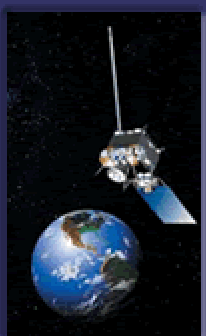
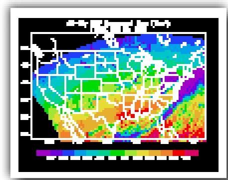


NOTICE: This product has now been terminated. It was superseeded by GSIP V2 in April 2009 .



GOES Surface and Insolation Product (GSIP).Images for every hour of the most recent full day produced from the data in the *Contiguous US* (CONUS) *Geostationary Operational Environmental Satellite* (GOES) *Surface and Insolation Product* (GSIP) was shown at this site. The images were updated every day at 9:30 AM Eastern Standard Time.

The CONUS GSIP product area was bounded by 66^{o}-126^{o}W longitude and 24^{o}-54^{o}N latitude. The CONUS GSIP was comprised of various geophysical parameters. The core parameters included solar irradiance at the top of the atmosphere and at the surface and skin temperature. The parameters were obtained from the radiances observed by the imager/sounder instrument onboard GOES East (currently GOES-12). Details are provided under "PROJECT" on the left.

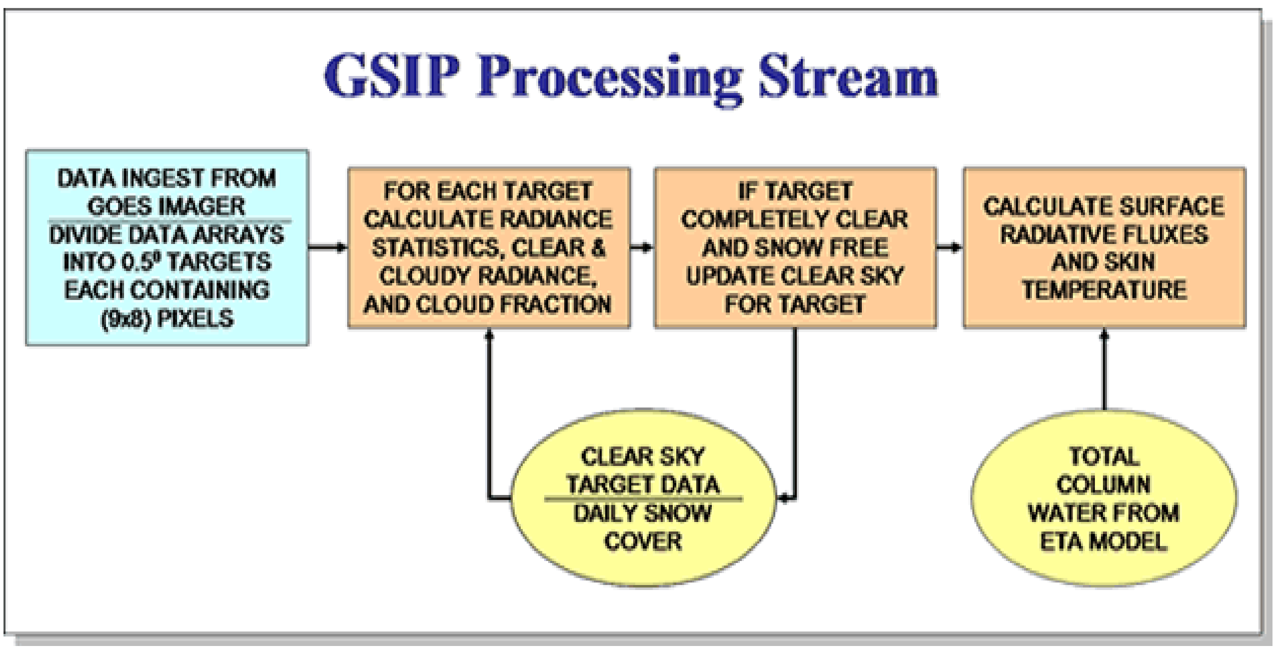
The complete set of parameters for the last six days were accessable from the NESDIS ftp site. Selected parameters can also be downloaded from an ftp site at the Department of Meteorology, University of Maryland at College Park. Details are provided under "DATA" on the left.

