(E) 表示(U) 履歴(S) ブックマーク(B) ツール(T) ヘルプ(H)

よく見るページ Firefox を使ってみよう 最新ニュース

SKYNET atmospheric radiation... skyrad data at Fukue

SKYNET menu

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2010.03.10

Welcome to SKYNET

SKYNET is an observation network to understand **aerosol -cloud-radiation interaction** in the atmosphere. The main instruments consist of a sky radiometer and radiation instruments such as a pyranometer and pyrgeometer as a basic site, and a super site has more instruments extended for analyzing **atmospheric parameters** of aerosol, cloud and radiation.

The **observation sites of SKYNET** are located mainly in the Eastern Asia from Mongolia to Thailand as well as in Japan. The data observed at each site are collected into a site server and then transferred using an internet for super sites and sent by off-line transportation for other sites. These data are archived into a SKYNET server in Chiba University and then open to the public.

The **SKYNET is a voluntary-based activity**, which is supported by **many researchers and collaborators** in the community.

All the researchers who are interested in are welcome to join the activity.
 The analysis system of the SKYNET is also voluntary-based.
 All the data are distributed to ones who are interested in under the [data policy](#)

Map of SKYNET sites

Link (Historical Data)

[Japan sites]

- [Hedo misaki](#)
- [Fukue jima](#)
- [Miyako jima](#)
- [Chiba Univ.](#)
- [Eitchu jima](#)
- [Moshiri](#)
- [Fuji Hokuroku](#)
- [Nagasaki](#)
- [Minami-Torishima](#)
- [Amami-ooshima](#)

[China sites]

- [Hefei](#)
- [Dunhuang](#)
- [Yinchuan](#)

[Tailand sites]

- [Phimai](#)
- [Sri-samrong](#)

[Mongolia site]

- [Mandalgovi](#)

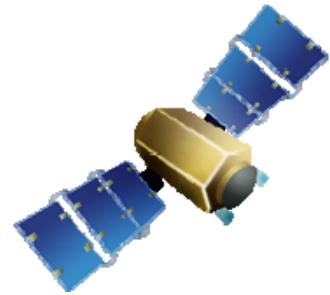
[South Korea site]

- [Seoul](#)

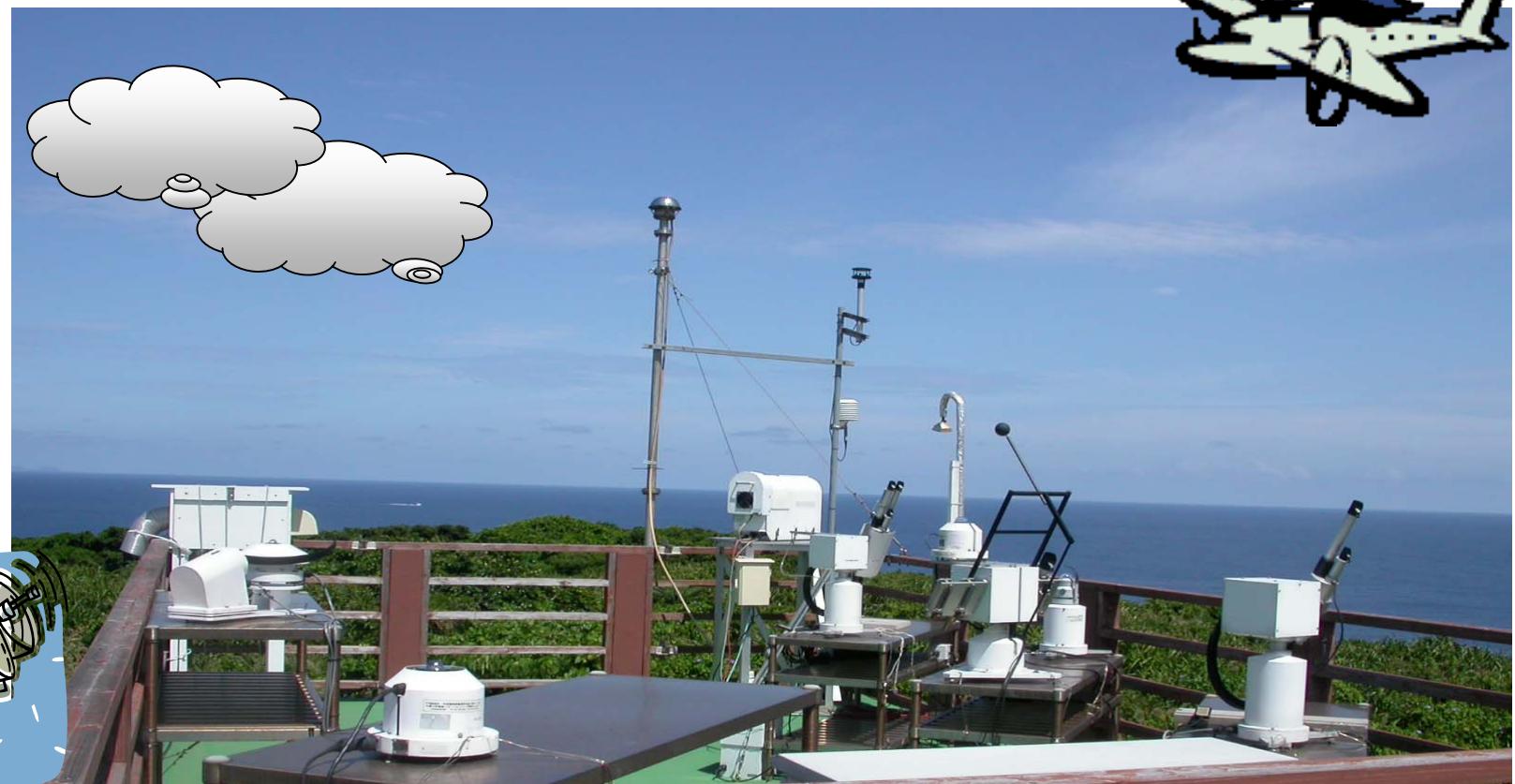
[Europe sites]

- [Bologna](#)
- [Rome](#)
- [Bremen](#)
- [Orleans](#)

