Optical Characteristics of Aerosols over south-western islands of Japan using SKYNET observation network

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Contents

- Objectives and overview of SKYNET
  ➔ Importance of atmospheric parameters in radiation budget

- Aerosol observation by spectro-pyranometer, -Examples-

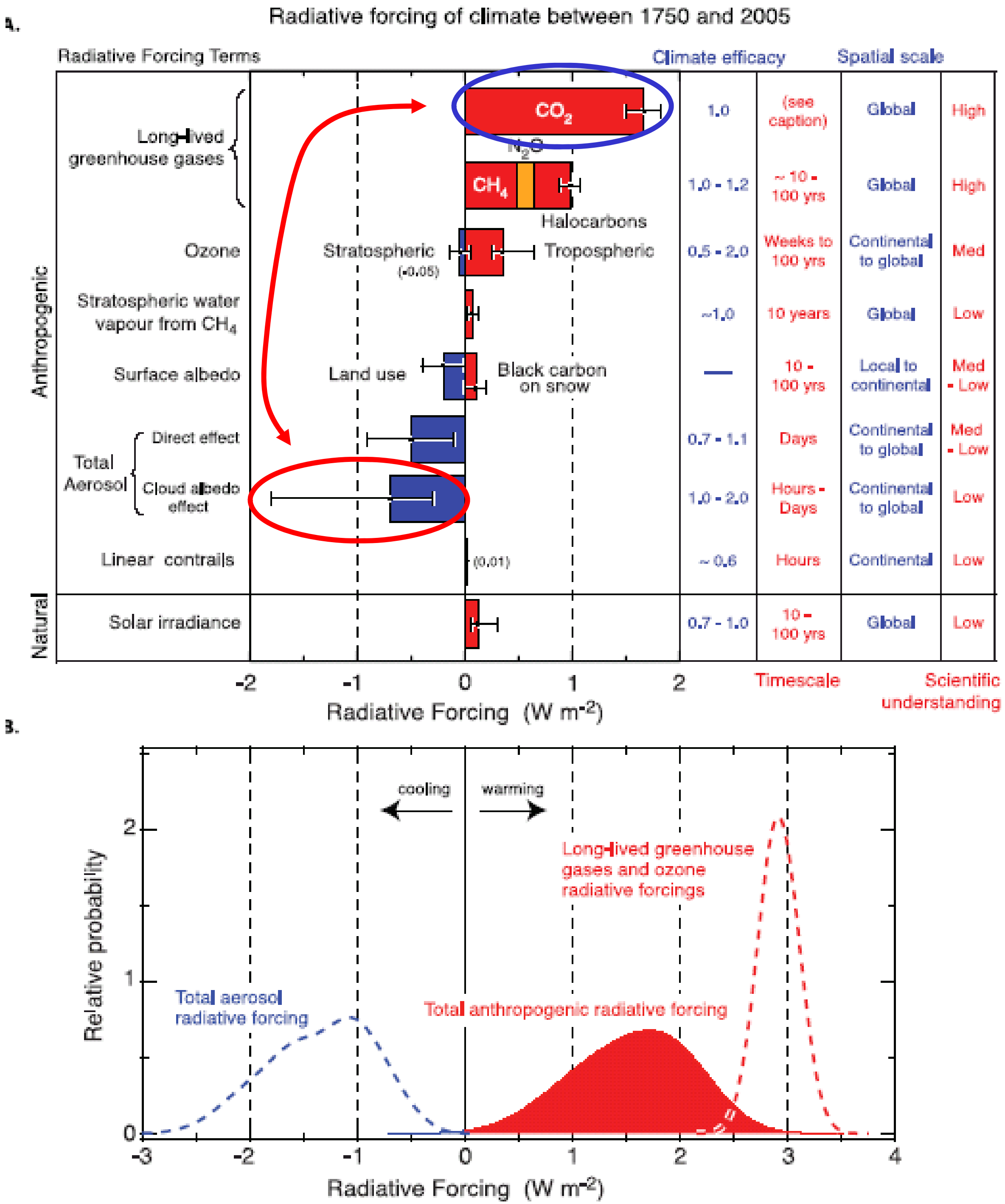


Figure 2.20 (A) Global mean RFs from the agents and mechanisms discussed in this chapter, grouped by agent type. Anthropogenic RFs and the natural direct solar RF are shown. The plotted RF values correspond to the bold values in Table 2.12. Columns indicate other characteristics of the RF; efficacies are not used to modify the RFs shown. Time scales represent the length of time that a given RF term would persist in the atmosphere after the associated emissions and changes ceased. No CO2 time scale is given, as its removal from the atmosphere involves a range of processes that can span long time scales, and thus cannot be expressed accurately with a narrow range of lifetime values. The scientific understanding shown for each term is described in Table 2.11. (B) Probability distribution functions (PDFs) from combining anthropogenic RFs in (A). Three cases are shown: the total of all anthropogenic RF terms (block filled red curve; see also Table 2.12); LLGHGs and ozone RFs only (dashed red curve); and aerosol direct and cloud albedo RFs only (dashed blue curve). Surface albedo, contrails and stratospheric water vapour RFs are included in the total curve but not in the others. For all of the contributing forcing agents, the uncertainty is assumed to be represented by a normal distribution (and 90% confidence intervals) with the following exceptions: contrails, for which a lognormal distribution is assumed to account for the fact that the uncertainty is quoted as a factor of three; and tropospheric ozone, the direct aerosol RF・ (sulphate, fossil fuel organic and black carbon, biomass burning aerosols) and the cloud albedo RF, for which discrete・ values based on Figure 2.9, Table 2.6 and Table 2.7 are・ randomly sampled. Additional normal distributions are included in the direct aerosol effect for nitrate and mineral dust, as these are not explicitly accounted for in Table 2.6. A one−million point Monte Carlo simulation was performed to derive the PDFs (Boucher and Haywood, 2001). Natural RFs (solar and volcanic) are not included in these three PDFs. Climate efficacies are not accounted for in forming the PDFs.

Cited from WG1 _Pub_ch2 page203.

Importance of aerosol indirect effects

Usual aerosol effect

Cooling effect (direct effect)

普通の雲の効果（粒径大）

エアロゾル（凝結核）の影響を受けた雲、（粒径小で光学的厚さ大）	エアロゾル（凝結核）の影響を受けた雲、（降水抑制、雲水量増加）	エアロゾル（凝結核）の影響を受けた雲、（雲頂上昇、OLR減少）	エアロゾル（凝結核）の影響を受けた雲、（雲寿命の増大、日射の減少）	エアロゾル（氷晶核）の影響を受けた雲、（雲量の増大、温室効果）	エアロゾルと混在する雲、（日射の吸収による雲の消滅）

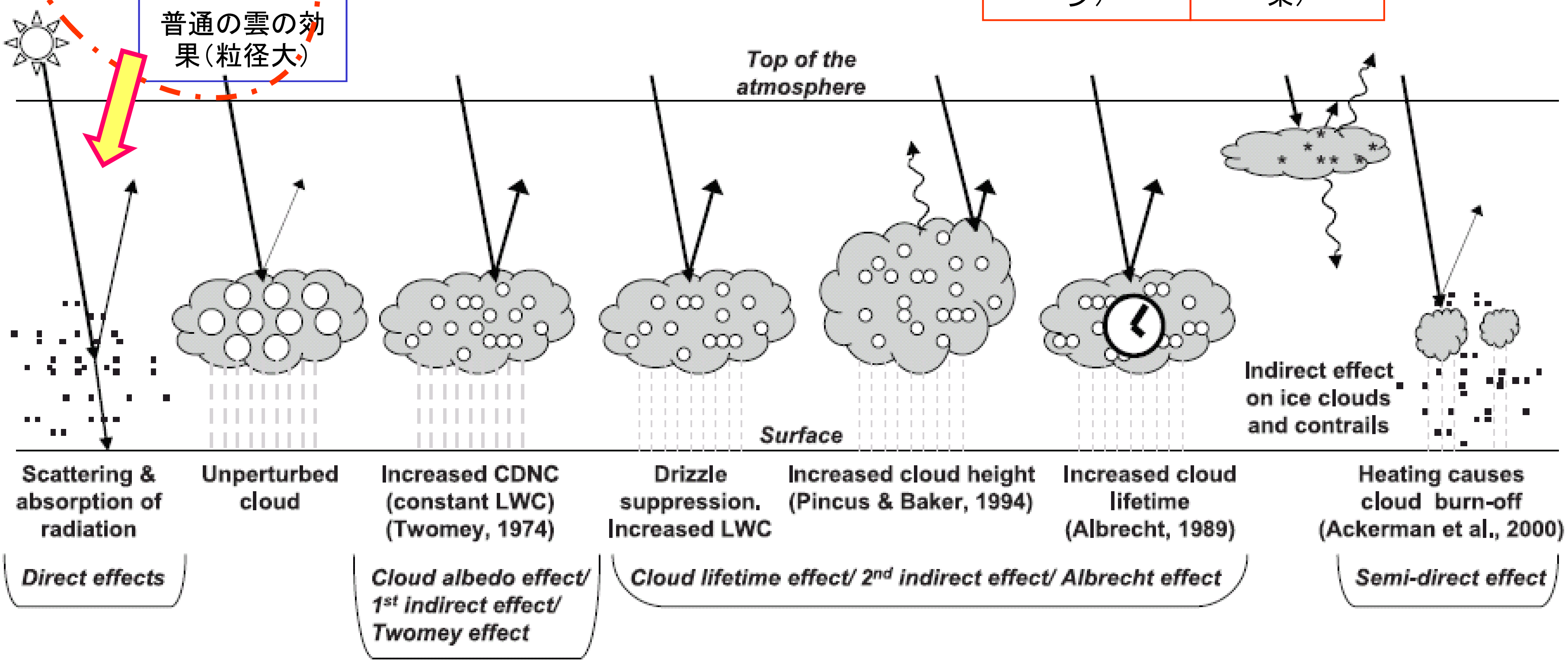


Figure 2.10. *Schematic diagram showing the various radiative mechanisms associated with cloud effects that have been identified as significant in relation to aerosols (modified from Haywood and Boucher, 2000). The small black dots represent aerosol particles; the larger open circles cloud droplets. Straight lines represent the incident and reflected solar radiation, and wavy lines represent terrestrial radiation. The filled white circles indicate cloud droplet number concentration (CDNC). The unperturbed cloud contains larger cloud drops as only natural aerosols are available as cloud condensation nuclei, while the perturbed cloud contains a greater number of smaller cloud drops as both natural and anthropogenic aerosols are available as cloud condensation nuclei (CCN). The vertical grey dashes represent rainfall, and LWC refers to the liquid water content.*

Cited from WG1 _Pub_ch2 page154.

