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Swiss GCOS Data in International Data Centers

Swiss GCOS Office
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2012-02-29	Corrections in the table of chapter <i>3.3.1 Land use</i>
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2013-08-19	Hydrosphere: general update of information
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1 Introduction and purpose

The Global Climate Observing System (GCOS) is a joint initiative of the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC) of the UNESCO, the UN Environmental Programme (UNEP) and the International Council of Science (ICSU). The system is designed to ensure that the observations and information needed to address climate-related issues are obtained systematically and made available to all potential users.

The Swiss GCOS Office, hosted by the Federal Office of Meteorology and Climatology MeteoSwiss, is responsible for coordinating climate observations in Switzerland. The submission of data from Swiss GCOS monitoring stations to the corresponding international data centers is part of Switzerland's obligations within GCOS. The Swiss GCOS Office supports this commitment.

GCOS data shall be freely available. Therefore the following quote from the GCOS Implementation Plan (2010), states the main **motivation** for this report: "The flow of data to the user community and to the IDCs [international data centers] is inadequate for many ECVs [Essential Climate Variables], especially for those of the terrestrial observing networks. Lack of national engagement and resources, restrictive data policies, and inadequate national and international data system (including telecommunication) infrastructure are the main causes of the inadequacy. [...]" [GCOS, 2010]. The following key requirement can be derived from this statement (Key Need 10): "Parties should ensure regular and timely submission of climate data to International Data Centers for all ECVs." [GCOS, 2010, p.9]. A list of all IDC's is provided in Annex A.

The **purpose** of this report is to provide an overview on the availability of Swiss data, submitted to IDCs recognized by GCOS. National processes and data centers outside of Switzerland are beyond the scope of this report.

The report 'National Climate Observing System (GCOS Switzerland)' [Seiz and Foppa, 2007] lists monitoring stations in Switzerland for the following 6 categories, whose measurements contribute to GCOS, and names their corresponding international data centers:

- Atmospheric Domain ,Surface'
- Atmospheric Domain ,Upper-Air'
- Atmospheric Domain ,Composition'
- Terrestrial Domain ,Hydrosphere'
- Terrestrial Domain ,Cryosphere'
- Terrestrial Domain ,Biosphere'

The present report is structured according to these six categories. The important GCOS category 'oceans' is not covered with data from Swiss stations. Therefore, this category is not further documented in this report. In comparison with Seiz and Foppa [2007], the new ECV 'soil moisture' was added (see chapter 3.1.6).

A table with the following structure is presented for each of the Essential Climate Variables:

Sub parameters	Which sub-parameters of the ECVs are being measured, submitted or archived?	State of information (■ good ■ medium ■ unsatisfactory)
Network(s)	What is the relevant GCOS monitoring network?	
Stations	Which Swiss monitoring stations are part of the monitoring network (incl. station identifier, etc.)?	
Data centers	Which is the official data center? Is there more than just one?	
Responsible institution for data submission	Which Swiss institution has the main responsibility?	
Data submission	How does the data submission work (frequency, transmission path)?	
Data format	In which data format are the datasets available?	
Data access	How can one get access to the data?	
Data quality	Who evaluates the data quality? How does it work? Are there quality classifications? What is the current state of Swiss data?	
Performance Monitoring	How is the data availability being monitored? Who does the monitoring?	
User statistics	Who uses the data? What is the number of downloads? Is this statistic available online?	
Publications	Which publications have been issued by the data centers?	
Contact	Who is the contact person a) at the data center b) in Switzerland?	
Notes	Additional information not mentioned above	

We would like to thank those institutions and individuals, who have contributed to the current status of the document (see list in chapter 7). Information concerning errors or gaps are welcome at any time. Please contact the Swiss GCOS Office: gcos@meteoswiss.ch.