http://atmos.cr.chiba-u.ac.jp/



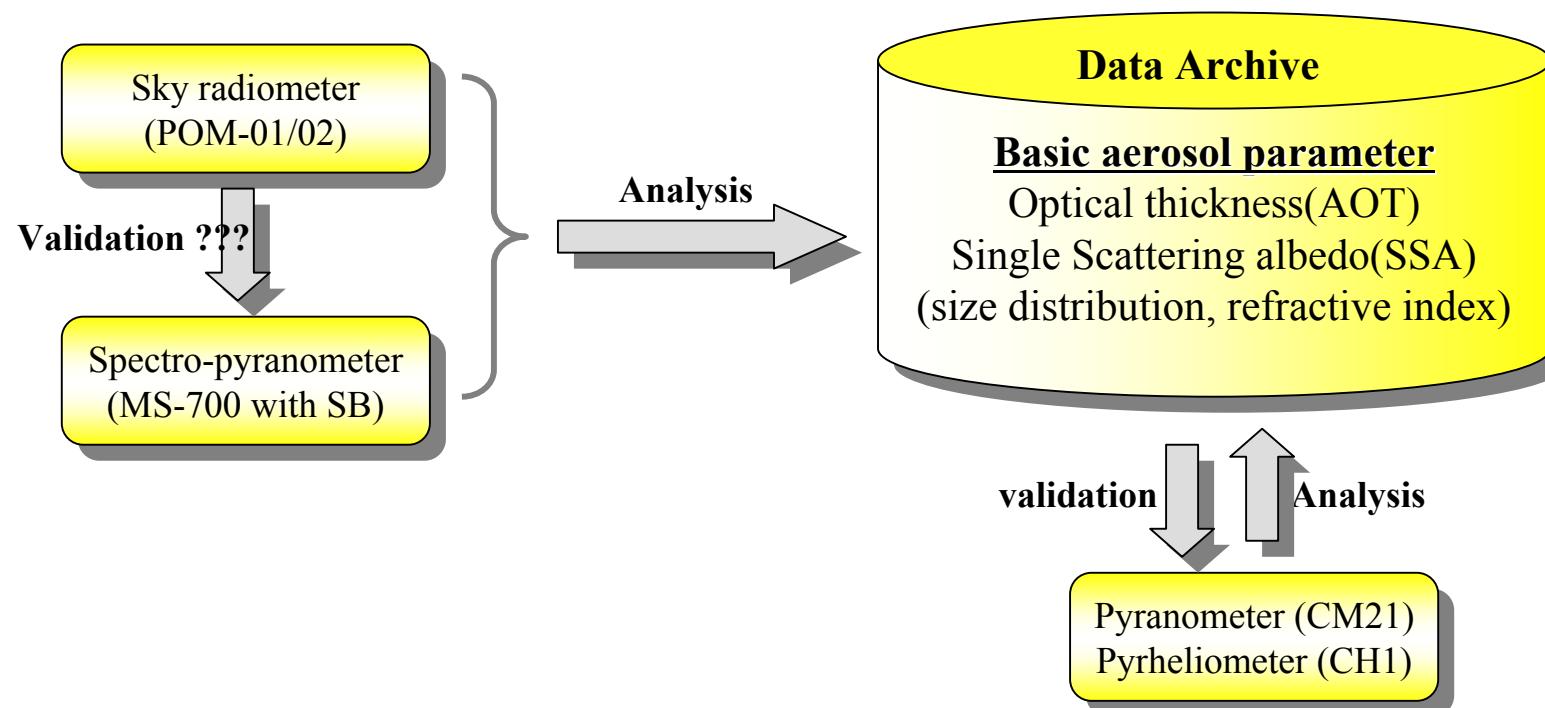
沖繩辺戸岬觀測施設 (放射関連觀測A棟)