The GSIP estimates of the surface insolation were routinely compared with ground observations from the SURFRAD network. These comparisons can be viewed by following the links provided in "LINKS" on the left.

PROJECT

The primary goal of the GOES Surface and Insolation Product (GSIP) project is to provide realtime surface insolation and surface temperature fields for the continental United States (CONUS) in support of the World Climate Research Program (WCRP) GEWEX Continental-scale International Project (GCIP) and the GEWEX Americas Prediction Project (GAPP). The product is obtained from measurements taken by instruments onboard the Geostationary Operational Environmental Satellite (GOES) operated by the National Oceanic and Atmospheric Administration (NOAA). Surface insolation is estimated from the visible-channel data by an algorithm developed at the Department of Meteorology, University of Maryland (UMD). Atmospheric and surface input parameters are produced and provided by the NOAA/National Centers for Environmental Prediction (NCEP). Data processing and cloud detection was developed at the NOAA National Environmental Satellite Data and Information Service (NESDIS), Office of Research and Applications (ORA).

Data collection at NESDIS begun in early 1995. After extensive development and testing the product became operational in July 2000.



References:

Pinker, R. T., J. D. Tarpley, I. Laszlo, et al., 2003: Surface radiation budgets in support of the GEWEX Continental-Scale International Project (GCIP) and the GEWEX Americas Prediction Project (GAPP), including the North American Land Data Assimilation System (NLDAS) Project, *J. Geophys. Res.*, **108** (D22): Art. No. 8844, NOV 19 2003.

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Pinker, R. T., I. Laszlo, and J. D. Tarpley, 2000: Geostationary satellite products for surface energy balance models, COSPAR 2000, 16-23, July, Warsaw, Poland.

Pinker R. T., J. D. Tarpley, I. Laszlo, and K. Mitchell, High resolution shortwave radiation budgets from GOES satellites in support o modeling the hydrological cycle in GCIP: Current status and future plans, *The Third International Scientific Conference on Global Energy and Water Cycle*, Beijing, China, 16-19 June 1999.

Pinker, R. T., I. Laszlo, Q-H. Li, and J. D. Tarpley, 1997: GCIP GOES shortwave radiation budget, 13th Conference on Hydrology, 77th AMS Annual Meeting, 2-7 February 1997, Long Beach CA, USA.

Pinker, R. T., I. Laszlo, Y. Wang, and J. D. Tarpley, 1996: GCIP GOES-8 shortwave radiation budgets: Validation activity, Second International Scientific Conference on the Global Energy and Water Cycle, 17-21 June 1996, Washington, DC, USA, Preprint volume, 245-249.

DATA

GSIP data can be accessed at the following sites:

NOAA/NESDIS site

The instantaneous GSIP data can be downloaded from the directory **/pub/gsip** at the NOAA/NESDIS ftp site at **140.90.195.61**. Access to this ftp site can be obtained by sending a request to the NOAA/NESDIS Office of Satellite Data Processing and Distribution (OSDPD) Satellite Services Division (SSD). Contact: *Richard Garey, E/SP22, Room 607, WWBG, 5200 Auth Road, Camp Springs, MD 20746-430, voice: 301 763 8142, x130, fax: 301 899 9196, e-mail: Richard.Garey@noaa.gov*. Dowload the request form (MS Word document) from here.

There are two types of files in the directory /pub/gsip:

- data for a particular observation time, **HRyydddhh.Z** and
- data for a day, **Dyyddd.Z**. This file contains all HR* files for a day.

yy: two-digit year (e.g.: 2005 is 05)
ddd: day of year (range: 1-365/366)
hh: nominal hour of satellite observation (UTC)

The UNIX compressed files contain little-endian binary data. For every observation time 71 parameters are reported. A complete list of these parameters along with an example Fortran code for reading the files is found here.

The HR* and D* files are kept at this site for the last 5-6 days.

