GEWEX Cloud Assessment data base

The datasets are provided in netCDF format, with one file per cloud property, per individual year and observation time of day. The map grid corresponds to 1° latitude x 1° longitude.

The cloud teams produced the L3 data for the common GEWEX Cloud Assessment database by averaging the original L2 cloud products (given at instantaneous pixels) first over each grid cell (1° x 1°) for each time step (day) and then the averages of each grid cell over the month. Polar orbiting satellites provide measurements with one daytime (at a particular local time) and one nighttime overpass (12 hours later). At higher latitudes cross-track scanning instruments may measure the same location several times within 12 hours, whereas in the tropics each location is only measured once. Therefore, to keep track of the diurnal cycle of clouds, it is preferable to keep only one observation per half-day at every location, by choosing the observation with the smallest viewing angle at higher latitudes. Most of the datasets have followed this concept. Only the two MODIS teams started from daily L3 data which kept the orbit overlap at higher latitudes.

Each file contains monthly averages and statistics.

The following cloud properties (variables) are reported:		*range*
• Cloud amount (fractional cloud cover)	CA	(0-1)
• Cloud temperature at top	CT	(150-320 K)
• Cloud pressureat top	CP	(1013-100 hPa)
• Cloud height (above sea level)	CZ	(0-20 km)
• Cloud IR emissivity	CEM	(0-1)
• Effective Cloud amount (CA weighted by CEM)	CAE	(0-1)
• Cloud (visible) optical depth	COD	(0-400)
• Cloud water path (liquid, ice)	CLWP, CIWP	(0-3000 g/m^2)
• Average water path (CLWP/IWP weighted by CA)	ALWP, AIWP	(0-3000 g/m^2)
• Cloud effective particle size (liquid, ice)	CREW, CREI	(0-200 μm)

Statistics are provided for these variables for all clouds and separately stratified by cloud top height category. The latter is defined by cloud top pressure as in ISCCP: high-level clouds (CP < 440 hPa), mid-level clouds (440 hPa ≤ CP < 680 hPa) and low-level clouds (680 hPa ≤ CP). ISCCP further classifies and names cloud types by COD range within each height category. The cloud distribution in these different categories is given by two-dimensional histograms of CP and COD.

In addition to CAH, CAM and CAL, we define relative height stratified cloud amounts which are scaled by the total cloud amount: CAHR = CAH/CA, CAMR = CAM/CA and CALR = CAL/CA (in %). The scaling by total cloud amount shows how the different height categories are divided among all clouds present.

Statistics are also distinguished by cloud phase (liquid, ice). Thermodynamic phase may be distinguished by CT (ISCCP, TOVS Path-B, AIRS-LMD), by polarization signature (POLDER, CALIPSO) or by spectral radiance differences (PATMOS-x, MODIS, ATSR-GRAPE).

In addition to monthly averages, intra-monthly standard deviations are reported, as well as histograms of some variables.

The files contain the following information for each map grid cell for each variable:

• nb of orbit passages	*n_tot*
• percentage of retrieved pixels out of cloudy pixels	*f_var*
• monthly average values	*a_var*
• intra-monthly variability (standard deviation)	*s_var*
• histograms with monthly statistics (number of pixels)	*h_var*

where '*var*' stands for one of the cloud properties described above and listed in the table below.

Variable names of the cloud properties with statistics also distinguished by altitude (**H**: CP < 440 hPa, **M**: 440 hPa < CP < 680 hPa, **L**: CP > 680 hPa) and by thermodynamical phase (**W**: water clouds, **I**: ice clouds **IH**: ice clouds with CP < 440 hPa) available in the GEWEX Cloud Assessment batabase.