Objectives of SKYNET:

☆ Optical characteristics and radiative effect by aerosol and cloud

➔ Cloud and aerosol parameters retrieved by ground-based observations, using sun/sky radiometer, pyranometer and other related instruments. Estimate of the radiative effect.

(Aerosol-cloud interaction)

➔ Observation of vertical structure of aerosol and cloud using lidar and radar to understand variations of the parameters in regional/spatial and time domain.

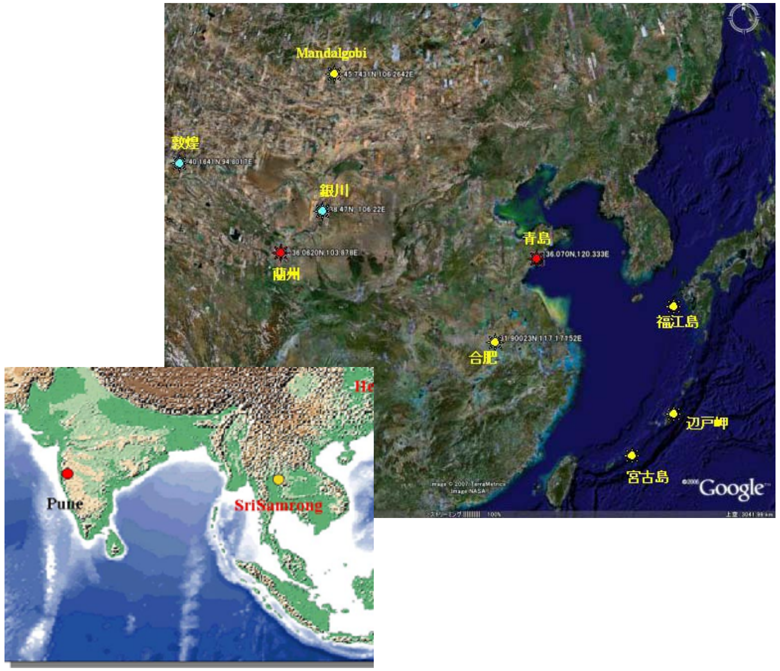
➔ Analysis of physical and chemical parameters of aerosol and cloud.

☆ Validation of satellite products and model input

➔ Comparison of cloud and aerosol products retrieved from satellites with ground-based data, and secondary products such as surface radiative flux/radiation budget deduced using satellite aerosol/cloud parameters.