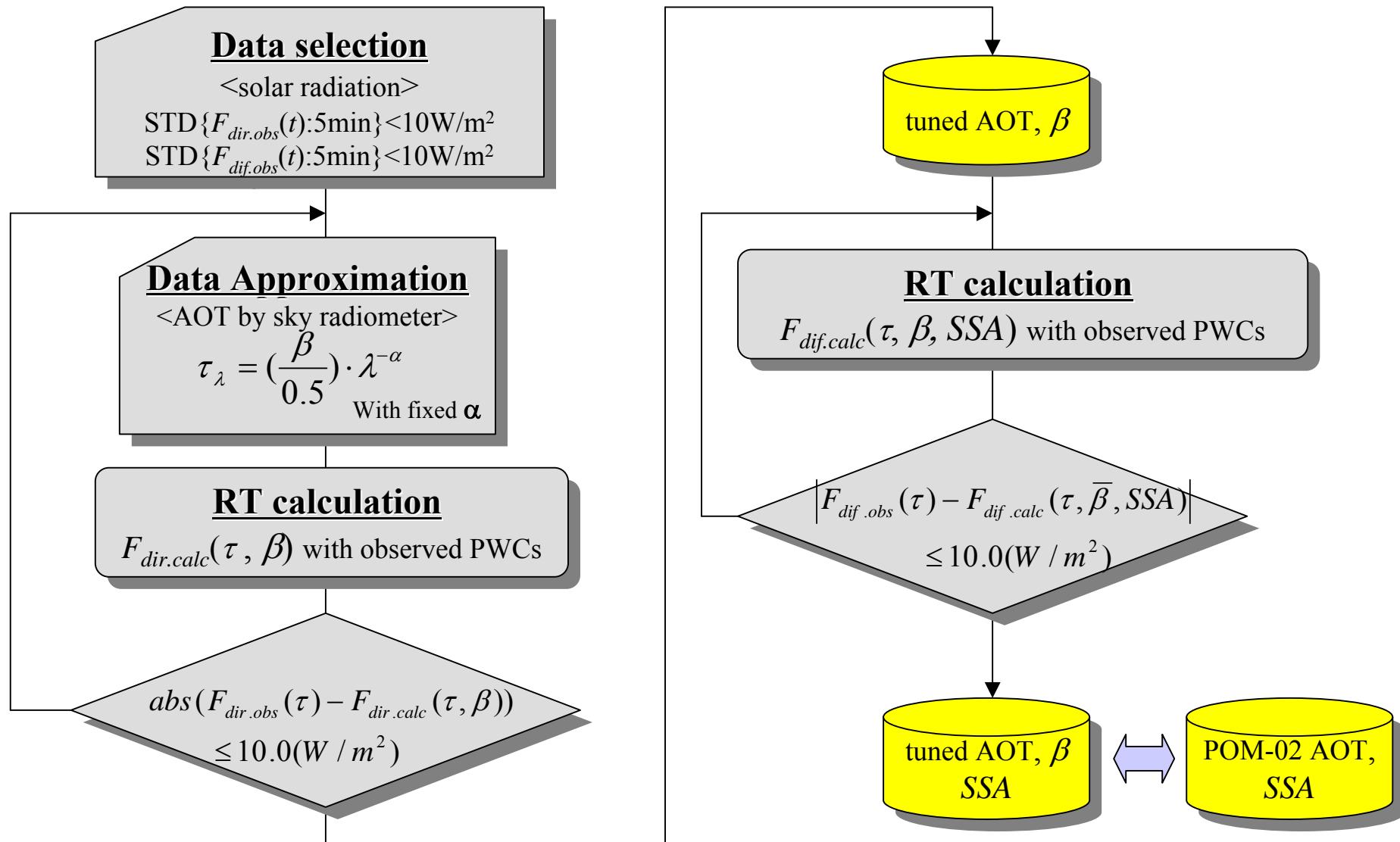
Instrumentation at SKYNET super sites

	<u>Phimai</u> (Thailand)	<u>Hefei</u> (China)	<u>Hedo-misaki</u> (Japan)	<u>Fukue</u> (Japan)	<u>Miyako</u> (Japan)	<u>Chiba</u> (Japan)
<u>sky radiometer</u> POM-01, POM-02 (Prede)	POM-01 POM-02	POM-02	POM-01 POM-02	POM-01 POM-02	POM-02	POM-01 POM-02
<u>LIDAR</u> NIES model(Japan)	NIES model	NIES model	NIES model	NIES model	---	NIES model
<u>integrating nephelometer</u>	M903	M903	M903 TSI 3563	M903	M903	M903
<u>absorption meter</u> aethalometer(AE-31,Magee Sci) BC monitor(Thermo MAAP5012) sampling photometer (SP-Y01)	SP-Y02	SP-Y02	AE-31 MAAP5012 SP-Y02	AE-31 SP-Y02	PSAP	---
<u>Particle counter</u> OPC(MetOne 237B), OPC(Rion KC-01D)	---	---	237B KC-01D	KC-01D	237B	---
<u>microwave radiometer</u> WVR-1100/1500(Radiometrics)	WVR-1100	WVR-1100	WVR-1100	RPG-LWP	WVR-1500	WVR-1100
<u>cloud camera</u> PSV-100(Prede)	PSV-100	PSV-100	PSV-100	PSV-100	PSV-100	PSV-100
<u>Pyrheliometer</u> MS-53(EKO), CH01(Kipp & Zonen)	MS-53	MS-53	CH01	CH01	CH01	CH01
<u>Pyranometer(CM21)</u> <u>Spectro-pyranometer</u> MS-700 with SB	CM21(U) CM21(D)	CM21(U) CM21(D)	CM21 MS-700	CM21 MS-700	CM21 MS-700	CM21 MS-700
<u>Pyrgeometer</u> PIR(Eppley), CG4(Kipp & Zonen)	PIR(U) PIR(D)	PIR(U) PIR(D)	PIR	CG4	PIR	PIR CG4

何を求めるのか？

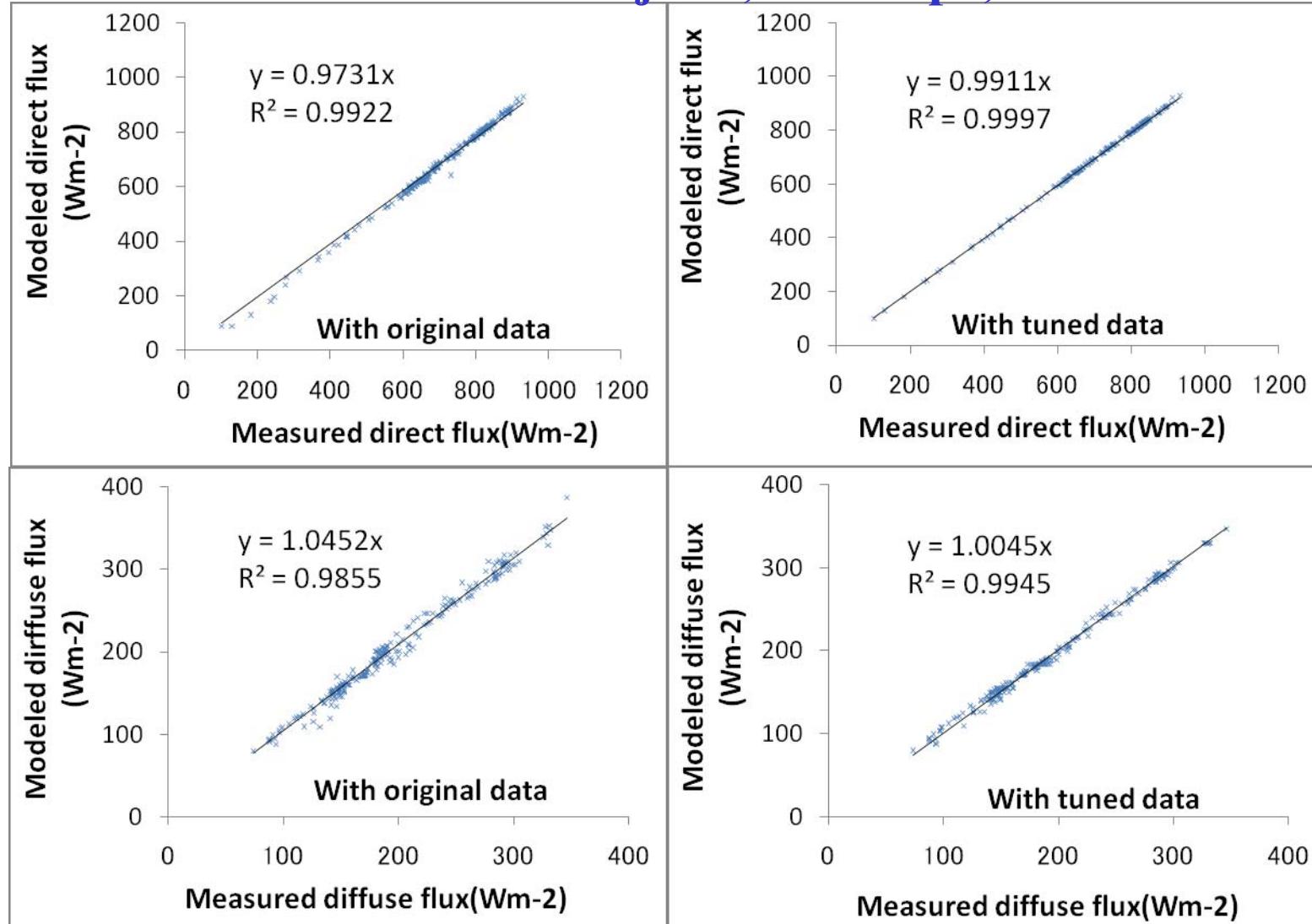


AOT correction(tuning) with direct solar radiation and estimate of SSA fitted to observed diffuse radiation