Total	**H**	**M**	**L**	**W**	**I**	**IH**
CA	CAH	CAM	CAL	CAW	CAI	CAIH
CAE	CAEH	CAEM	CAEL	CAEW	CAEI	CAEIH
	CAHR	CAMR	CALR	CAWR	CAIR	CAIHR
CT	CTH	CTM	CTL	CTW	CTI	CTIH
CP						
CZ						
CEM	CEMH	CEMM	CEML	CEMW	CEMI	CEMIH
COD	CODH	CODM	CODL	CODW	CODI	CODIH
				CLWP	CIWP	CIWPH
				CREW	CREI	

This data base has already revealed its usefulness in the interpretation of cloud properties retrieved from different satellite instruments, and we hope that it will further contribute to climate studies and climate model evaluation.

The whole data base can be downloaded via the website **http://climserv.ipsl.polytechnique.fr/gewexca/** or via ftp server (zipped files):

File name convention: **var_dataset_satellite_obstime_year.nc**

ISCCP

1984-2007: var_ISCCP_D1_0300AM_yyyy.nc, PM, AMPM
var_ISCCP_D1_0900AM_yyyy.nc, PM, AMPM
var_ISCCP_D1_AMPM_yyyy.nc (including 0300, 0900 AM & PM)

PATMOSX

1982 – 2009: var_PATMOSX_NOAA_0130AM_yyyy.nc, PM
1992 - 2009: var_PATMOSX_NOAA_0730AM_yyyy.nc, PM

HIRS

1984 - 2006: var_HIRS_NOAA_0730AM_yyyy.nc, PM
1986 - 2008: var_HIRS_NOAA_0130AM_yyyy.nc, PM

TOVSB

1987 – 1994: var_TOVSB_NOAA_0730AM_yyyy.nc, PM, AMPM (CA,CP,CT,CEM,COD)
1989 – 1994: var_TOVSB_NOAA_0130AM_yyyy.nc, PM, AMPM (CA,CP,CT,CEM,COD)
1987 – 1990: varIH_mp_TOVSB_NOAA_0730AM_yyyy.nc, PM, AMPM (microphysics semi-transp. Ci)

AIRS-LMD

2003 – 2009: var_AIRS-LMD_AQU_0130AM_yyyy.nc, PM, AMPM (CA,CP,CT,CEM,COD)
2004 – 2009: varIH_mp_AIRS-LMD_AQU_0130AM_yyyy.nc, PM, AMPM (microphysics semi-transp. Ci)

MODIS-ST

2001 – 2009: var_ MODIS-ST_TER_1030AM_yyyy.nc, PM
2003 – 2009: var_ MODIS-ST_AQU_0130AM_yyyy.nc, PM

MODIS-CE

2001 – 2009 : var_MODIS-CE_TER_1030AM_yyyy.nc, PM
2003 - 2009 : var_MODIS-CE_AQU_0130AM_yyyy.nc, PM

CALIPSO-ST

2007 – 2008: var_CALIPSO-ST_ATRAIN_0130AM_yyyy.nc, PM, AMPM

CALIPSO-GOCCP

2007 – 2008: var_CALIPSO-GOCCP_ ATRAIN _0130AM_yyyy.nc, PM, AMPM

POLDER

2006 – 2008: var_POLDER_PARASOL_0130PM_yyyy.nc

MISR

2001 – 2009: var_MISR_TER_10AM_yyyy.nc

ATSR-GRAPE

1997 – 2002: var_ATSR-GRAPE_ERS_AM_yyyy.nc
2003 – 2009: var_ATSR-GRAPE_ENV_AM_yyyy.nc