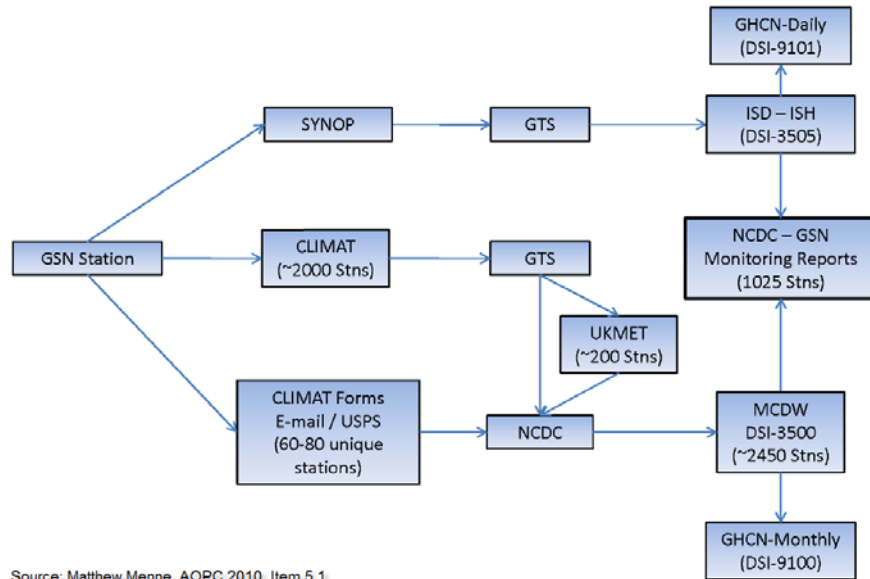
2 Atmospheric Domain

2.1 SURFACE

2.1.1 Air temperature

Sub parameters	Air temperature (precipitation, snow depth)
Network(s)	GCOS Surface Network (GSN) Full WWW/GOS Swiss National Basic Climatological Network (NBCN)
Stations	GSN Sântis (WMO 06680), Grand St Bernard (WMO 06717) RBCN 8 Stations
Data centers	National Climatic Data Centre (NCDC) National Oceanic and Atmospheric Agency (NOAA), Ashville (NC), US GSN Archives at World Data Center (WDC) for Meteorology, Ashville (NC), US - http://www.ncdc.noaa.gov/ > Data Access > Land-Based Station Data - http://www.ncdc.noaa.gov/cdo-web/ > Search Tool - http://www.ncdc.noaa.gov/oa/hofn/gsn/gsn-home.html Further data from Swiss stations (128 stations) are archived in this data center. These Global Summary of the Day (GSOD) data are available at http://www.climate.gov/daily-observational-data-global-summary-day-gsod-%E2%80%93-gis-data-locator . These current values are not delivered by MeteoSwiss but probably computed from (unadjusted) SYNOP bulletins. ECA&D European Climate Assessment & Dataset (at KNMI) http://eca.knmi.nl/
Responsible institution for data submission	Swiss Federal Office of Meteorology and Climatology (MeteoSwiss)
Data submission	CLIMAT reports via GTS, monthly (8 stations, 2 GSN und 6 RBCN) GSOD data via GTS (unadjusted data, probably computed by NCDC) Data delivery for ECA&D twice a year
Data format	PDF, CSV and text formats at: http://www.ncdc.noaa.gov/cdo-web/ > Search Tool Global Summary of the Day (GSOD) format: http://www.climate.gov/daily-observational-data-global-summary-day-gsod-%E2%80%93-gis-data-locator ECA&D ASCII

Data access



NOAA National Data Centre Climate Data Online (NNDC CDO). Data of GSN stations are being distributed in the form of bulletins (SYNOP, CLIMAT), from which different data sets are made available. From CLIMAT-bulletins the data sets MCDW, NCDC-GSN, and GHCN-monthly are generated. From SYNOP bulletins the data sets GSOD, GHCN-daily and NCDC-GSN are generated.

GCOS Surface Network (GSN)

<http://gosis.org/content/gcos-surface-network-gsn-data-access>

The stations Sântis and Grand St Bernard were found. The website includes a table. The cells in the second right-most column contain each a hyperlink with the label 'Report'. It refers to an HTML table of the data (so-called 'GCOS Surface Network Station Data from the Monthly Climatic Data for the World (MCDW) Dataset').

Surface data, monthly global (GSNMON)

<http://www7.ncdc.noaa.gov/CDO/cdo>

Only station Sântis was found.