GCIP/GAPP site at the Department of Meteorology, UMD, College Park

Instantaneous, hourly, daily, and monthly averages of selected parameters:

- surface downward shortwave radiation,
- surface downward photosynthetically active radiation (PAR),
- top of atmosphere downward shortwave radiation,
- top of atmosphere upward shortwave radiation,
- cloud cover fraction, and
- surface skin temperature

can be downloaded from the GCIP/GAPP website at the Department of Meteorology, University of Maryland at College Park.

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LINKS

This page provides links to web sites that show comparisons of GSIP estimates with data from other sources.

GOES East SRB Verification site at EMC/NCEP/NOAA

Provides comparison of hourly values of surface downward flux from GSIP with ground measurements at seven SURFRAD sites.

URL: http://www.emc.ncep.noaa.gov/mmb/gldas/goes/index.html

Evaluation of AGRMET, GOES, and EDAS surface insolation

Provides comparison plots of daily and monthly diurnal cycles of surface downward flux estimated from various sources (including GCIP) with ground observations.

URL: http://www.emc.ncep.noaa.gov/mmb/gldas/agrmet/evaluation.html

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GCIP/GAPP site at the Department of Meteorology, UMD, College Park

Provides comparison of satellite-derived hourly values of downward fluxes with ground measurements at the surface at six SURFRAD sites on daily and monthly time scales. Historic validation of the insolation is also presented.

URL: http://www.atmos.umd.edu/~srb/gcip/validat.htm

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GOES Surface and Insolation Product (GSIP)

Contacts

Istvan Laszlo (Istvan.Laszlo@noaa.gov): For questions related to the insolation product and to this web site

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GOES Surface and Insolation Product (GSIP)

Credits

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- The animation of images uses AniS, a Java applet Copyright(©) 1999-2004 by Tom Whittaker.
- The image (an artist conception of GOES) appearing in the navigation bar on the left of the main page is by Allan Kung. It was taken from the GOES DataBook "GOES-NO/P/Q - The Next Generation" available from NASA/GSFC.

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Images and Data

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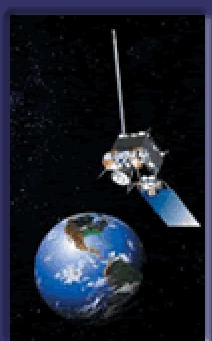