parameters and bin boundaries

Parameter	Id	Boundaries	bins	unit
cloud amount	**CA**	0, .1, .2, .3, .4, .5, .6, .7, .8, .9, 1	10	
cld amount, high	**CAH**	0 – 1	-	
cld amount, mid	**CAM**	0 – 1	-	
cld amount, low	**CAL**	0 – 1	-	
cld amount, water	**CAW**	0 – 1	-	
cld amount, ice	**CAI**	0 – 1	-	
cld amount, iceH	**CAIH**	0 – 1	-	
cld amount, high/CA	**CAHR**	0 – 100	-	%
cld amount, mid /CA	**CAMR**	0 – 100	-	%
cld amount, low /CA	**CALR**	0 – 100	-	%
Effective cloud amount	**CAE**	0, .1, .2, .3, .4, .5, .6, .7, .8, .9, 1	10	
Eff cld amount, high	**CAEH**	0 – 1	-	
Eff cld amount, mid	**CAEM**	0 – 1	-	
Eff cld amount, low	**CAEL**	0 – 1	-	
Eff cld amount, water	**CAEW**	0 – 1	-	
Eff cld amount, ice	**CAEI**	0 – 1	-	
Eff cld amount, iceH	**CAIEH**	0 – 1	-	
cloud pressure	**CP**	100-1100	10	hPa
Cloud height	**CZ**	0-20	40	km
cloud temperature	**CT**	150,180,185,190,195,...310, 320	28	K
cloud temp, high	**CTH**	150,180,185,190,195,…310, 320	28	K
cloud temp, mid	**CTM**	150,180,185,190,195,…310, 320	28	K
cloud temp, low	**CTL**	150,180,185,190,195,…310, 320	28	K
cloud temp, water	**CTW**	150,180,185,190,195,…310, 320	28	K
cloud temp, ice	**CTI**	150,180,185,190,195,…310, 320	28	K
cloud temp, iceH	**CTIH**	150,180,185,190,195,…310, 320	28	K
cloud_emissivity	**CEM**	0,0.2,0.4,0.8,0.95,1	5	
cld emissivity, high	**CEMH**	0,0.2,0.4,0.8,0.95,1	5	
cld emissivity, mid	**CEMM**	0,0.2,0.4,0.8,0.95,1	5	
cld emissivity, low	**CEML**	0,0.2,0.4,0.8,0.95,1	5	
cld emissivity, water	**CEMW**	0,0.2,0.4,0.8,0.95,1	5	
cld emissivity, ice	**CEMI**	0,0.2,0.4,0.8,0.95,1	5	
cld emissivity, iceH	**CEMIH**	0,0.2,0.4,0.8,0.95,1	5	
cloud optical depth	**COD**	0, .1, .2, .3, .4, .5, .6, .7, .8, .9, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,15, 20, 25, 30, 40 ,50 ,60 ,70 ,80 ,90 ,100, 150, 200, 300 ,>300	34	
cld opt. depth, high	**CODH**	"	34	
cld opt. depth, mid	**CODM**	"	34	
cld opt. depth, low	**CODL**	"	34	
cld opt. depth, water	**CODW**	"	34	
cld opt. depth, ice	**CODI**	"	34	
cld opt. depth, iceH	**CODIH**	"	34	
cld liquid water path	**CLWP**	0, 5, 10, 15, 20, 25, 30, 40, 50,100, 150, 200, 250, 300, 350, 400, 450, 500, 1000, 1500, 2000, 3000, >3000	22	gm^{-2}
Cld ice water path	**CIWP**	"	22	gm^{-2}
Cld ice water path H	**CIWPH**	"	22	gm^{-2}
av. liquid water path	**ALWP**		-	gm^{-2}
av. ice water path	**AIWP**		-	gm^{-2}
av. ice water path H	**AIWPH**		-	gm^{-2}
cld eff. radius, water	**CREW**	0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20,22,24,26,28, 30, 35, 40, 45, 50, >50	20	μm
cld eff. radius, ice	**CREI**	0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20,22,24,26,28, 30,35,40,45, 50, 55, 60, 65, 70, 75, 80, 90, 100, 110, 120, 150, >150	31	μm
cld eff. radius, iceH	**CREIH**	"	31	μm

joint histograms: parameters and bin boundaries:

var1 [bins]	bin boundaries	var2 [bins]	bin boundaries
COD [7bins]	0, .3,1.3, 3.6, 9.4, 23 ,60 ,1000	**CP** [7 bins]	0, 180, 310, 440, 560, 680, 800, 1100 hPa
CEM [5bins]	0, .2, .4, .8, .95, 1	**CP** [7 bins]	0, 180, 310, 440, 560, 680, 800, 1100 hPa
CODW [7bins]	0, .3, 1.3, 3.6, 9.4, 23 ,60 ,1000	**CREW**[10bins]	2, 4, 6, 8, 10, 12.5, 15 17.5, 20, 25, 30μm
CODI [7bins]	0, .3, 1.3, 3.6, 9.4, 23 ,60 ,1000	**CREI** [13bins]	0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 90μm
CEMI [5bins]	0, .2, .4, .8, .95, 1	**CREI** [13bins]	0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 90μm

The following two tables recapitulate available time periods and cloud properties of the participating data sets:

Approximate local observation times and time periods covered by the individual datasets of the GEWEX Cloud Assessment database.

dataset	1 :30 AM	3:00 AM	7 :30 AM	9:00 AM	10 :30 AM	1 :30 PM	3:00 PM	7 :30 PM	9:00 PM	10 :30 PM	Time period
ISCCP microphys.		x		x			x		x		**1984-2007** **1984-2000**
PATMOSx	x		 x			x		 x			**1982-2009** **1992-2009** **histos:** **1998-2009**
HIRS-NOAA	x x x		 x x x x x			x x x		 x x x x x			**1986/87/89** **1991-2004, 2006** **1987/89/90** **1992-1996** **1999** **2002-2006** **2008**
TOVSB microphys.	 x		x x			 x		x x			**1987-1994** **1987-1990** **1989-1994**
AIRS-LMD microphys.	x					x					**2003-2009** **2004-2009**
MODIS-ST	 x				x	 x				x	**2001-2009** **2003-2009**
MODIS-CE	 x				x	 x				x	**2001-2009** histos : >2006 **2003-2008**
MISR					x						**2001-2009**
POLDER						x					**2006-2008**
ATSR-GRAPE					x						**1997-2002** **2003-2009**
CALIPSO	x					x					**2007-2008**

Variables and statistics (a = monthly average, s = intra-monthly variability, h = histogram) provided by the participating datasets (ISCCP, PATMOS-x, HIRS-NOAA, TOVS Path-B, AIRS-LMD, MODIS-ST, MODIS-CE, MISR, POLDER, ATSR-GRAPE, CALIPSO-ST, CALIPSO-GOCCP).