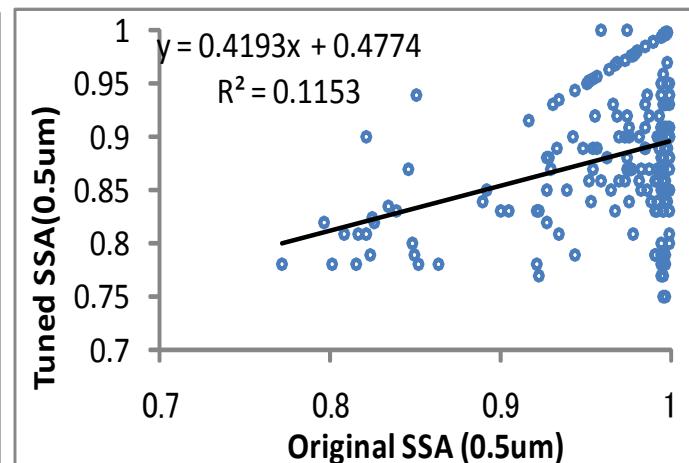
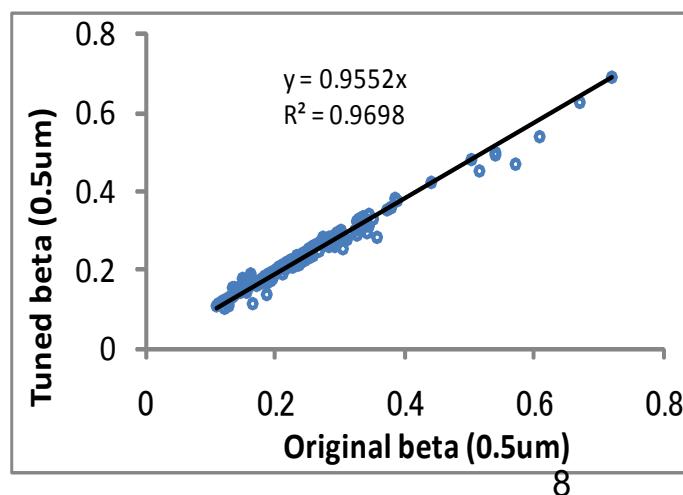
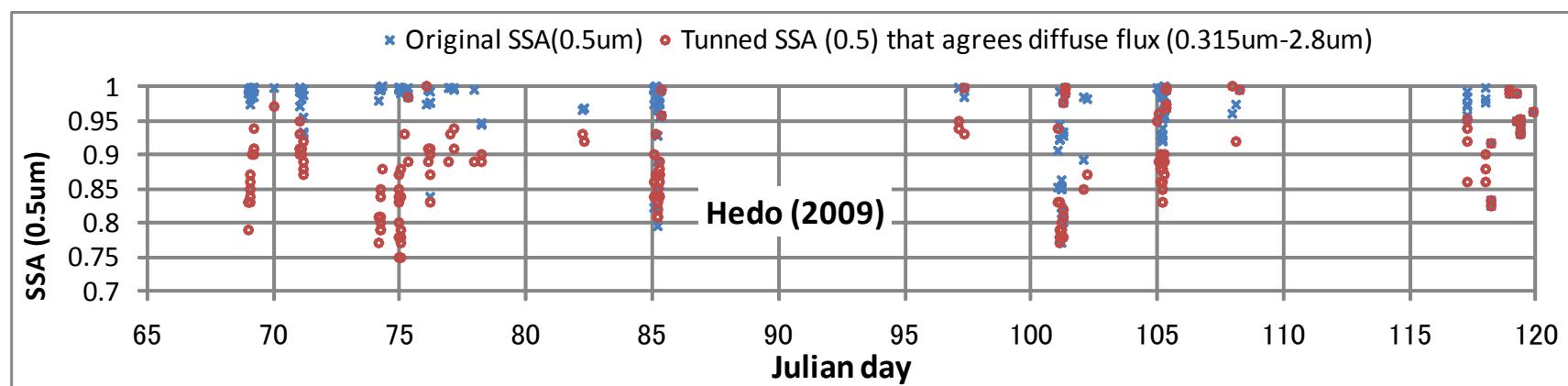
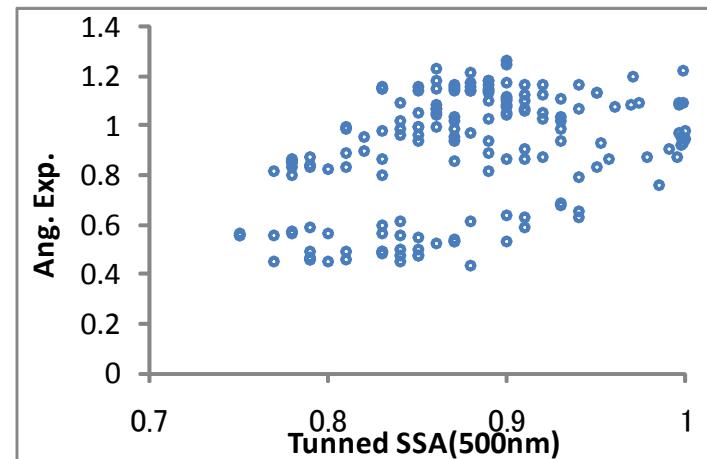


Comparison of Direct/Diffuse Solar radiation between before and after tuning with observed direct and diffuse radiation

SKYNET Fukue-jima, Mar-Apr, 2009



**AOT corrected by direct radiation
and estimated SSA at SKYNET
Cape Hedo**



Aerosol retrieval by using a spectral pyranometer



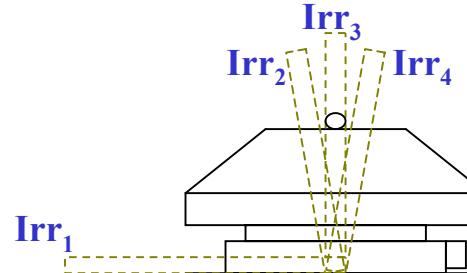
Instrument

Type: MS-700 with shadow band

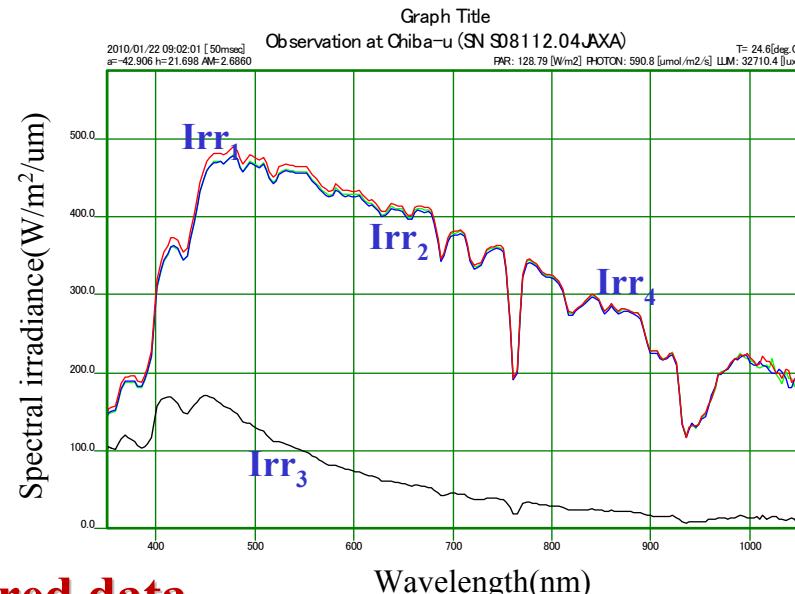
Manufacturer: EKO Co., Ltd., Japan

A major difficulty to use data

Cosine correction factors for diffuse and global irradiances are not known.