SKYNET & Other networks

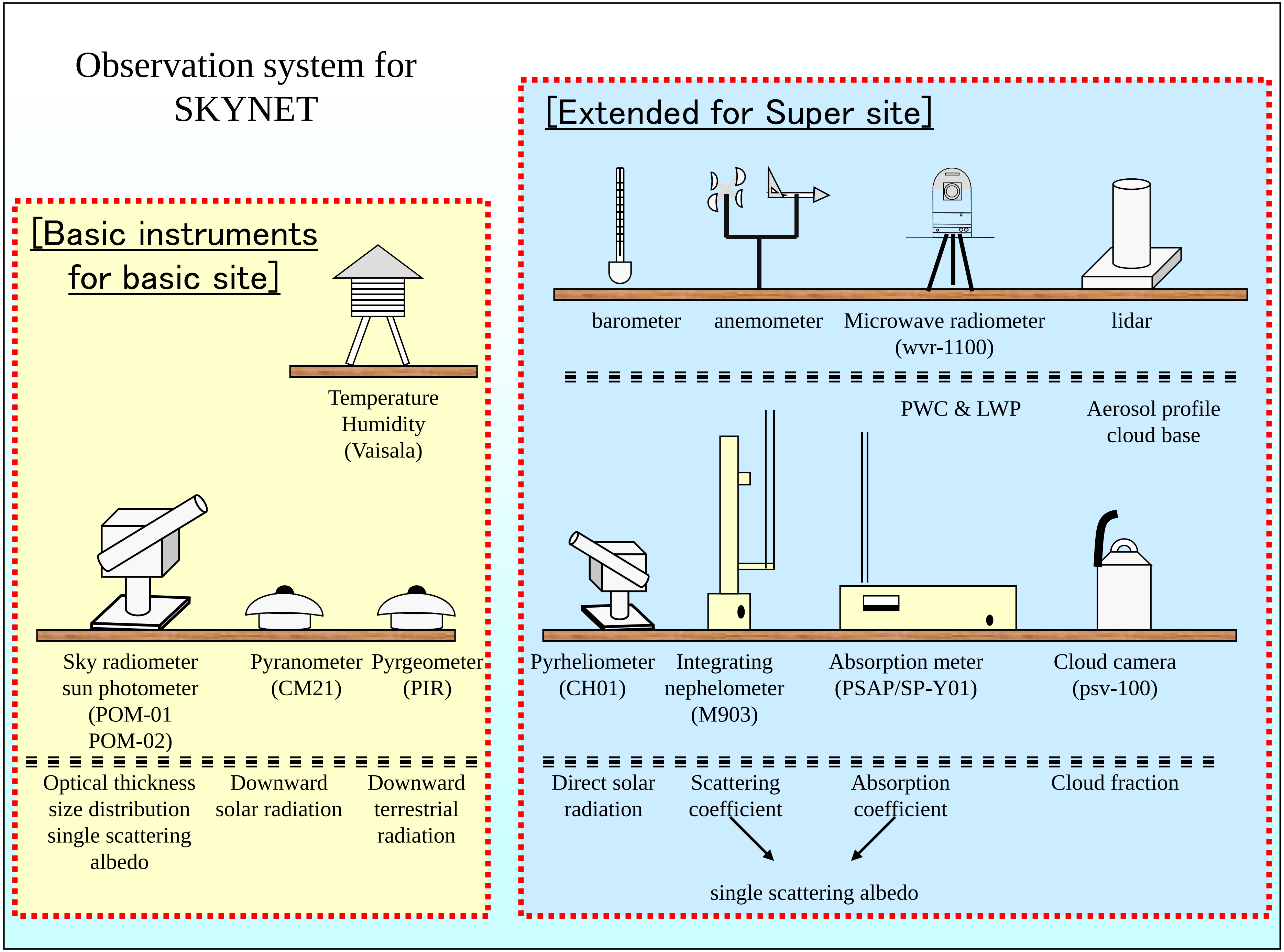
http://atmos.cr.chiba-u.ac.jp/



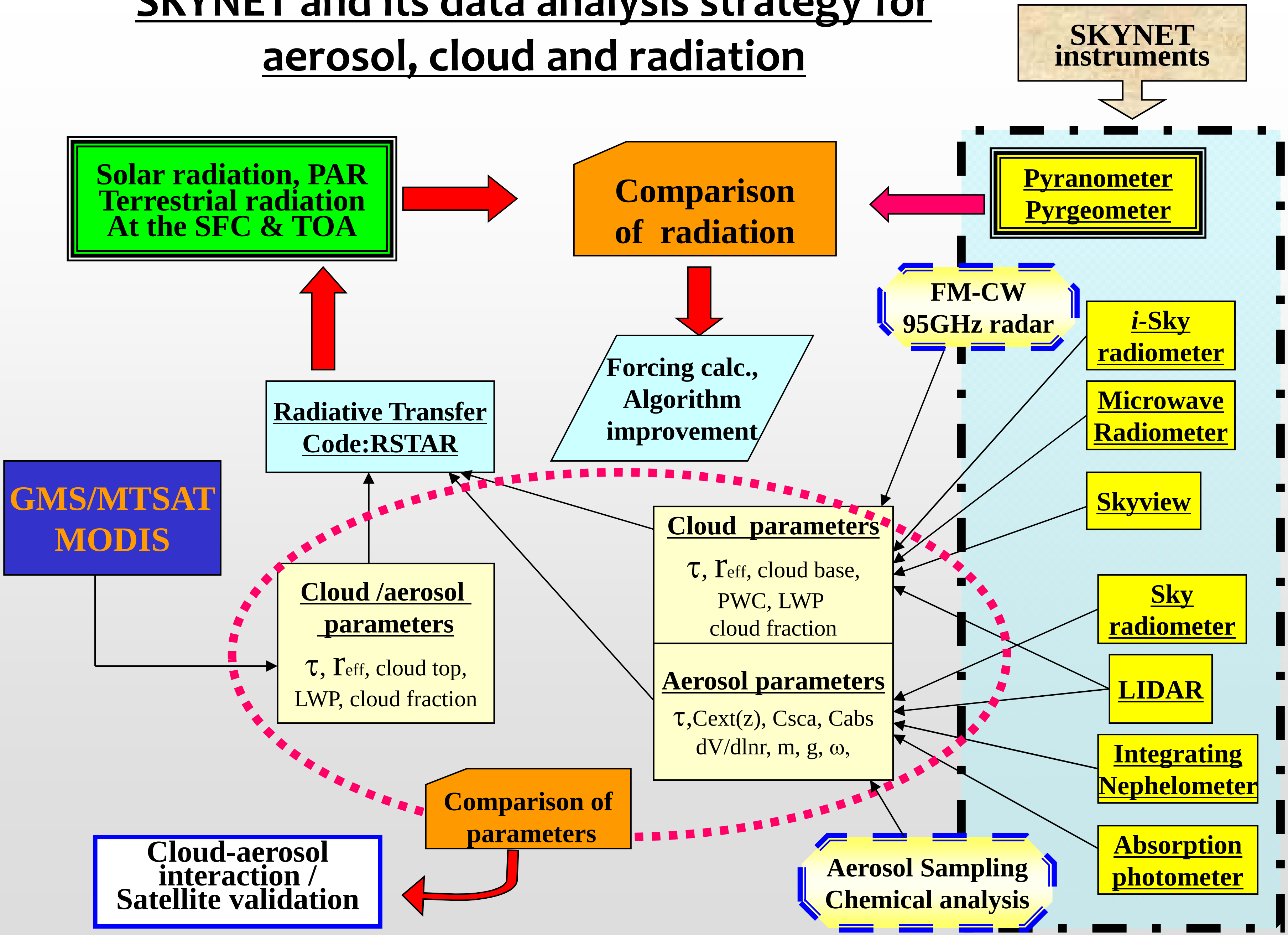
ESR: EUROPEAN SKYRAD USERS' NETWORK

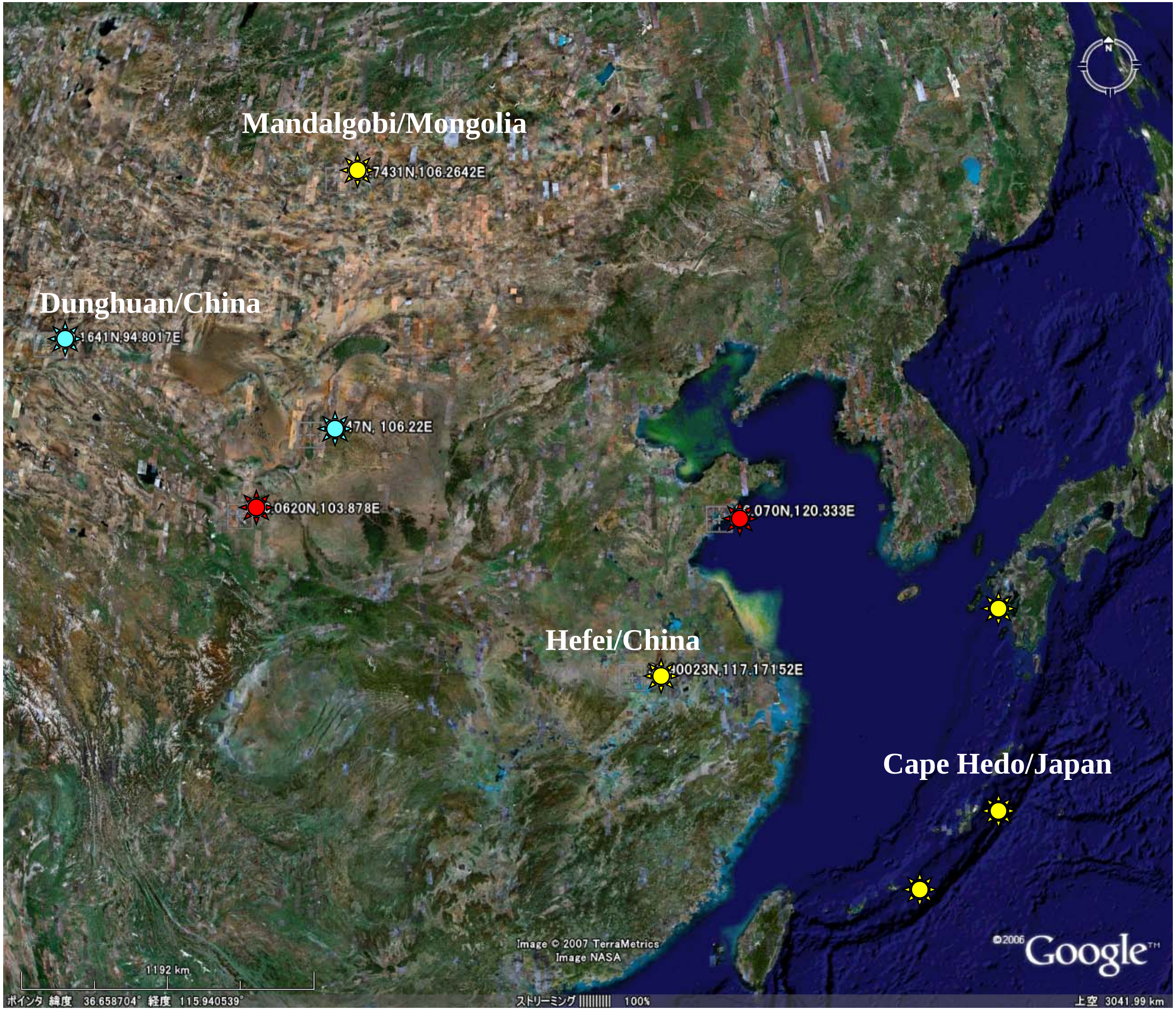
Present sites registered in the SKYNET data center of Chiba Univ.

	Site	Responsible Institute	status	Data transfer
Japan	Moshiri(母子里)	GOSAT/NIES	Pause	ON
	Sendai(仙台)	Tohoku U	Running	ON
	Tsukuba(筑波)	MRI	Running	NA
	Tokyo(東京)	Tokyo Marine U	Running	ON
	Chiba(千葉)	Chiba U	Running	ON
	Fuji-hokuroku(富士北)	NIES/AIST		ON
	Noto(能登)	Kinki U	NA	NA
	Fukue-jima(福江島)	Chiba U	Running	ON
	Cape Hedo(辺戸岬)	Chiba U/NIES	Running	ON
	Miyako-jima(宮古島)	MRI	Running	ON
	Marcus(南鳥島)	MRI	Running	OFF
ASIA				
Mongolia	Mandalgobi	MUST	Stop	OFF
Korea	Seoul	SNU		ON
China	Beijing(北京)	IAP/MRI	Running	---
	Quindao(青島)	CMU/MRI	Running	---
	Hefei(合肥)	AIOFM/Chiba-U	Running	---
	Lanzhou(蘭州)	Lanzhou U/Chiba U	Running	---
	Dunhuang(敦煌)	IAP/Chiba-U	Closed	---
	Yinchuan(銀川)	IAP/Chiba-U	Closed	---
Thailand	Phimai	Chulalongkorn U	Running	ON
	Sri Samrong	Chulalongkorn U	Closed	---
India	Pune	IITM		OFF
Nepal	Kathmandu	Kathomanzu Univ	NA	NA
EUROPE				
Italy	Rome	ISAC CNR	Running	ON
	Bologna	ISAC CNR	Running	ON
France	Olreans	GOSAT/NIES	Running	ON
New Zealand	Lauder	GOSAT/NIES	Running	ON


Observation system for SKYNET
[Basic instruments for basic site]
Temperature
Humidity
(Vaisala)
Sky radiometer
sun photometer
(POM-01
POM-02)
Pyranometer
(CM21)
Pyrgeometer
(PIR)
Optical thickness
size distribution
single scattering
albedo
Downward
solar radiation
Downward
terrestrial
radiation
[Extended for Super site]
barometer
anemometer
Microwave radiometer
(wvr-1100)
lidar
PWC & LWP
Aerosol profile
cloud base
Pyrheliometer
(CH01)
Integrating
nephelometer
(M903)
Absorption meter
(PSAP/SP-Y01)
Cloud camera
(psv-100)
Direct solar
radiation
Scattering
coefficient
Absorption
coefficient
Cloud fraction
single scattering albedo

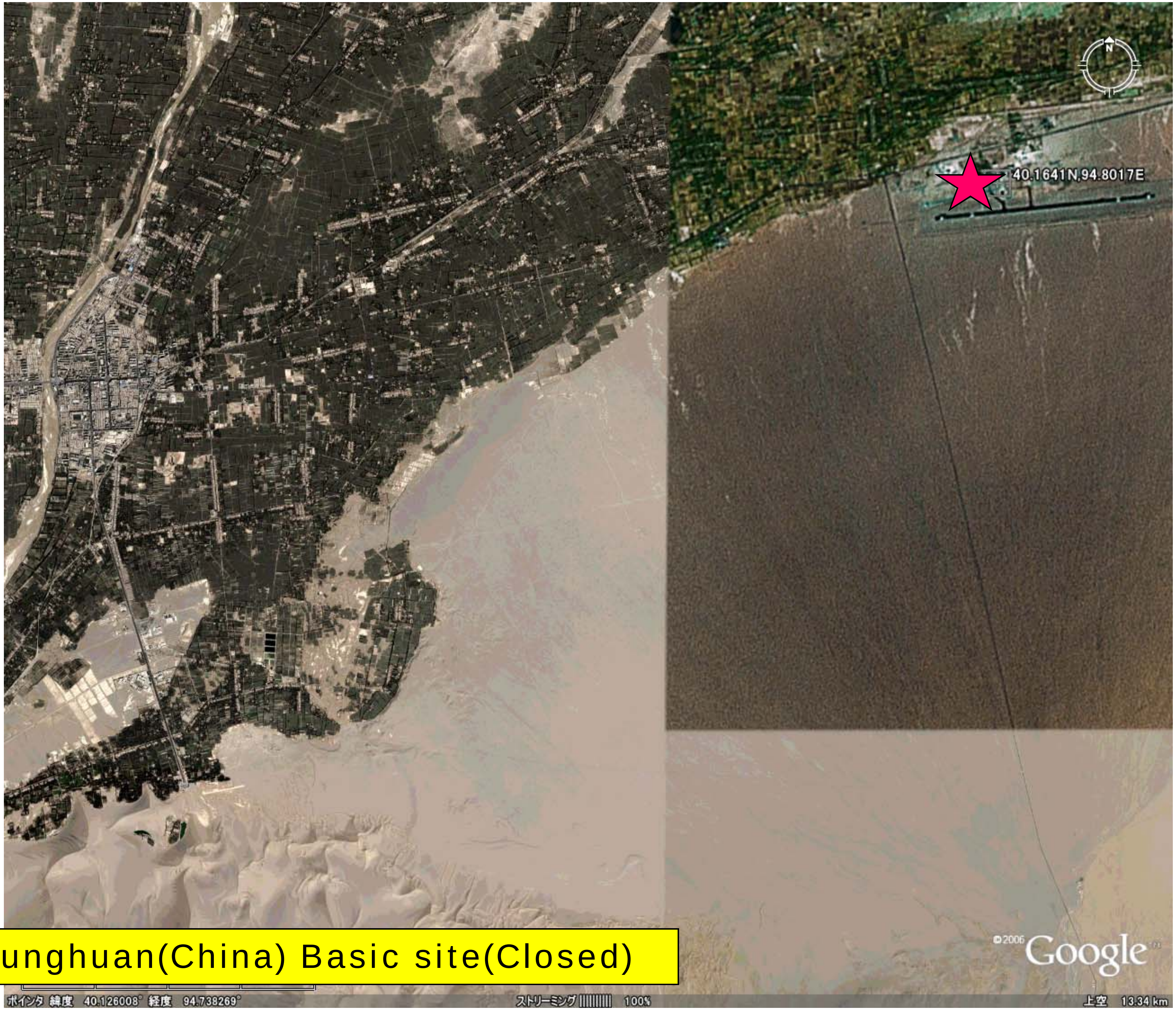
SKYNET and its data analysis strategy for aerosol, cloud and radiation