variable	ISCCP	PATMOSx	HIRS-NOAA	TOVSB	AIRS-LMD	MODIS-ST	MODIS-CE	MISR	POLDER	ATSR-GRAPE	CALIPSO-ST	CALIPSO GOCCP
CA	**ash**	**as**	**a**	**ash**	**ash**	**ash**	**ash**	**a**	**ash**	**ash**	**ah**	**ah**
CAH	**as**	**as**	**a**	**as**	**as**	**as**	**as**	**a**	**ash**		**a**	**a**
CAM	**as**	**as**	**a**	**as**	**as**	**as**	**as**	**a**	**ash**		**a**	**a**
CAL	**as**	**as**	**a**	**as**	**as**	**as**	**as**	**a**	**ash**		**a**	**a**
CAW	**as**	**as**		**as**	**as**	**as**	**as**		**ash**		**a**	
CAI	**as**	**as**		**as**	**as**	**as**	**as**		**ash**		**a**	
CAIH	**as**	**as**		**as**	**as**		**as**		**ash**		**a**	
CAE	**ash**	**as**	**a**	**ash**	**ash**	**ash**	**ash**		**ash**			
CAEH	**as**	**as**	**a**	**as**	**as**		**as**					
CAEM	**as**	**as**	**a**	**as**	**as**		**as**					
CAEL	**as**	**as**	**a**	**as**	**as**		**as**					
CAEW	**as**	**as**		**as**	**as**		**as**					
CAEI	**as**	**as**		**as**	**as**		**as**					
CAEIH	**as**			**as**	**as**		**as**					
CAHR	**as**	**a**	**a**	**as**	**as**	**a**	**as**	**a**	**ash**	**as**	**a**	**a**
CAMR	**as**	**a**	**a**	**as**	**as**	**a**	**as**	**a**	**ash**	**as**	**a**	**a**
CALR	**as**	**a**	**a**	**as**	**as**	**a**	**as**	**a**	**ash**	**as**	**a**	**a**
CAWR	**as**	**a**		**as**	**as**	**a**			**ash**	**as**	**a**	
CAIR	**as**	**a**		**as**	**as**	**a**			**ash**	**as**	**a**	
CAIHR	**as**	**a**		**as**	**as**	**a**			**ash**		**a**	
CP	**ash**	**ash**	**ah**	**ash**	**ash**	**ash**	**as**		**ash**	**ash**		
CZ	**ash**				**ash**		**ash**	**ah**			**ah**	**ah**
CT	**ash**	**ash**	**ah**	**ash**	**ash**	**ash**	**as**			**ash**	**ah**	**ah**
CTH	**ash**	**ash**	**a**	**ash**	**ash**		**as**			**ash**	**ah**	**ah**
CTM	**ash**	**ash**	**a**	**ash**	**ash**		**as**			**ash**	**ah**	**ah**
CTL	**ash**	**ash**	**a**	**ash**	**ash**		**as**			**ash**	**ah**	**ah**
CTW	**ash**	**ash**		**ash**	**ash**	**ash**	**as**			**ash**	**ah**	
CTI	**ash**	**ash**		**ash**	**ash**	**ash**	**as**			**ash**	**ah**	
CTIH	**ash**	**ash**		**ash**	**ash**		**as**			**ash**	**ah**	
CEM	**ash**	**ash**	**a**	**ash**	**ash**	**ash**	**as**			**ash**		
CEMH	**ash**	**ash**	**a**	**ash**	**ash**		**as**			**ash**		
CEMM	**ash**	**ash**	**a**	**ash**	**ash**		**as**			**ash**		
CEML	**ash**	**ash**	**a**	**ash**	**ash**		**as**			**ash**		
CEMW	**ash**	**ash**		**ash**	**ash**		**as**					
CEMI	**ash**	**ash**		**ash**	**ash**		**as**					
CEMIH	**ash**	**ash**		**ash**	**ash**		**as**					
COD	**ash**	**ash**		**ash**	**ash**	**ash**	**ash**		**ash**	**ash**		
CODH	**ash**	**ash**		**as**	**ash**	**ash**	**as**		**ash**	**ash**		
CODM	**ash**	**ash**		**as**	**ash**	**ash**	**as**		**ash**	**ash**		
CODL	**ash**	**ash**		**as**	**ash**	**ash**	**as**		**ash**	**ash**		
CODW	**ash**	**ash**		**as**	**ash**	**ash**	**ash**		**ash**	**ash**		
CODI	**ash**	**ash**		**as**	**ash**	**as**	**ash**		**ash**	**ash**		
CODIH	**ash**	**ash**		**as**	**ash**	**ash**	**as**		**ash**	**ash**		
CLWP	**ash**	**ash**				**ash**	**ash**			**ash**		
CIWP	**ash**	**ash**				**ash**	**as**			**ash**		
CIWPH	**ash**	**ash**		**ash**	**ash**		**as**			**ash**		
CREW	**ash**	**ash**				**ash**	**ash**			**ash**		
CREI	**ash**	**ash**				**ash**	**ash**			**ash**		
CREIH	**ash**			**ash**	**ash**	**ash**	**as**			**ash**		
COD/CP	**x**	**x**		**x**	**x**				**x**	**x**		
CODW/CP						**x**						
CODI/CP				**x**	**x**	**x**						
CEM/CP	**x**	**x**		**x**	**x**	**x**						
CODW/CREW	**x**	**x**				**x**						
CODI/CREI	**x**	**x**		**x**	**x**	**x**						
CEMI/CREI	**x**	**x**		**x**	**x**							