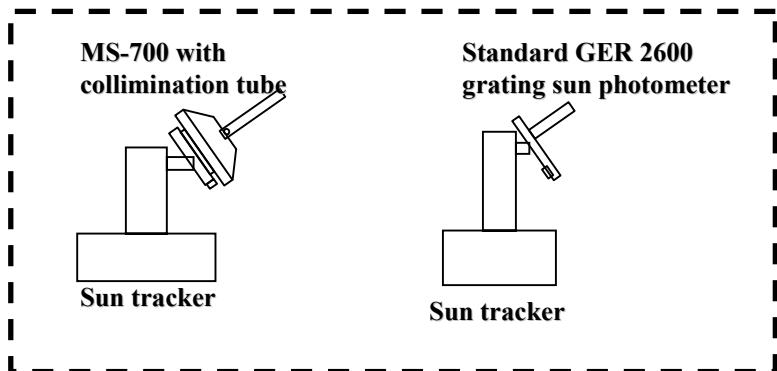
Measurement technique



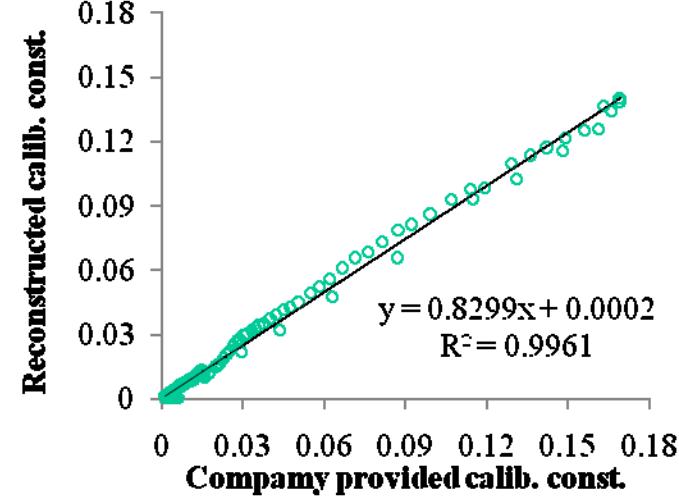
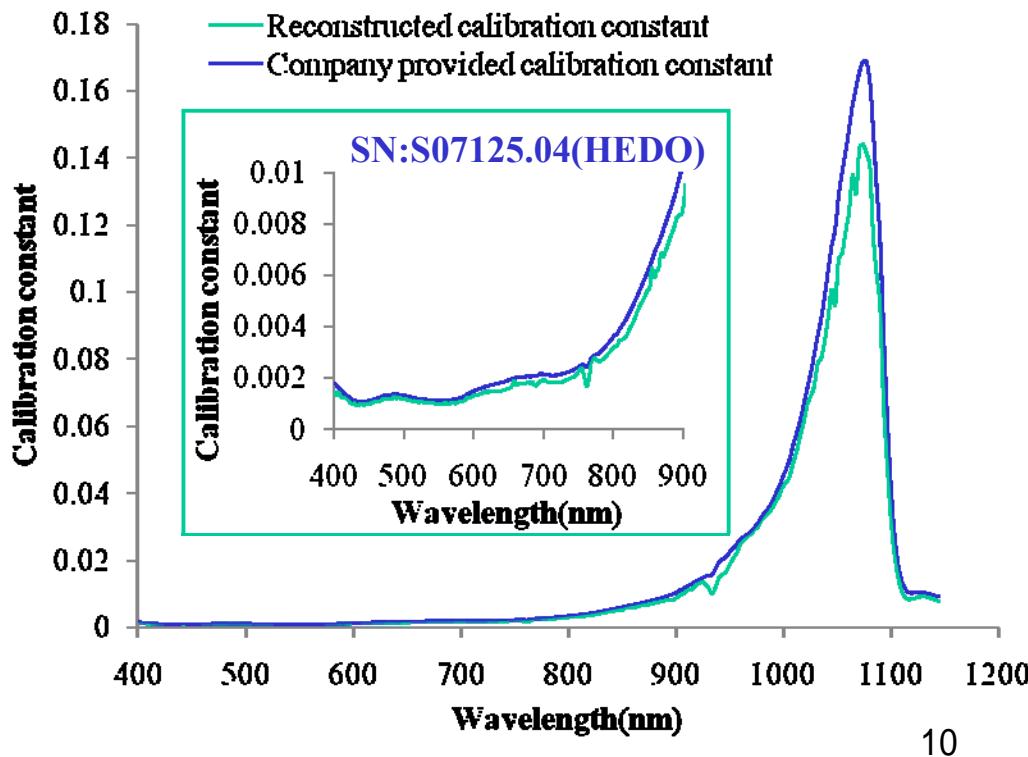
Measured data

- Spectral global irradiance = $Irr_1(\lambda)$
- Spectral diffuse irradiance = $Irr_3(\lambda) + Irr_1(\lambda) - (Irr_2(\lambda) + Irr_4(\lambda))/2$

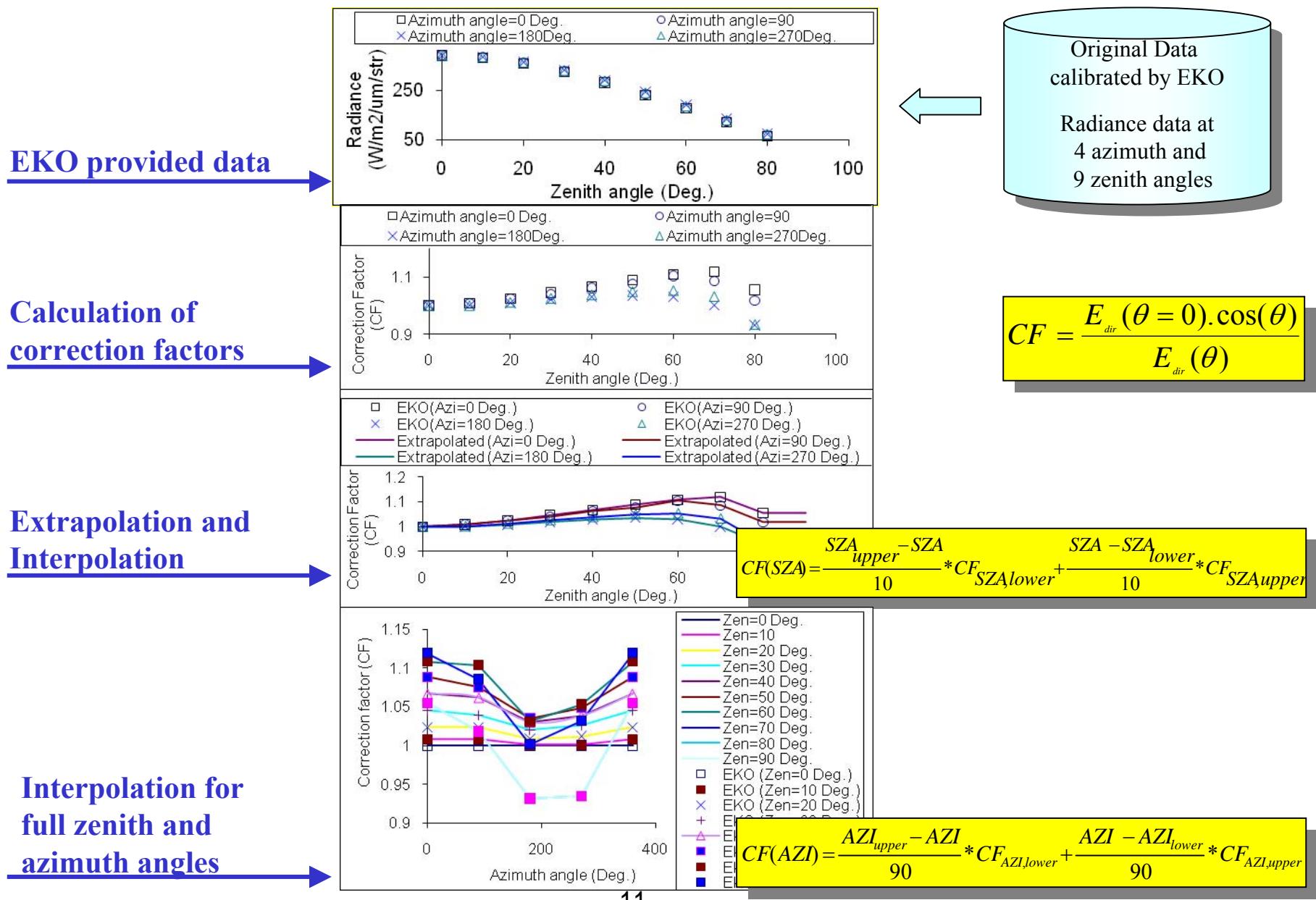
Re-calibration for MS-700 spectro-pyranometer



Calibration constants of MS-700 are reconstructed using standard grating sun photometer (GER 2600) at MRI, Tsukuba



Cosine characteristics of MS-700 sensor and correction factor only for direct radiance