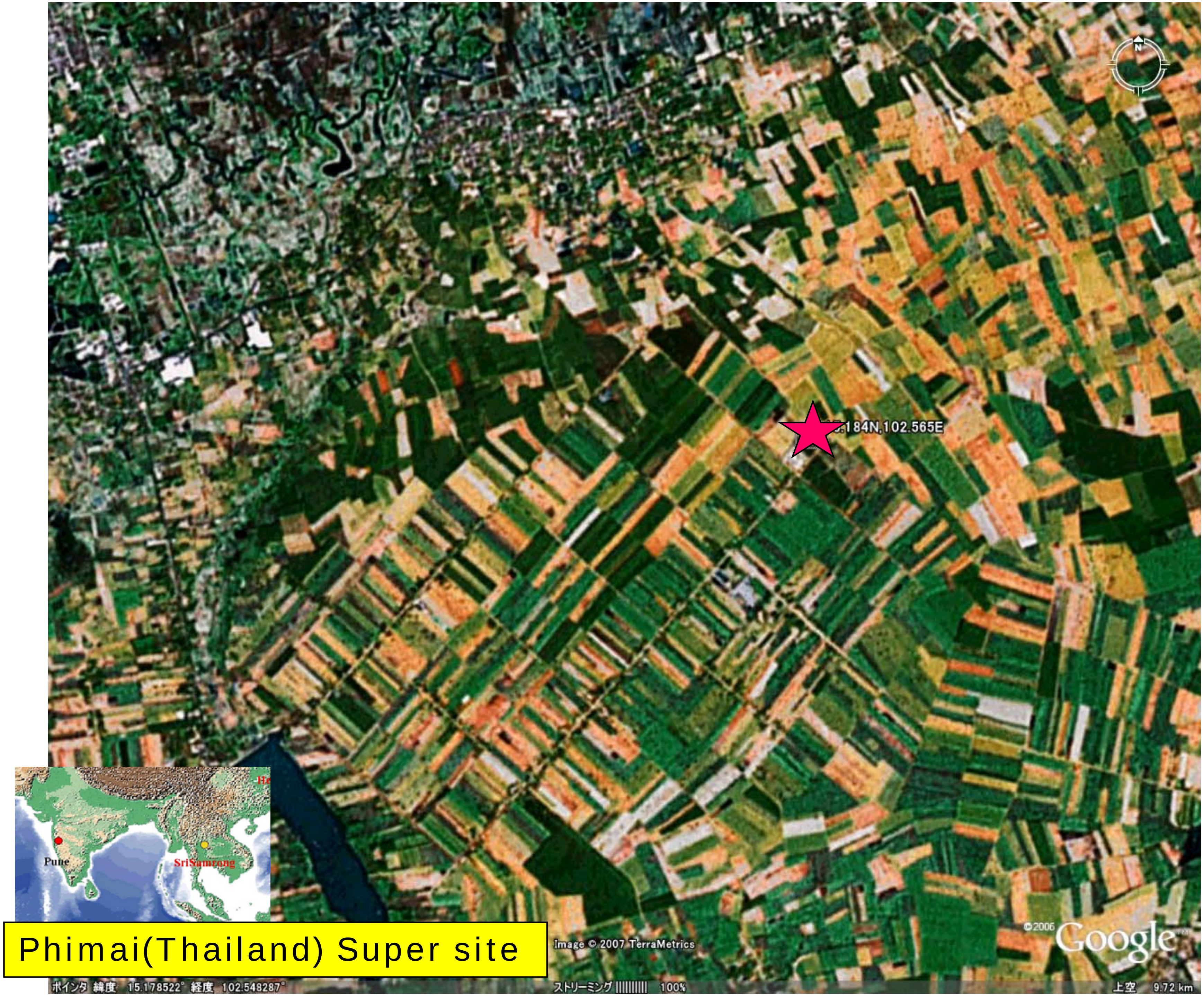


Mandalgobi/Mongolia
7431N,106.2642E
Dunghuan/China
1641N,94.8017E
7N, 106.22E
0620N,103.878E
070N,120.333E
Hefei/China
40023N,117.17152E
Cape Hedo/Japan
Image © 2007 TerraMetrics
Image NASA
©2006 Google™
1192 km
ポインタ 緯度 36.658704° 経度 115.940539°
ストリーミング |||||||||| 100%
上空 3041.99 km

Mandalgovi(Mongolia) Basic site

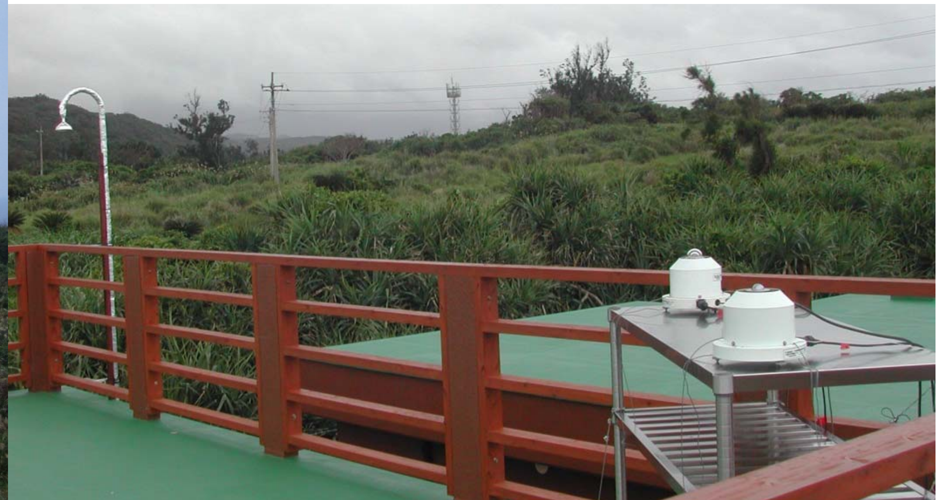


Dunghuan(China) Basic site(Closed)

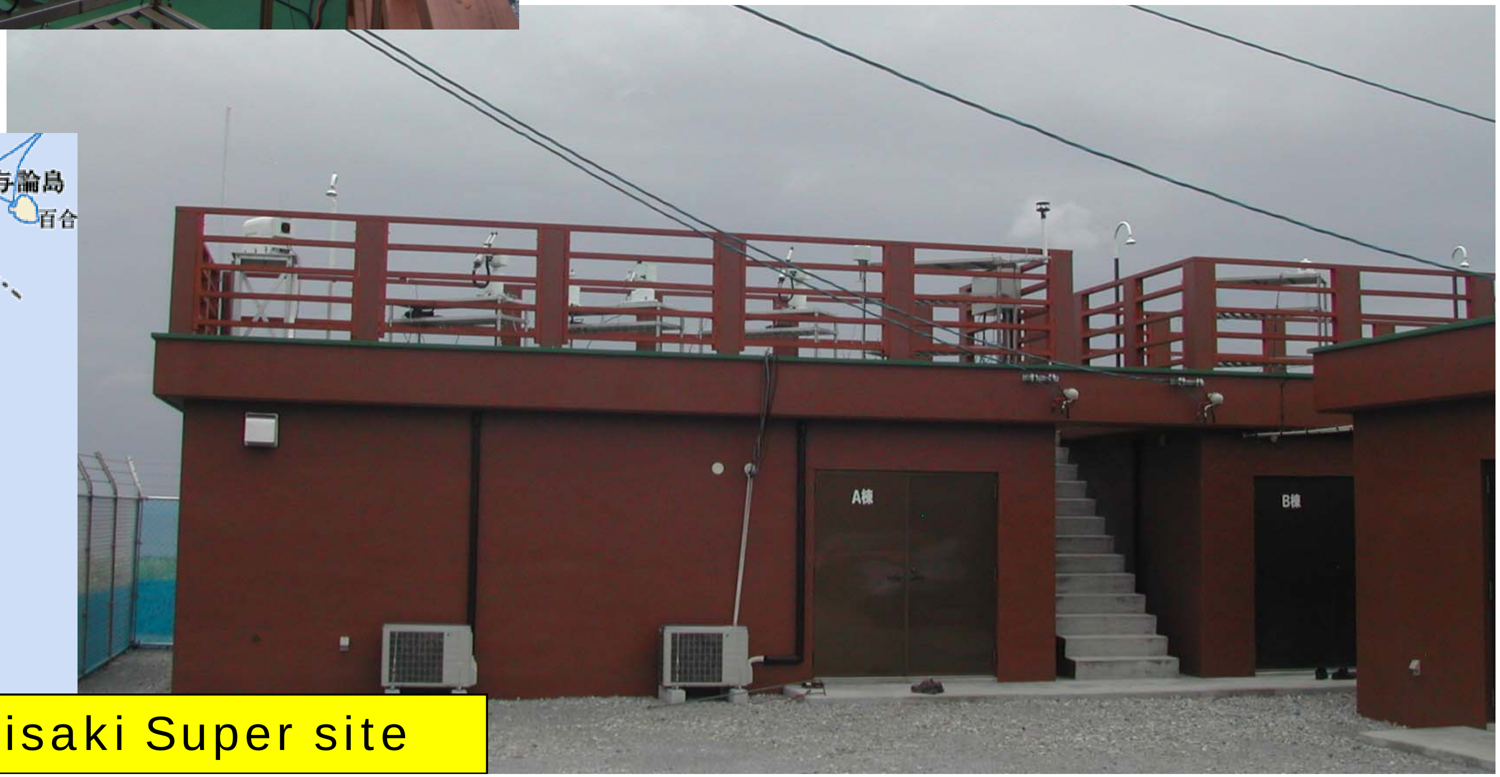


Phimai(Thailand) Super site

(To northwest)