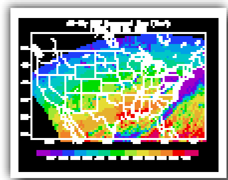

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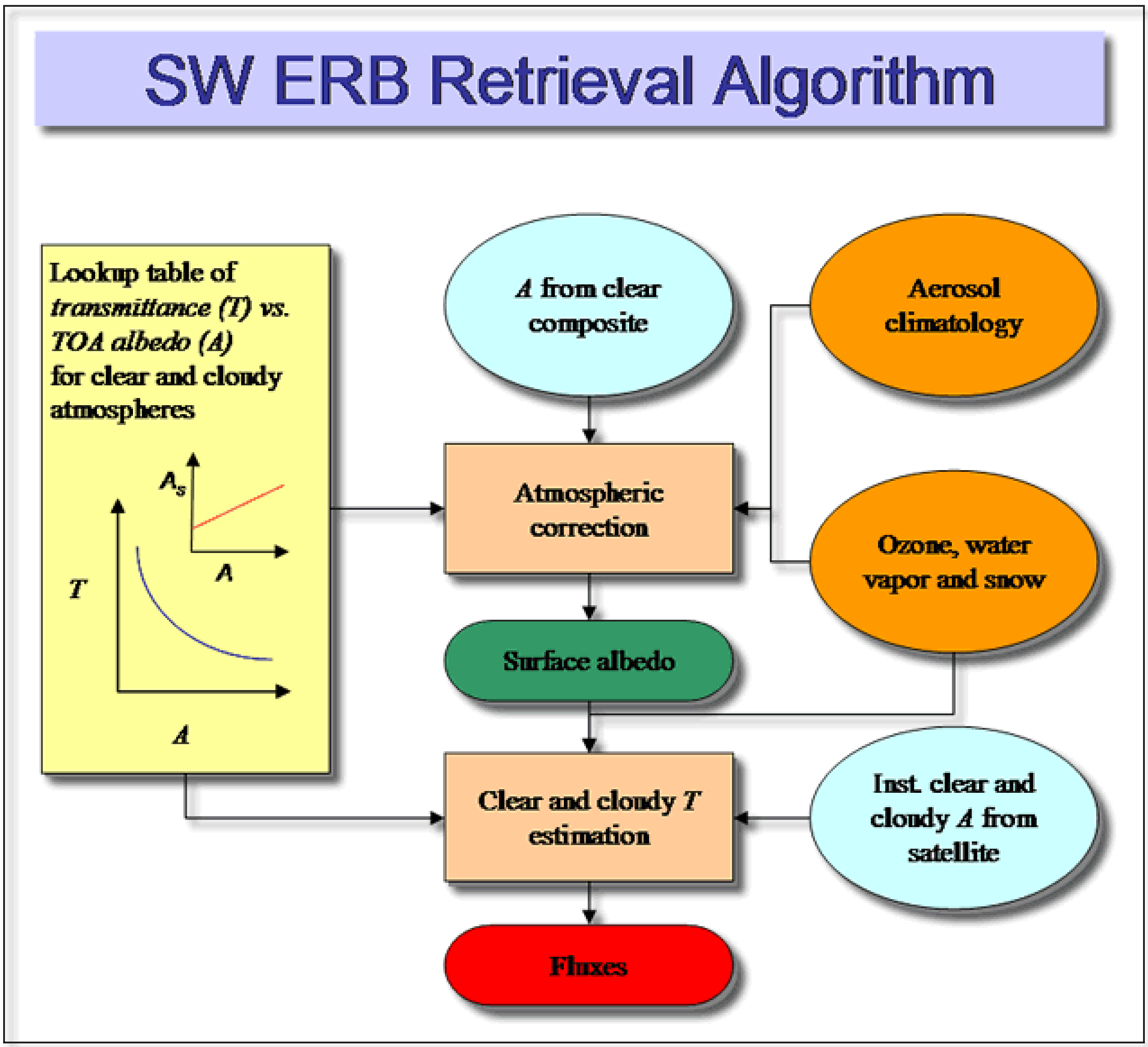
Insolation Algorithm

The algorithm used for estimating the surface insolation is a modified version of the GEWEX Shortwave Radiation Budget (SRB) algorithm [Pinker and Laszlo, 1992, Pinker et al., 1995]. The algorithm uses satellite-derived top-of-atmosphere (TOA) albedo derived separately from clear and cloudy visible radiances, along with ancillary data on column amount of water vapor and ozone, and snow cover fraction to estimate clear and cloudy fluxes. These fluxes are derived by comparing the satellite-derived TOA clear-sky and cloudy-sky albedos with corresponding albedos calculated from data in look-up tables. The look-up tables are constructed from the results of radiative transfer calculations and include surface fluxes and corresponding TOA albedos for a set of atmospheric conditions and for non-reflecting surface. In the retrieval, first the surface albedo is estimated from a composite of the satellite-derived clear TOA albedos. Next, the albedo vs. flux data stored in the look-up tables are updated to include surface reflection and to actual amounts of water vapor and ozone. Finally, fluxes from the updated albedo-flux data best matching the satellite-derived TOA albedos are selected. All-sky flux is calculated by weighting the clear and cloudy fluxes by the cloud fraction derived from the cloud detection module.



References:

Pinker, R. T., and I. Laszlo, 1992: Modeling surface solar irradiance for satellite applications on a global scale, *J. Appl. Meteor.* **31**, 192-211.

Pinker, R. T., I. Laszlo, C. H. Whitlock, and T. P. Charlock, 1995: Radiative flux opens new window on climate research, *EOS*, 76, No. **15**.