Aerosol optical thickness

MS-700



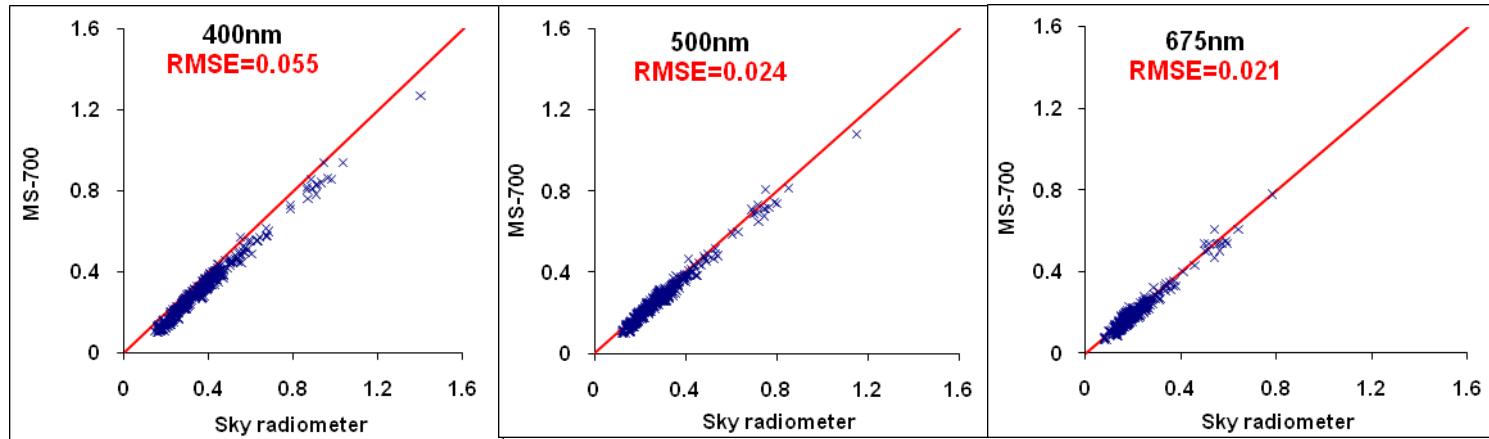
VS



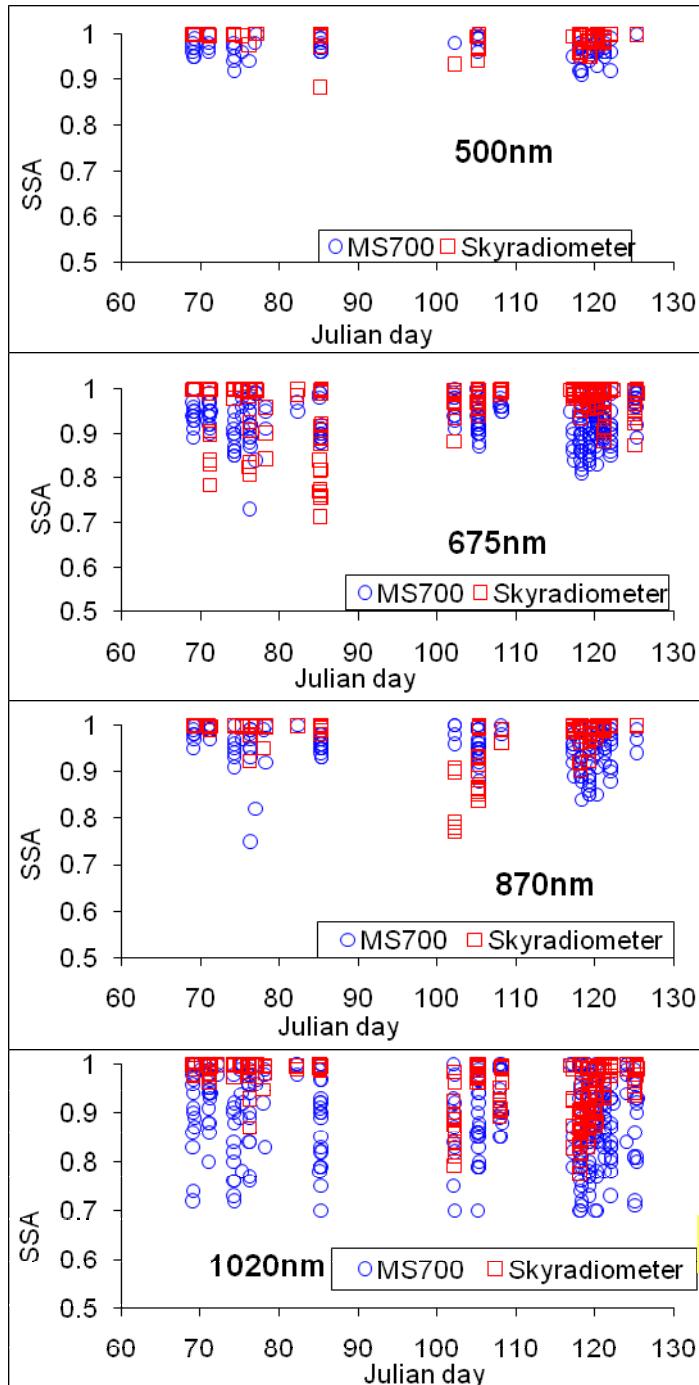
Sky radiometer
(POM-02)

Observation area: Cape-Hedo, Japan

Observation period: March 2009 – May 2009



Correlations between
sky radiometer and MS-700
AOTs are good
(Relatively large RMSE for
400nm channel)



Single scattering albedo(SSA)

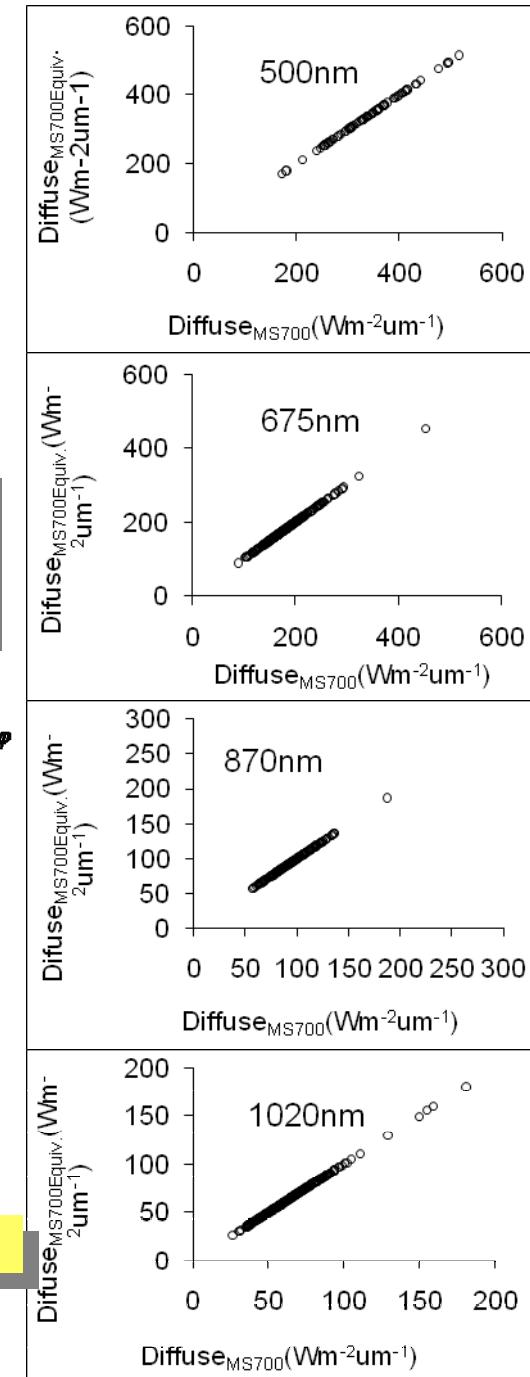
Diffuse_{MS700Equiv.}
→Simulated diffuse irradiance equivalent to measured irradiance by MS-700

$$\text{Diffuse}_{\text{MS700Equiv.}} = \int_0^{2\pi} \int_0^{\pi/2} I(\theta, \varphi) / k_{\text{dir.}}(\theta, \varphi) \sin \theta \cos \theta d\theta d\varphi$$