NCDC CLIMAT Monthly Bulletins (→MCDW)

<http://www.ncdc.noaa.gov/cdo-web/>

This website offers a filter function for displaying the data according to certain criteria. Under criteria 'Switzerland' six stations are listed:

<u>WMO ID</u>	<u>Station Name</u>	<u>Country</u>	<u>Period of Record</u>
06610	PAYERNE	SWITZERLAND	1993/03 to 2009/12
06660	ZURICH (TOWN/VILLE).	SWITZERLAND	1987/01 to 2009/12
06680	SAENTIS	SWITZERLAND	1987/01 to 2009/12
06700	GENEVE-COINTRIN	SWITZERLAND	1987/01 to 2009/12
06717	ST BERNARD	SWITZERLAND	2005/07 to 2009/12
06770	LUGANO	SWITZERLAND	1987/01 to 2009/12

If the stations identifier is known, the stations can be chosen directly. E.g.

<http://cdo.ncdc.noaa.gov/pls/plclimprod/poemain.cdobystrn?dataset=DS3500&StnList=06680>

A fee of >USD10 is charged for the delivery of data from one station, a fee of USD40 is charged for all stations over the entire period.

Global Historical Climatology Network – daily (→GHCN-daily)

<http://www.ncdc.noaa.gov/oa/climate/ghcn-daily/>

Metadata from 7 Swiss stations are shown in this dataset. Among them are the two GSN stations Säntis and Grand St. Bernard:

SZ000001940	47.5500	7.5800	316.0	BASEL-BINNINGEN	06601
SZ000002220	47.2500	9.3500	2490.0	SAENTIS	GSN 06680
SZ000003700	47.3800	8.5700	556.0	ZUERICH-SMA	06660
SZ000006717	45.8700	7.1700	-999.9	GRAND ST. BERNARD	GSN 06717
SZ000008390	46.2000	6.1500	405.0	GENEVE-OBSERVATOIRE
SZ000008440	46.2500	6.1300	420.0	GENEVE-COINTRIN	06700
SZ000009480	46.0000	8.9700	273.0	LUGANO	06770

The inventory for Swiss GSN stations presents itself as follows (TMAX: temperature maximum, TMIN: temperature minimum, PRCP: precipitation, SNWD: snow depth)

SZ000002220	47.2500	9.3500	TMAX	1882	2011
SZ000002220	47.2500	9.3500	TMIN	1882	2011
SZ000002220	47.2500	9.3500	PRCP	1901	2011
SZ000002220	47.2500	9.3500	SNWD	1973	2011
SZ000006717	45.8700	7.1700	TMAX	1864	2011
SZ000006717	45.8700	7.1700	TMIN	1864	2011
SZ000006717	45.8700	7.1700	PRCP	2001	2011

Snow depth is defined for every station except for 6717 and 8390.

The data sets as individual ASCII files are compressed in one tarball file

(http://www1.ncdc.noaa.gov/pub/data/ghcn/daily/ghcnd_gsn.tar.gz, approx. 88 Mbyte) freely available. For further explanations:

<http://www1.ncdc.noaa.gov/pub/data/ghcn/daily/readme.txt> (only data files for the two GSN stations).

Global Summary of the Day (→GSOD)

<http://www7.ncdc.noaa.gov/CDO/cdo>

Several dozen stations are listed. Data is available for free, the use of the data falls under the WMO Resolution 40 (<http://www.wmo.int/pages/about/Resolution40.html>). Data can be selected via a series of web-based forms. However, for machine processing, the use of the FTP archive is more efficient <ftp://ftp.ncdc.noaa.gov/pub/data/g sod/>.

Useful information (summary files as well as datasets) was found rather randomly on the FTP server of the NDCD <ftp://ftp.ncdc.noaa.gov/pub/data/> (/gcos, /gsn, and /gsod).

Overall, data access is not evident and in no case particularly user-friendly.