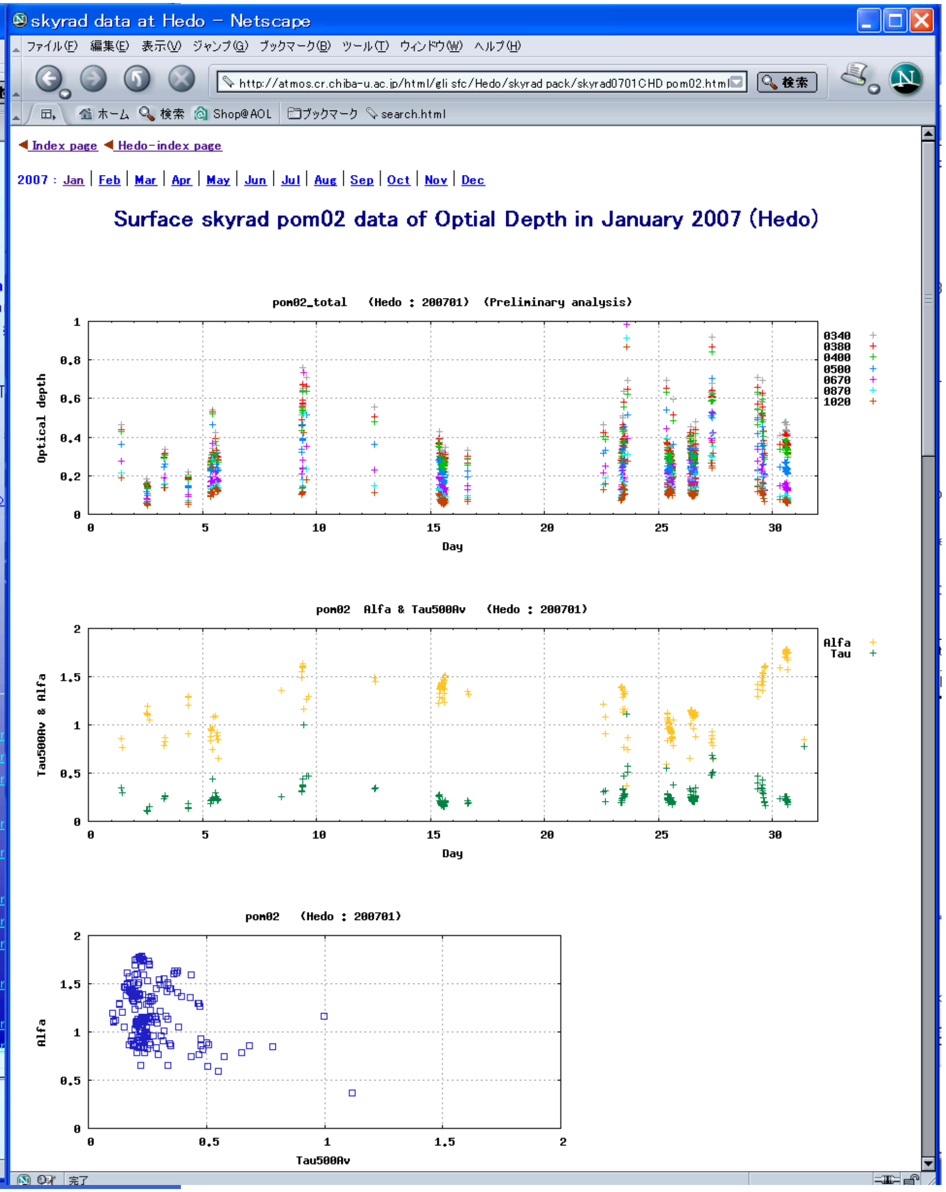
(To south)