Back to PROJECT

Contents of GSIP files

Index	*Description*	*Unit*
1	latitude of target center	Deg
2	mean albedo of channel 1	%
3	longitude of target center	Deg
4	mean temperature of channel 2	K
5	year (yy) and day of year (ddd)	yyddd(1)
6	UTC time	hhmmss
7	mean temperature of channel 3	K
8	mean temperature of channel 4	K
9	skin temperature	K
10	mean temperature of channel 5	K
11	outgoing longwave radiation	W/m^2
12	channel 1 radiance	rdu1(2)
13	channel 2 radiance	rdu2(3)
14	channel 3 radiance	rdu2(3)
15	channel 4 radiance	rdu2(3)
16	channel 5 radiance	rdu2(3)
17	mean clear visible radiance	rdu1(2)
18	mean cloudy visible radiance	rdu1(2)
19	clear sky composite radiance for UMD model	rdu1(2)
20	number of clear pixels	
21	number of cloudy pixels	
22	precipitable water (from forecast)	cm
23	snow depth	inch/10
24	solar zenith angle	Deg
25	satellite zenith angle	Deg
26	relative azimuth angle	Deg
27	snow cover	%
28	aerosol optical depth at 0.55 microns	
29	cloud optical depth at 0.55 microns	
30	temperature 1st level above surface	K
31	temperature 2nd level above surface	K
32	standard deviation of channel 1 albedo	%
33	moisture 1st level above surface	
34	moisture 2nd level above surface	
35	standard deviation of channel 2 temperature	K
36	wind speed 1st level above surface	m/s
37	wind speed 2nd level above surface	m/s
38	standard deviation of channel 3 temperature	K
39	all-sky top of atmosphere downward flux	W/m^2
40	all-sky top of atmosphere upward flux	W/m^2
41	all-sky surface downward flux	W/m^2
42	all-sky surface upward flux	W/m^2
43	clear-sky top of atmosphere upward flux	W/m^2

44	clear-sky surface downward flux	W/m^2
45	clear-sky surface upward flux	W/m^2
46	all-sky surface diffuse downward flux	W/m^2
47	all-sky surface diffuse PAR	W/m^2
48	all-sky surface global (direct+diffuse) PAR	W/m^2
49	land surface type (1:water, 2:land, 3:desert, 4:snow)	
50	number of partly cloudy pixels	
51	covariance between channels 1 and 4	
52	standard deviation of channel 1	
53	standard deviation of channel 2	K
54	standard deviation of channel 3	K
55	standard deviation of channel 4	K
56	standard deviation of channel 5	K
57	clear standard deviation of channel 1	
58	clear standard deviation of channel 4	K
59	forecast time(4)	hh.h
60	standard deviation of channel 4 temperature	K
61	standard deviation of channel 5 temperature	K
62	clear composite radiance for cloud detection	rdu1(2)
63	surface pressure	mb
64	mean clear temperature of channel 2	K
65	mean clear temperature of channel 3	K
66	mean clear temperature of channel 4	K
67	mean clear temperature of channel 5	K
68	mean cloudy temperature of channel 2	K
69	mean cloudy temperature of channel 3	K
70	mean cloudy temperature of channel 4	K
71	mean cloudy temperature of channel 5	K

Notes

(1) yyddd is preceded by “1” for years onward of 2000
(2) rdu1 = $W/(m^2\ sr\ \mu m)$
(3) rdu2 = $W/(m^2\ sr\ cm^{-1})$
(4) The forecast data is time interpolated from the two forecasts bracketing the hour being processed. This time refers to the extrapolated valid time.

Example Fortran code for reading the GSIP files HR*

```
   INTEGER  Ncol, Nrow, Nvar
   PARAMETER  ( Nlon=121, Nlat=61, Nparam=71 )
   REAL  Rdat( Nlon, Nlat, Nparam )

   OPEN ( Unit=1, File='HR0418217', Form='UNFORMATTED', Status='OLD' )

   DO Lat = 1, Nlat
      DO Lon = 1, Nlon
         READ ( 1 ) ( Rdat(Lon,Lat,Ip),Ip=1, Nparam )
      END DO
   END DO
```