ECA&D

<http://eca.knmi.nl/dailydata/datadictionary.php> (10 Swiss stations, RBCN free, the others only for L&F)

239	BASEL BINNINGEN	CH	+47:33:00	+07:35:00	316
240	GENEVE COINTRIN	CH	+46:15:00	+06:08:00	413
241	GENEVE OBSERVAT OIRE	CH	+46:12:00	+06:09:00	405
242	LUGANO	CH	+46:00:00	+08:58:00	300
243	SAENTIS	CH	+47:15:00	+09:21:00	2502
244	ZUERICH/F LUNTERN	CH	+47:23:00	+08:34:00	556
1662	SION 2	CH	+46:13:00	+07:20:00	482
1649	COL DU GRAND ST-	CH	+45:52:00	+07:10:00	2472

		BERNARD				
	2180	PAYERNE	CH	+46:49:12	+06:57:00	490
	1661	SION 1	CH	+46:13:00	+07:20:00	542
Data quality	ECA&D Quality codes are added to the dataset.					
Online Performance Monitoring	<p>On the GOSIC (Global Observing Systems Information Center) website http://gosic.org/content/gcos-surface-network-gsn-stations-performance-indicators a collection of links as well as the corresponding contact person can be found. The links refer to inventories of GSN stations and GSN performance indicators.</p> <p>DWD</p> <p>The DWD hosts the Global Climate Observing System Surface Network Monitoring Centre (GSNMC). The GSNMC monitors the availability and quality of CLIMAT entries of GCOS Surface Network (GSN) stations which were exchanged via the Global Telecommunication System of WMO (GTS).</p> <p>www.dwd.de > Climate + Environment > Climate Data Centres > GSNMC; one of the following entries has to be selected:</p> <ul style="list-style-type: none"> • Data Set: monitoring data on a monthly basis can be downloaded. This interface cannot be selected directly. • Monitoring Products: a series of performance monitoring products in the form of maps, plots and tables is available for the data of the last 1,6,12 and 24 months. <p>NCDC</p> <p>Some performance indicators for daily and monthly data can be found at http://www.ncdc.noaa.gov/cdo-web/. The easiest way to run a search for a specific station is to use the browser's FIND function. The available linkages provide access to:</p> <ul style="list-style-type: none"> • HTML tables of indicators of the current year, a specific year, or every year • Plots of indicators <p>As an alternative to web browsing, the evaluation of specific files has to be considered:</p> <ul style="list-style-type: none"> • ftp://ftp.ncdc.noaa.gov/pub/data/gcos/gsn/GSN_POR_summary (every year, ASCII text) • ftp://ftp.ncdc.noaa.gov/pub/data/gcos/gsn/GSN_sum_long_term.txt (last 10 years) <p>These data files contain summarized information on the stations of Säntis and Grand St. Bernard. The data files are relatively large. As well, tables for specific WMO regions are available online at e.g. ftp://ftp.ncdc.noaa.gov/pub/data/gcos/gsn/WW_REG6_POR_summary or http://www1.ncdc.noaa.gov/pub/data/gcos/WW_REG6_POR_summary (every year, ASCII text, beware of large data files). Some of the mentioned data files are available in CSV version as well. These files are more suitable for machine processing.</p>					
User statistics	not evident					
Publications	ECA&D see http://eca.knmi.nl/publications/index.php					
Contact	<p>DWD Udo Schneider (udo.schneider@dwd.de)</p> <p>NCDC Stuart Hinson (stuart.hinson@noaa.gov)</p> <p>MeteoSwiss Christian Lukasczyk (dataservice@meteoswiss.ch)</p> <p>National GCOS Contact follow http://www.wmo.int/pages/prog/gcos/index.php?name=NationalActivities</p>					
Notes	<p>At http://www.ncdc.noaa.gov/cdo-web/ the country code (FIPS) for Switzerland is 'SZ'. See http://cdo.ncdc.noaa.gov/cdo/info.html for further information.</p> <p>Homogenised series out of the HISTALP project are available for R&D, https://www.zamg.ac.at/cms/de/klima/news/histalp (data delivery via MeteoSwiss).</p>					