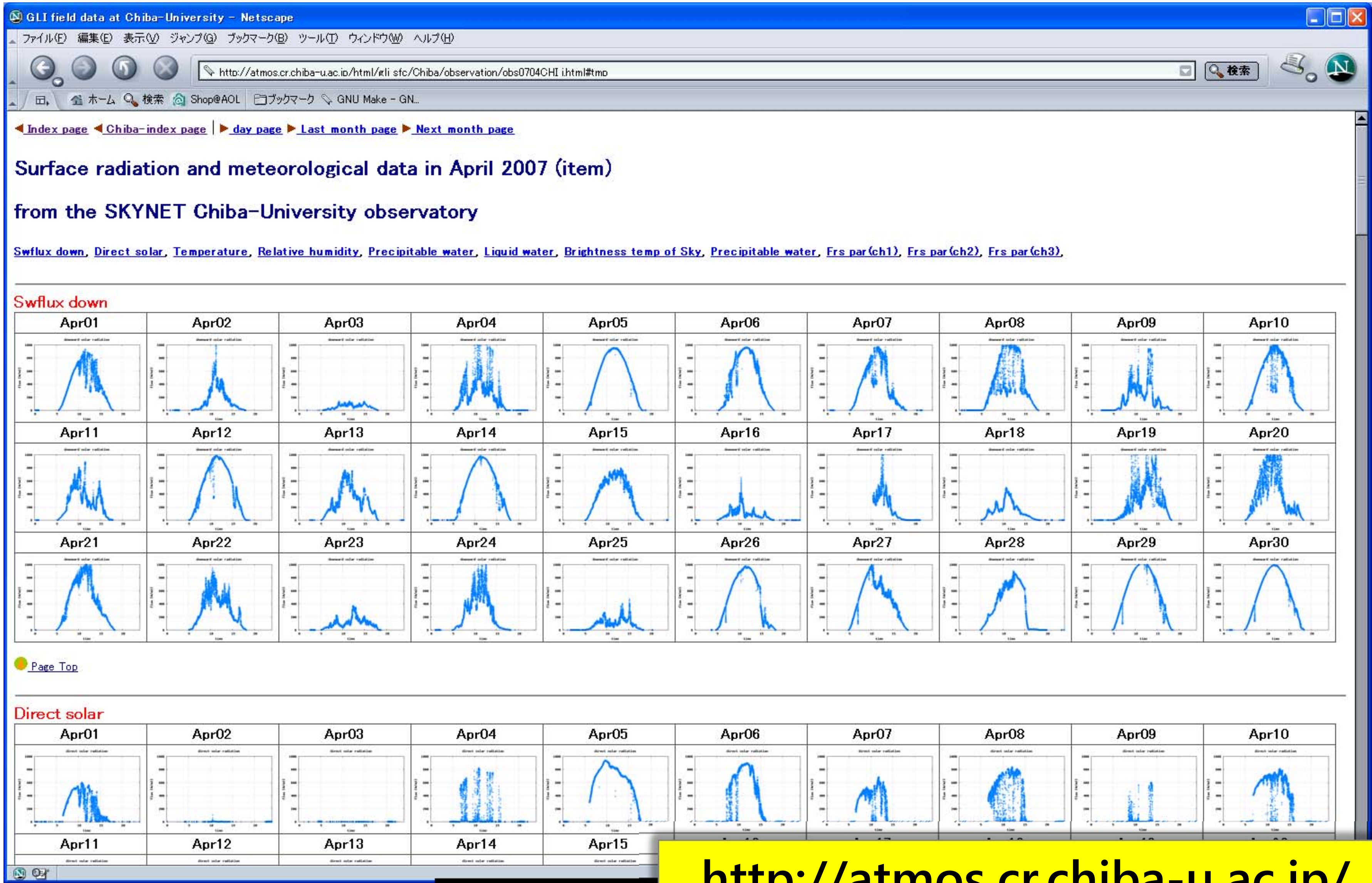
Hedo-misaki Super site

Homepage of SKYNET

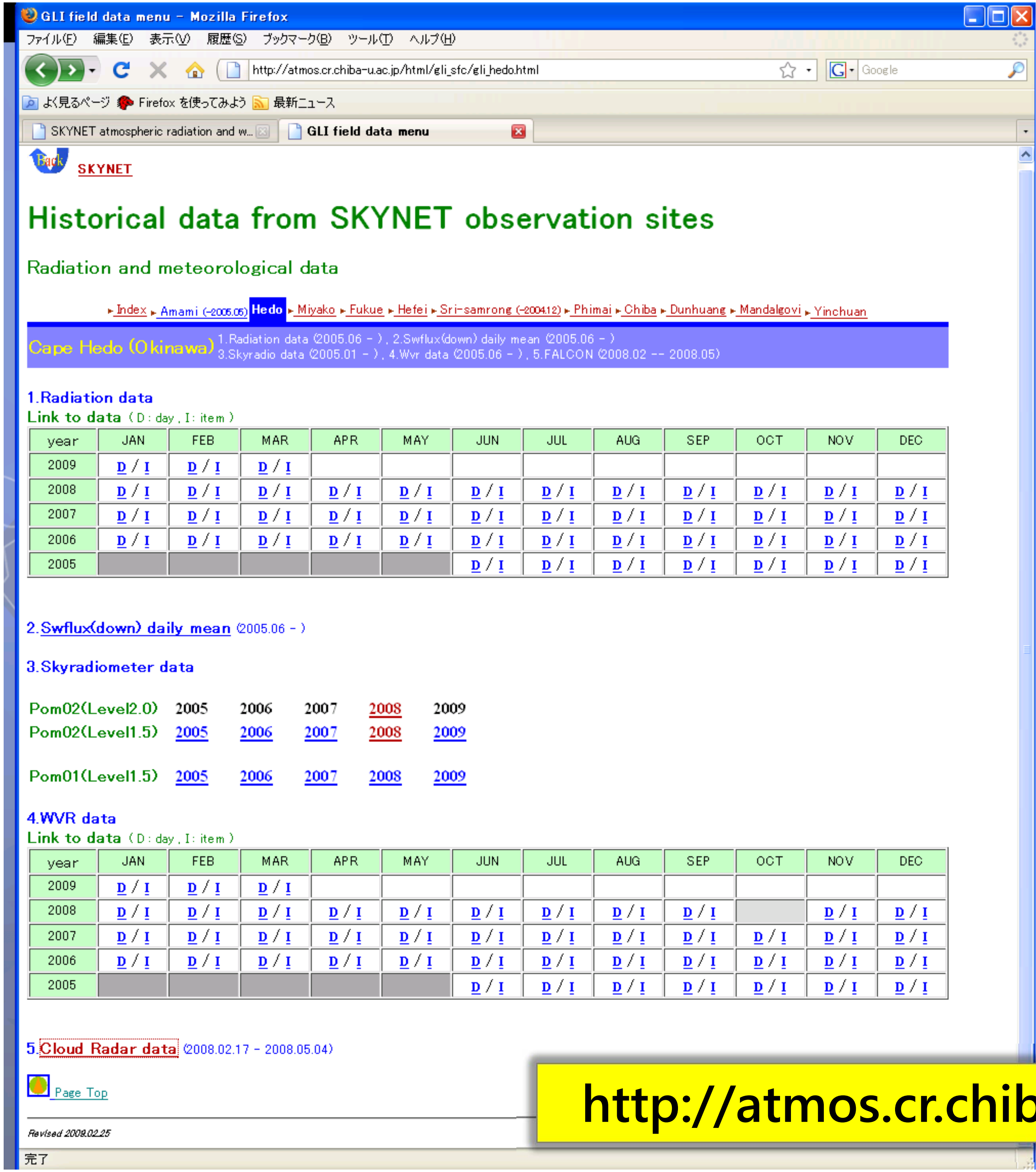
http://atmos.cr.chiba-u.ac.jp/



Quick view in SKYNET Web



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


GLI field data menu - Mozilla Firefox

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SKYNET atmospheric radiation and w... | GLI field data menu

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Historical data from SKYNET observation sites

Radiation and meteorological data

▸ Index ▸ Amami (-2005.05) Hedo ▸ Miyako ▸ Fukue ▸ Hefei ▸ Sri-samrong (-2004.12) ▸ Phimai ▸ Chiba ▸ Dunhuang ▸ Mandalgovi ▸ Yinchuan

Cape Hedo (Okinawa) 1.Radiation data (2005.06 -), 2.Swflux(down) daily mean (2005.06 -) 3.Skyradio data (2005.01 -), 4.Wvr data (2005.06 -), 5.FALCON (2008.02 -- 2008.05)

1.Radiation data

Link to data (D : day , I : item)

year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2009	D / I	D / I	D / I									
2008	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I
2007	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I
2006	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I
2005						D / I	D / I	D / I	D / I	D / I	D / I	D / I

2.Swflux(down) daily mean (2005.06 -)

3.Skyradiometer data

Pom02(Level2.0)	2005	2006	2007	2008	2009
Pom02(Level1.5)	2005	2006	2007	2008	2009
Pom01(Level1.5)	2005	2006	2007	2008	2009

4.WVR data

Link to data (D : day , I : item)

year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2009	D / I	D / I	D / I									
2008	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I		D / I	D / I
2007	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I
2006	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I	D / I
2005						D / I	D / I	D / I	D / I	D / I	D / I	D / I

5.Cloud Radar data (2008.02.17 - 2008.05.04)

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Revised 2008.02.25

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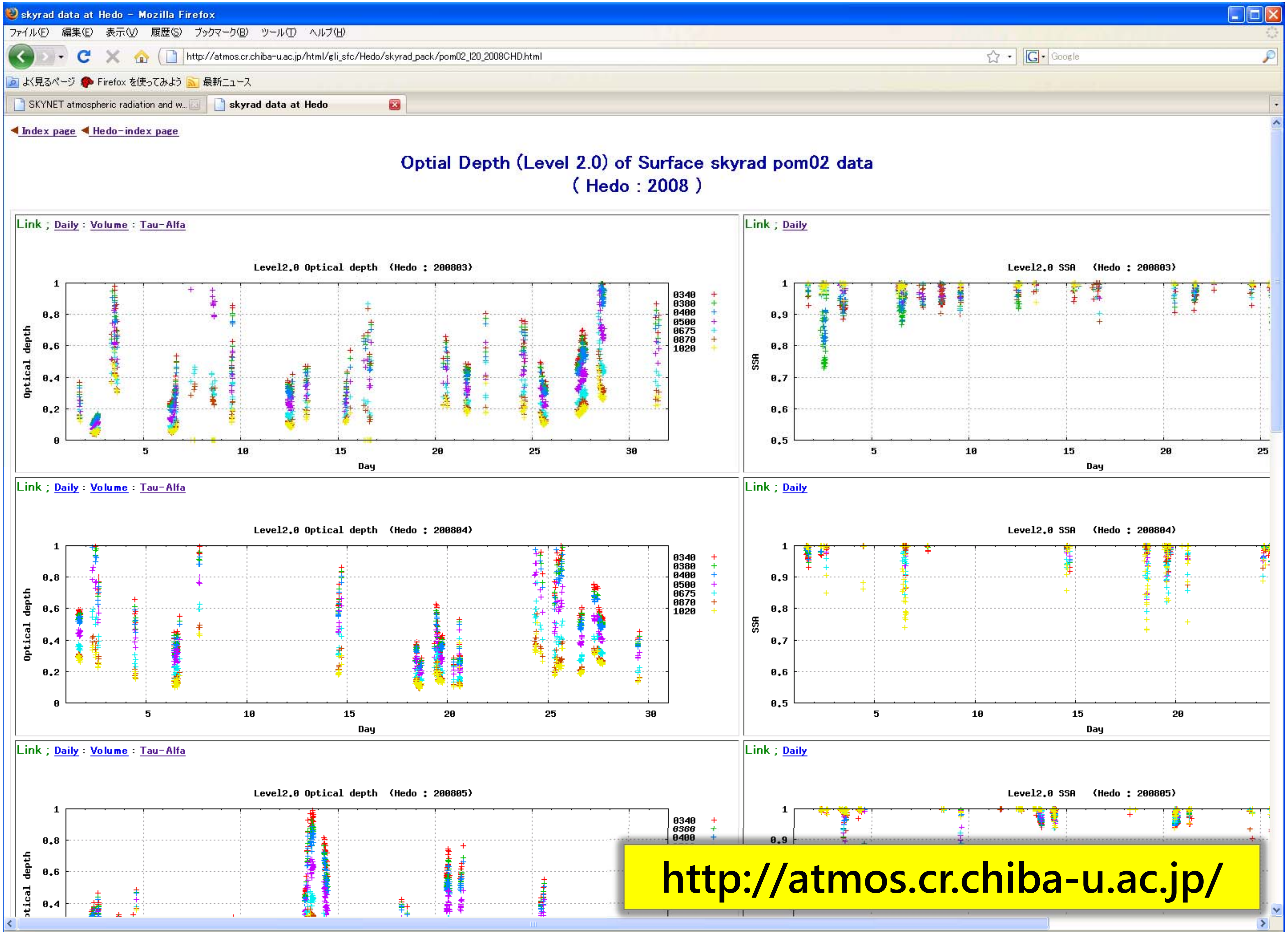

skyrad data at Hedo - Mozilla Firefox
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skyrad data at Hedo
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Hedo-index page
Optial Depth (Level 2.0) of Surface skyrad pom02 data
(Hedo : 2008)
Link ; Daily : Volume : Tau-Alfa
Level2.0 Optical depth (Hedo : 200803)
Optical depth
Day
0340
0380
0400
0500
0675
0870
1020
Link ; Daily
Level2.0 SSA (Hedo : 200803)
SSA
Day
Link ; Daily : Volume : Tau-Alfa
Level2.0 Optical depth (Hedo : 200804)
Optical depth
Day
Link ; Daily
Level2.0 SSA (Hedo : 200804)
SSA
Day
Link ; Daily : Volume : Tau-Alfa
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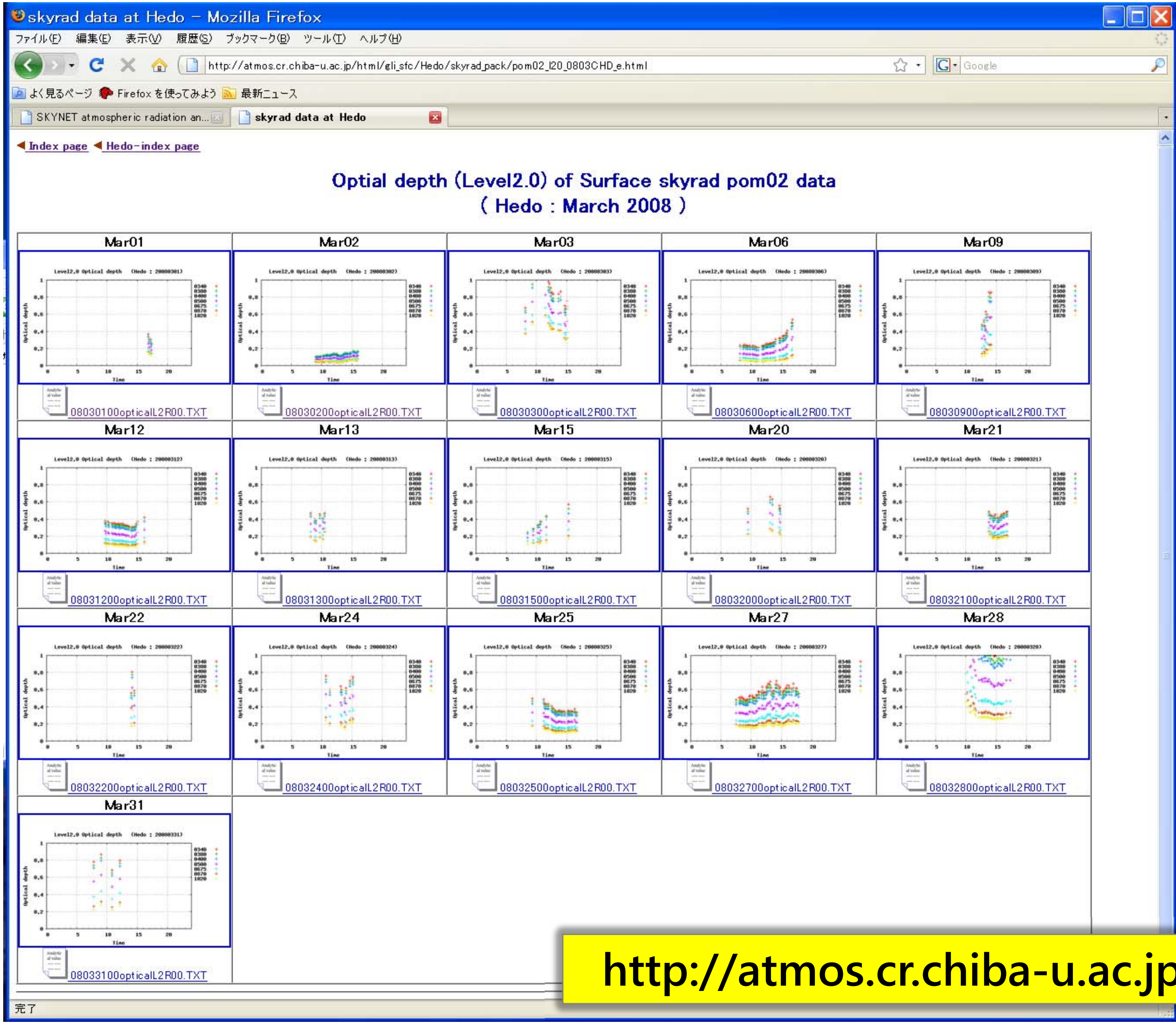