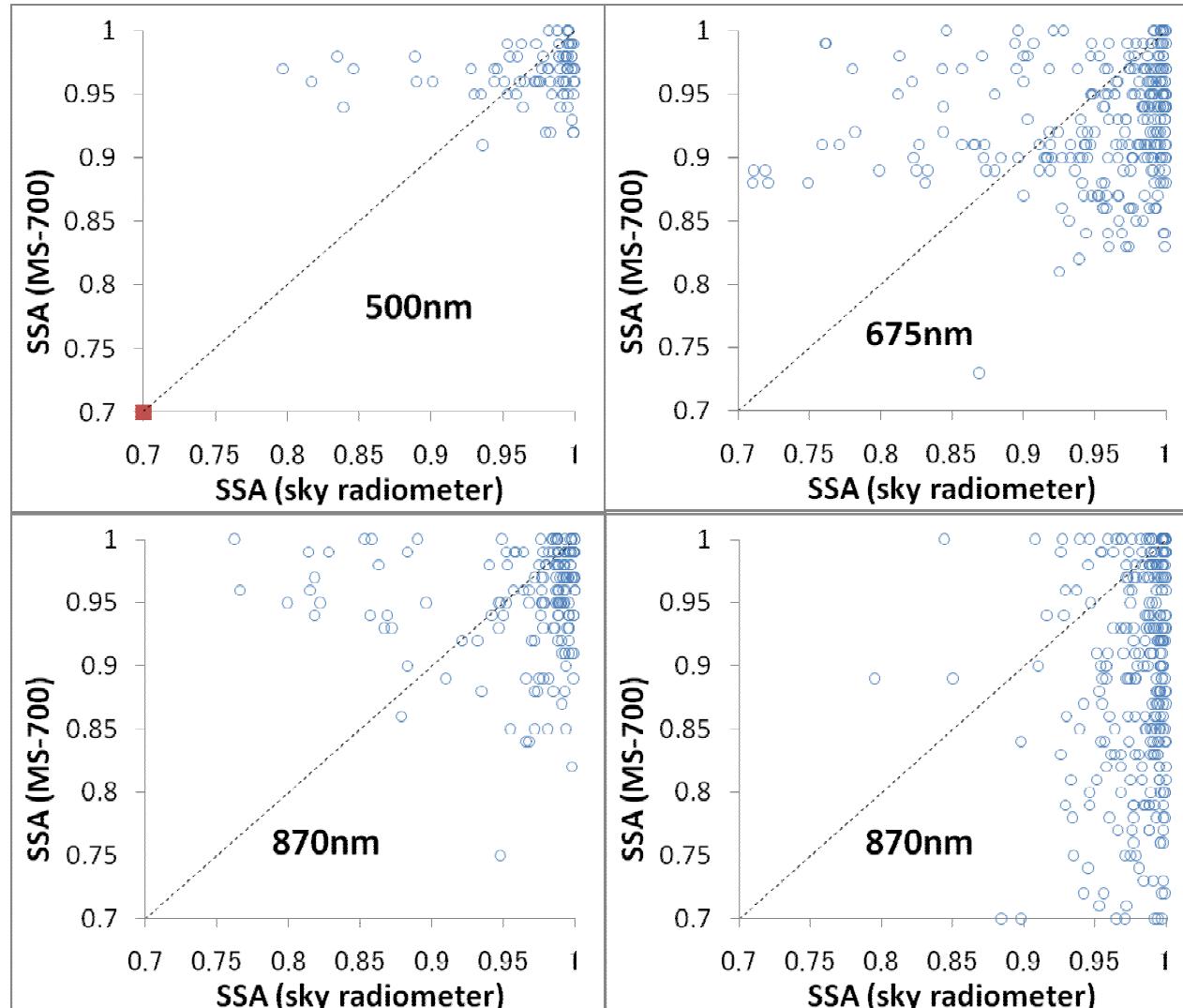
Diffuse_{MS700}
→Diffuse irradiance measured by MS-700

Condition for SSA retrieval using MS-700 data

$$|\text{Diffuse}_{\text{MS700Equiv.}} - \text{Diffuse}_{\text{MS700}}| < 1 \text{ W m}^{-2} \mu\text{m}^{-1}$$



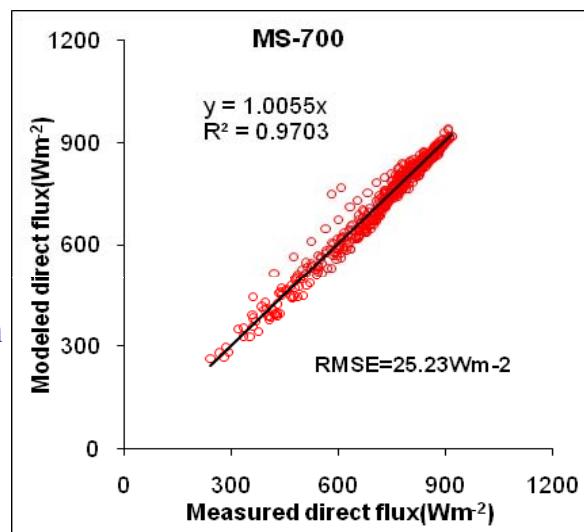
SSA scatter-plot between sky radiometer (POM-02) and MS-700 measurement



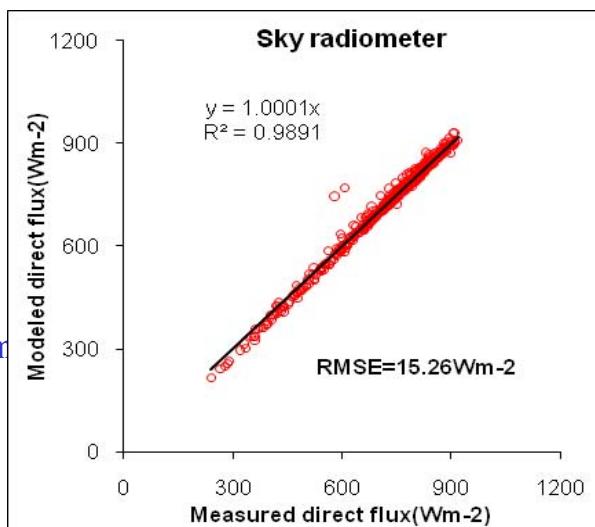
Site: Cape Hedo
Period: Mar.10-May 5, 2009
SSA(POM-02):
Skyrad.pack ver.4.2
SSA(MS-700): AOT no
tuned by CH01, and
forward calc for 0.7 to 1
with cosine correction.