2.1.2 Precipitation

Sub parameters	Precipitation
Network(s)	GSN Full WWW/GOS Swiss National Basic Climatological Network (NBCN)
Stations	GSN, Full WWW/GOS See chapter 2.1.1 Air temperature for further data on the stations NBCN Every station except of Jungfrauoch (in total 27) Totalizers Eight stations in Switzerland (Abschwung, Allalingletscher, Geissbützistock, Mönchsgrat, Mont Ruan, Piz Scalotta, Seeende, Silvrettahütte) have been designated as top priority for GCOS, another 27 as 2nd priority (progress report 231 of MeteoSwiss)
Data centers	National Climatic Data Centres (NCDC) See chapter 2.1.1 Air temperature Global Precipitation Climatology Centre (GPCC) DWD, Germany http://gpcc.dwd.de Because the gauge data are presented as a gridded field, it is not evident which Swiss stations exactly are taken into account. However, according to the GCOS Report [Seiz and Foppa, 2007], every MeteoSwiss station has been taken into account.
Responsible institution for data submission	Swiss Federal Office of Meteorology and Climatology (MeteoSwiss)
Data submission	CLIMAT Reports via GTS, monthly GSOD Data via GTS, daily
Data format	GPCC Data serve as basis for various products (gridded data sets), which are available as compressed ASCII files.
Data access	NCDC See chapter 2.1.1 Air temperature GPCC website, http://gpcc.dwd.de > Download
Data quality	NCDC Not evident GPCC Data quality is controlled by a reanalysis through GPCC.
Performance Monitoring	See chapter 2.1.1 Air temperature
User statistics	Not evident
Publications	GPCC See http://gpcc.dwd.de > Publications
Contact	NCDC GPCC Andreas Becker (gpcc@dwd.de)
Notes	

2.1.3 Air pressure

Sub parameters	Air pressure	
Network(s)	GSN Full WWW/GOS Swiss National Basic Climatological Network (NBCN)	
Stations	GSN, Full WWW/GOS See chapter 2.1.1 Air temperature for further data on the stations NBCN 28 stations	
Data centers	National Climatic Data Centre (NCDC) See chapter 2.1.1 Air temperature	
Responsible institution for data submission	Swiss Federal Office of Meteorology and Climatology (MeteoSwiss)	
Data submission	CLIMAT reports via GTS, monthly GSOD data via GTS, daily	
Data format	See chapter 2.1.1 Air temperature	
Data access	See chapter 2.1.1 Air temperature	
Data quality	See chapter 2.1.1 Air temperature	
Performance	See chapter 2.1.1 Air temperature	
Monitoring		
User statistics	See chapter 2.1.1 Air temperature	
Publications	See chapter 2.1.1 Air temperature	
Contact	See chapter 2.1.1 Air temperature	
Notes		

2.1.4 Sunshine duration

Sub parameters	Sunshine duration	
Network(s)	GSN Full WWW/GOS Swiss National Basic Climatological Network (NBCN)	
Stations	GSN, Full WWW/GOS See chapter 2.1.1 Air temperature for further data on the stations NBCN 28 stations	
Data centers	National Climatic Data Centre (NCDC) See chapter 2.1.1 Air temperature	
Responsible institution for data submission	Swiss Federal Office of Meteorology and Climatology (MeteoSwiss)	
Data submission	CLIMAT reports via GTS, monthly GSOD data via GTS, daily	
Data format	See chapter 2.1.1 Air temperature	
Data access	See chapter 2.1.1 Air temperature	
Data quality	See chapter 2.1.1 Air temperature	
Performance	See chapter 2.1.1 Air temperature	
Monitoring		
User statistics	See chapter 2.1.1 Air temperature	
Publications	See chapter 2.1.1 Air temperature	
Contact	See chapter 2.1.1 Air temperature	
Notes		

2.1.5 Radiation

Sub parameters	Surface radiation budget, short-wave (downward=GLOBAL, upward=REFLEX), diffuse, long-wave (downward, upward), net radiation
Network(s)	Baseline Surface Radiation Network (BSRN)
Stations	Payerne, Jungfrauoch (candidate)
Data centers	World Radiation Monitoring Center (WRMC-BSRN) Alfred Wegener Institute, Potsdam, Germany http://www.bsrn.awi.de/
Responsible institution for data submission	Swiss Federal Office of Meteorology and Climatology (MeteoSwiss)
Data submission	FTP Upload in defined format
Data format	Data available as ASCII files
Data access	Data per station can be downloaded via FTP or Pangaea („Publishing Network for Geoscientific & Environmental Data“) (login required) http://www.pangaea.de/PHP/BSRN_Status.php
Data quality	Control of internal consistency
Online Performance Monitoring	An inventory of the present data is available. http://www.pangaea.de/PHP/BSRN_Status.php The data center controls the consistency of the data sets.
User statistics	Not evident
Publications	http://bsrn.awi.de/other/publications.html
Contact	WRMC-BSRN Gert König-Langlo (Gert.Koenig-Langlo@awi.de) MeteoSwiss Rolf Philipona (rolf.philipona@meteoswiss.ch), Laurent Vuilleumier (laurent.vuilleumier@meteoswiss.ch)
Notes	The candidacy of Jungfrauoch is not further pursued. Pangaea seems to be a modern data center and works with progressive internet technologies. The offer on metadata is very rich.