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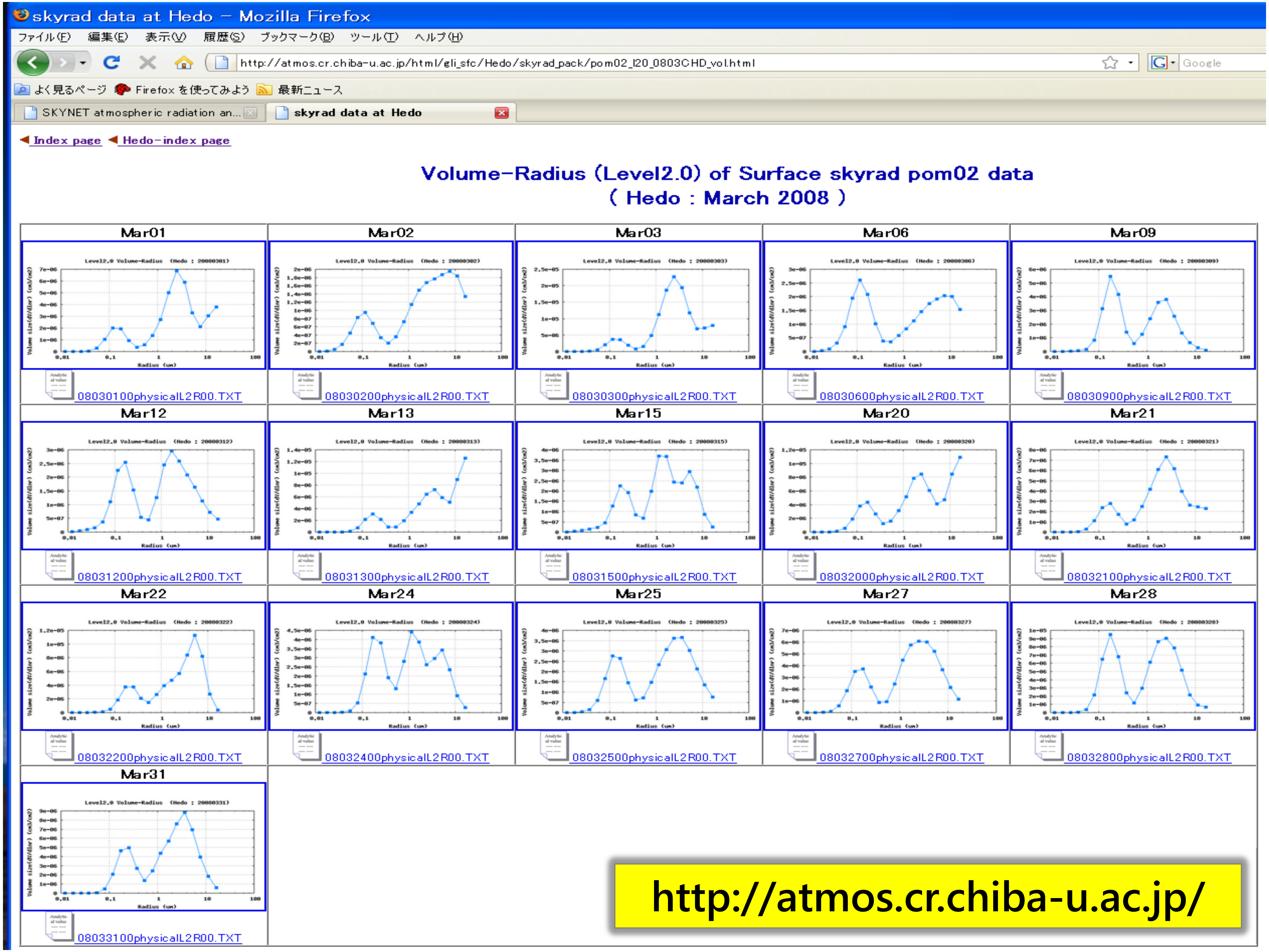
skyrad data at Hedo - Mozilla Firefox
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skyrad data at Hedo
Index page
Hedo-index page
Volume-Radius (Level2.0) of Surface skyrad pom02 data
(Hedo : March 2008)
Mar01
08030100physicalL2R00.TXT
Mar02
08030200physicalL2R00.TXT
Mar03
08030300physicalL2R00.TXT
Mar06
08030600physicalL2R00.TXT
Mar09
08030900physicalL2R00.TXT
Mar12
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Mar13
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Mar15
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Mar20
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Mar27
08032700physicalL2R00.TXT
Mar28
08032800physicalL2R00.TXT
Mar31
08033100physicalL2R00.TXT
http://atmos.cr.chiba-u.ac.jp/

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SKYNET atmospheric radiation an... | http://atmos....icalL2R00.TXT

Aerosol optical thickness, single scattering albedo, and asymmetry parameter measured by Prede sky radiometer(POM-02)

Observation area (Lon., Lat.): "HEDOMISAKI(JWTC)"(128.249E,26.867N)

Serial number of an instrument: "PS1202011"

NOTATIONS:

(1). Softwares

(i) Data analysis software (SKYRAD.pack): version4.2
(ii) Cloud screening software (CSSR) : version1.0
(iii) Gobal irradiance data for cloud screening :Applied (if Level is L2.20), Not applied (if Level is L2.00)
(iv) -999.99: Data not available

Calibration constants: 1.232E-05 2.674E-05 1.227E-04 2.847E-04 3.473E-04 2.260E-04 1.808E-04

Level	Year	Month	Day	Hour(LT)	Jday(UT)	SZA	AOT(0.34 um)	AOT(0.38 um)	AOT(0.4 um)	AOT(0.5 um)	AOT(0.675 um)	AOT(0.87 um)	AOT(1.02 um)	AOT(1.627um)	AOT(2.2um)	Ang. Exp.	Beta(0.5 um)
L2.20	2008	3	12	9.670	72.02792	51.917	0.3777	0.3590	0.3418	0.2592	0.1751	0.1240	0.1125	-999.99	-999.99	1.18794	0.25287
L2.20	2008	3	12	9.830	72.03458	50.041	0.3519	0.3335	0.3123	0.2311	0.1528	0.1094	0.1008	-999.99	-999.99	1.23336	0.22914
L2.20	2008	3	12	10.000	72.04167	48.088	0.3772	0.3544	0.3326	0.2496	0.1678	0.1194	0.1092	-999.99	-999.99	1.21159	0.24669
L2.20	2008	3	12	10.170	72.04875	46.182	0.3697	0.3503	0.3259	0.2422	0.1612	0.1146	0.1057	-999.99	-999.99	1.23261	0.24037
L2.20	2008	3	12	10.330	72.05542	44.437	0.3496	0.3306	0.3081	0.2273	0.1489	0.1068	0.0980	-999.99	-999.99	1.25238	0.22555
L2.20	2008	3	12	10.830	72.07625	39.356	0.3531	0.3373	0.3151	0.2326	0.1557	0.1109	0.1019	-999.99	-999.99	1.22676	0.23141
L2.20	2008	3	12	11.000	72.08333	37.787	0.3423	0.3259	0.3029	0.2230	0.1468	0.1037	0.0956	-999.99	-999.99	1.26022	0.22125
L2.20	2008	3	12	11.170	72.09042	36.317	0.3517	0.3343	0.3115	0.2290	0.1493	0.1058	0.0989	-999.99	-999.99	1.26084	0.22697
L2.20	2008	3	12	11.330	72.09708	35.035	0.3430	0.3252	0.3026	0.2223	0.1461	0.1037	0.0939	-999.99	-999.99	1.27062	0.22063
L2.20	2008	3	12	11.500	72.10417	33.792	0.3346	0.3177	0.2958	0.2178	0.1424	0.1004	0.0932	-999.99	-999.99	1.26576	0.21564
L2.20	2008	3	12	11.670	72.11125	32.688	0.3407	0.3235	0.3003	0.2207	0.1461	0.1030	0.0951	-999.99	-999.99	1.25886	0.21972
L2.20	2008	3	12	11.830	72.11792	31.788	0.3385	0.3234	0.3011	0.2202	0.1437	0.1019	0.0935	-999.99	-999.99	1.27331	0.21844
L2.20	2008	3	12	12.000	72.12500	30.993	0.3488	0.3310	0.3071	0.2261	0.1483	0.1044	0.0950	-999.99	-999.99	1.27764	0.22394
L2.20	2008	3	12	12.170	72.13208	30.378	0.3262	0.3100	0.2873	0.2097	0.1406	0.1003	0.0886	-999.99	-999.99	1.26549	0.21012
L2.20	2008	3	12	12.330	72.13875	29.972	0.3402	0.3231	0.2979	0.2199	0.1445	0.1059	0.0950	-999.99	-999.99	1.24637	0.21949
L2.20	2008	3	12	12.500	72.14583	29.733	0.3423	0.3235	0.2990	0.2204	0.1460	0.1041	0.0916	-999.99	-999.99	1.27603	0.21919
L2.20	2008	3	12	12.670	72.15292	29.696	0.3405	0.3240	0.2991	0.2186	0.1432	0.1014	0.0889	-999.99	-999.99	1.30449	0.21708
L2.20	2008	3	12	12.830	72.15958	29.848	0.3307	0.3150	0.2896	0.2118	0.1388	0.0992	0.0858	-999.99	-999.99	1.30460	0.21067
L2.20	2008	3	12	13.000	72.16667	30.204	0.3271	0.3124	0.2875								28