Which instruments are more accurate?

Direct fluxes are modeled using spectral AOTs from MS-700

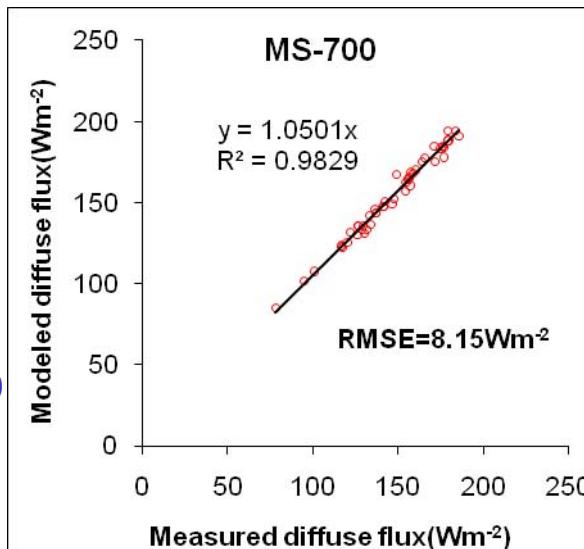


Direct fluxes are modeled using Spectral AOTs from sky radiometer

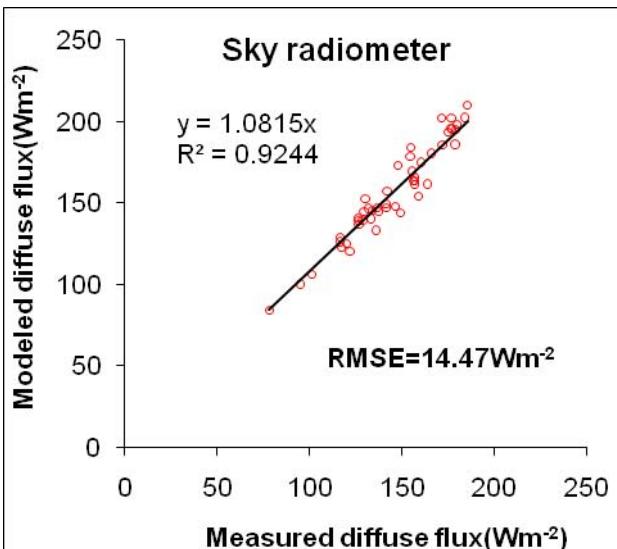


- Method of correcting excess diffuse flux blocked by shadow band
- Cosine error correction factors provided by the manufacturer
- Calibration constant for direct irradiances
- Spectral solar irradiance at the top of the atmosphere

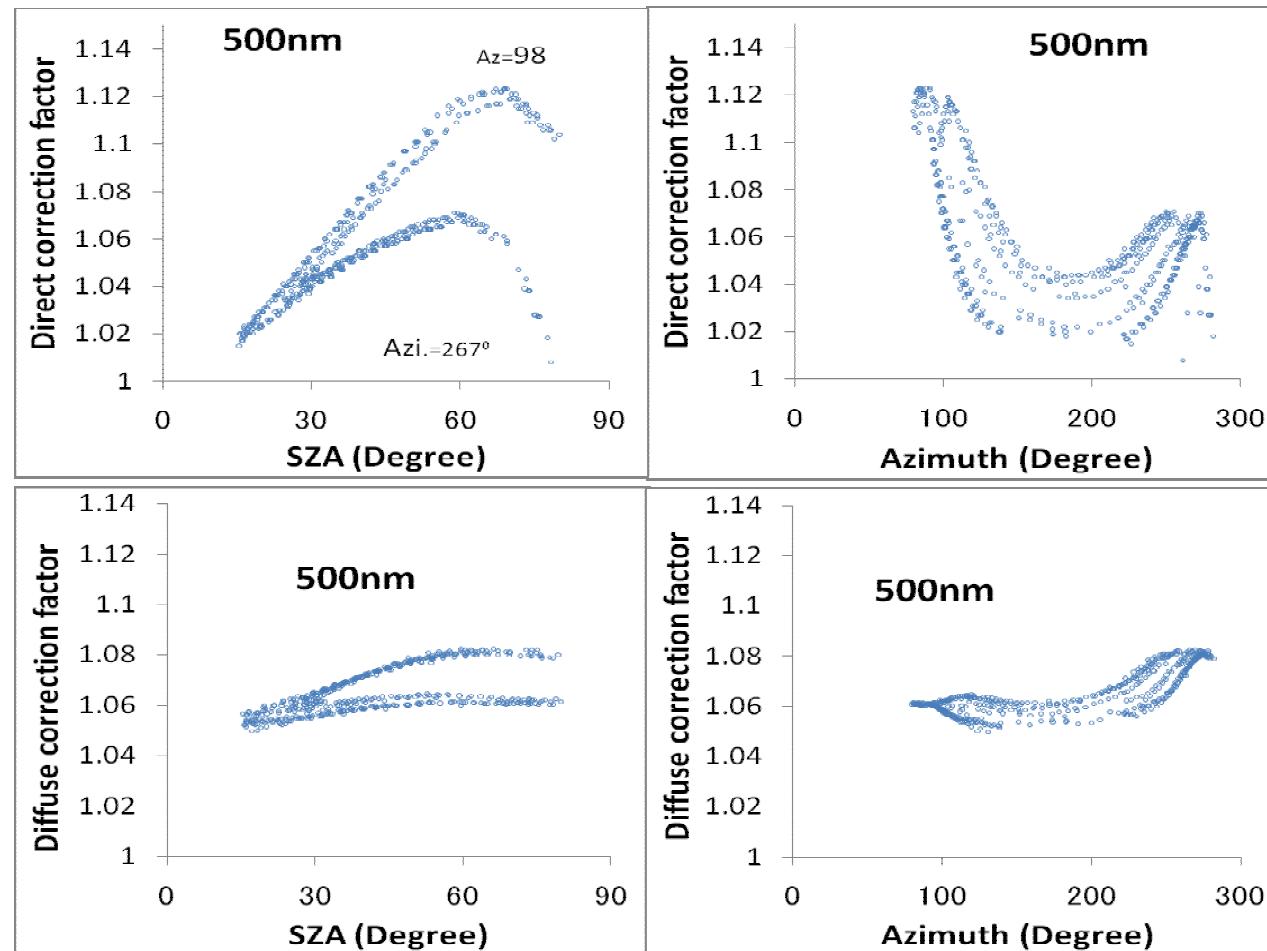
Diffuse fluxes are modeled using spectral SSAs and AOTs from MS-700



Diffuse fluxes are modeled using spectral SSAs and AOTs from sky radiometer



Correction factor of MS-700 at Cape Hedo for direct and diffuse spectral irradiance measurement



まとめ

- ☆ 全天分光日射計によるエアロゾルの波長別光学特性の推定を行った。
- ☆ AOTの推定結果では、sky radiometerと比較して良い一致を示している。
- ☆ SSAを推定するには、センサーのCosine特性に方位角依存があり、これを組み込んだ補正をすることが必要である。
- ☆ 精度の高いSSAの推定には、散乱日射量の精度維持が必須である。