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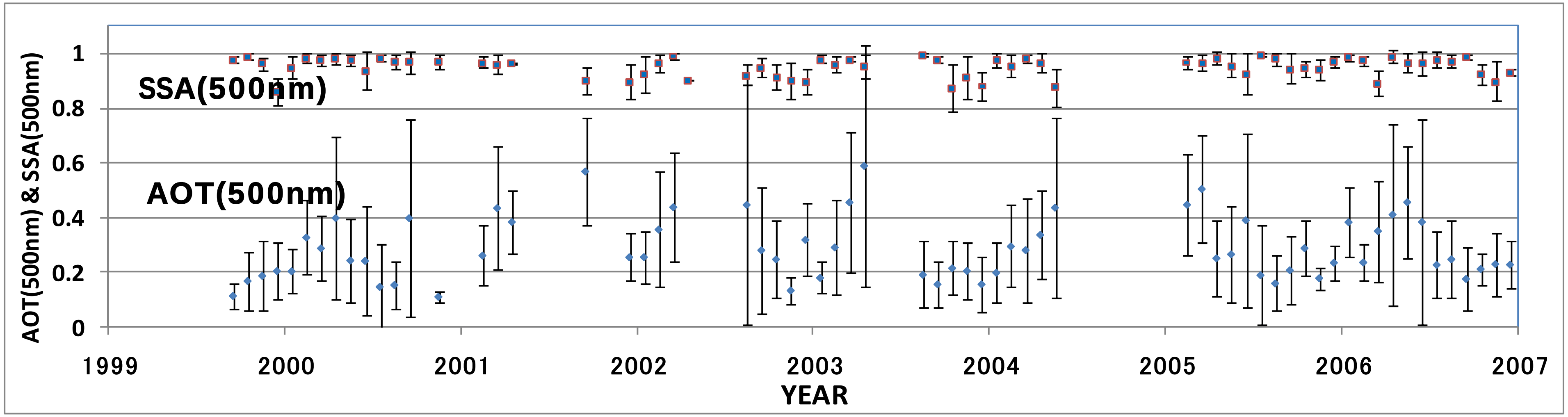
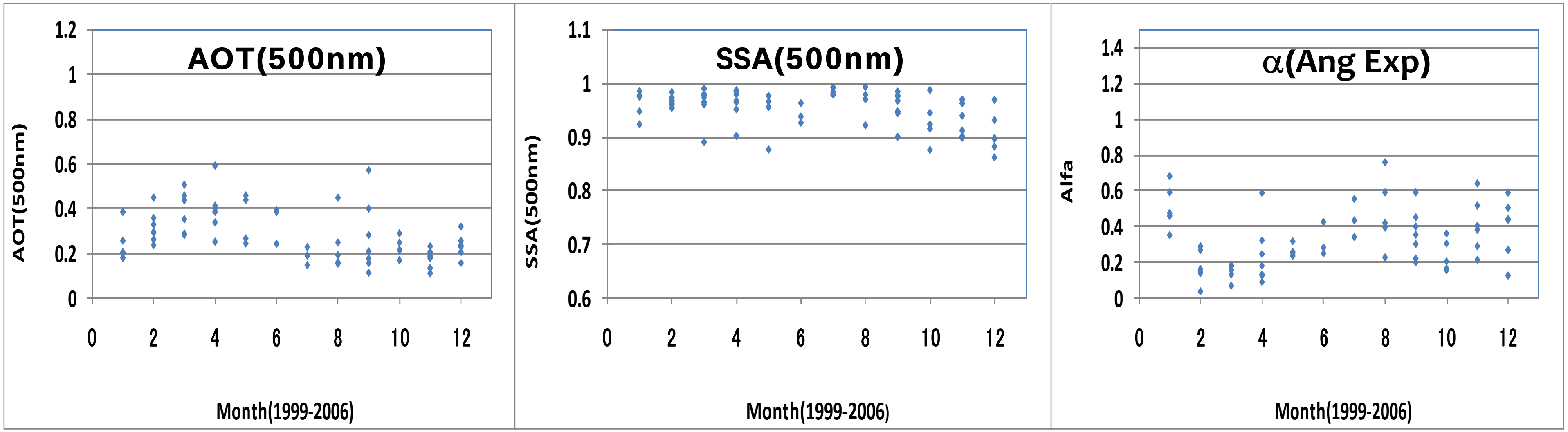
http://atmos.cr.chiba-u.ac.jp/

Monthly mean of aerosol characteristics at SKYNET Dunhuang (China)





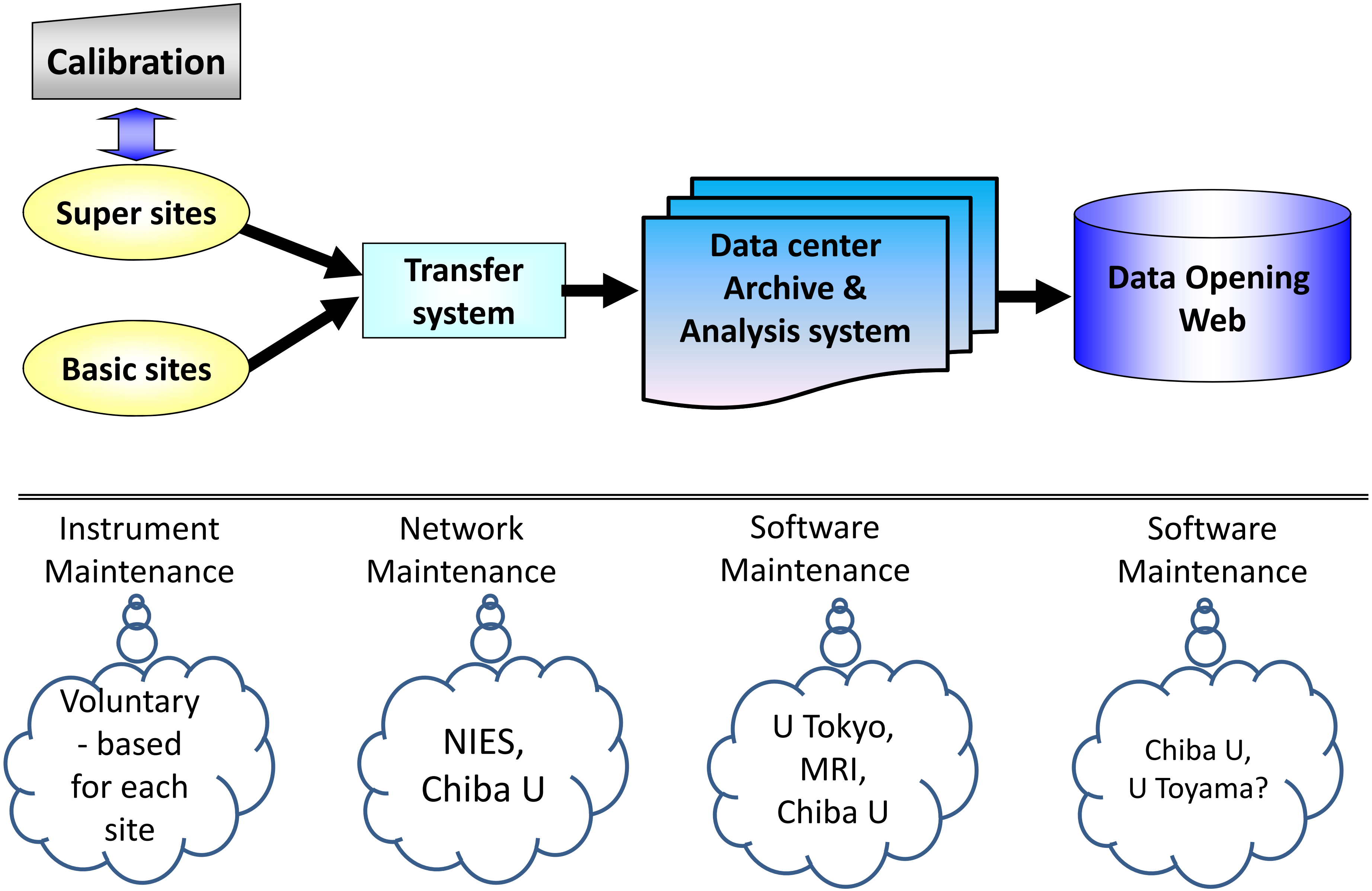
(1) Analysis and opening system(web)

Present status of analysis method

Level	Opening time	SKYRAD.pack
1.0, 1.5	quasi-real time analysis	V4.2
2 & 2.x	Monthly	V4.2
3	Monthly	V5.0* (Under testing)

* V5.0 will be discussed by Ms. Hashimoto/Dr. P. Khatri.

SKYNET data archive/analysis system



Observation for instrument calibration at MRI

(2009年12月～2010年１月）

Comparison of sky radiometers for calibration at MRI

Comparison of radiation instruments for calibration at MRI

Courtesy of Dr. A. Uchiyama(MRI/JMA)

Comparison between Normal Langley (Mauna Loa) and Improved Langley (on-site) calibration constants