Sub parameters	Surface radiation budget, special single components GLOBAL, DIRECT, DIFFUSE, SPECTRAL, downward long-wave
Network(s)	Swiss Alpine Climate Radiation Monitoring network (SACRaM)
Stations	SACRaM stations Jungfrauoch, Locarno-Monti, Payerne, Davos are registered under 'GAW Data' at WRDC. Further stations BASEL, ZUERICH / KLOTEN, SAENTIS, PAYERNE, DAVOS, JUNGFRAUJOCH, LA DOLE, CORVATSCH, GENEVE, LOCARNO – MONTI are registered under global radiation (daily mean and monthly mean)
Data centers	World Radiation Data Centre (WRDC) Voeikov Main Geophysical Observatory, St. Petersburg http://wrdc.mgo.rssi.ru/
Responsible institution for data submission	Swiss Federal Office of Meteorology and Climatology (MeteoSwiss)
Data submission	E-mail, maybe FTP
Data format	ASCII (HTML tables)
Data access	Access to WRDC archive with login after simple registration; GAW data are available for free. Daily data are presented in HTML tables, the entire dataset of one station in an animated graphic. At the moment only data for global radiation and diffuse radiation are provided. Example http://wrdc.mgo.rssi.ru/wrdccgi/dataview.exe?datadir0001/wrdc/0124/Global_Europe/switzerland/saentis/saentis_2007_glo_d.htm (login required)
Data quality	Not evident
Online Performance Monitoring	No information
User statistics	Not evident
Publications	Not evident
Contact	WRDC Anatoly Tsvetkov (tsvetkov@main.mgo.rssi.ru) Stations Rolf Philipona (rolf.philipona@meteoswiss.ch), Laurent Vuilleumier (laurent.vuilleumier@meteoswiss.ch)
Notes	Web access to WRDC is not entirely consistent. For example, data on diffuse radiation in Locarno-Monti cannot be found on the site created for diffuse radiation, but on the same site as global radiation for Locarno-Monti. Overall the data presentation in HTML tables is questionable, because, for further analyses, it has to be adopted first. The GCOS Implementation plan says that the 'quality and coverage of routine radiation is inadequate for climate purposes' [GCOS, 2010, p. 48].

Sub parameters	Surface radiation budget, specifically global radiation (most abundant), direct solar radiation, diffuse sky radiation, reflected short-wave radiation, long-wave incoming radiation, UV radiation, absorbed global radiation, long-wave outgoing radiation, as well as derived properties, namely albedo, latent heat flux, subsurface heat flux, latent heat of melt, sum of outgoing short and long -wave radiation, long-wave net radiation, sum of latent and sensible heat flux, radiation balance, circumglobal radiation, sensible heat flux
Network(s)	Not specified
Stations	Altdorf, Basel, Basel-Binningen, Bern/Zollikofen, Birmensdorf, Corvatsch, Davos, Davos-Dorf, Davos-Platz, Gd-St.-Bernard, Geneve, Genève-Cointrin (spelling as used by the data centre), Grimsel-Hospiz, Gütsch above Andermatt, Hunzigen (Molinietum & Schoenetum), Jungfrauoch, La Dole, Les Avants, Montreux, Locarno-Monti, Lugano, Luzern, Payerne BSRN, Payerne ETH, Payerne SMA, Reckenholz, Reckenholz-SMA, Rietholzbach, Säntis, San Bernardino, Sion, Sonzier, St. Gallen, Titlis Bergstation, Titlis Stand, Weissfluhjoch, ZH-UZI, Zuerich-Kloten, Zuerich-SMA (new), Zuerich-SMA (old)
Responsible institution for data submission	Data is not submitted to the data centers. Data is collected from different sources by the data center itself.
Data centers	Global Energy Balance Archive (GEBA) Institute for Atmosphere and Climate, ETH Zurich http://www.geba.ethz.ch/
Data submission	The data originates from various sources; national weather services, WRDC, ARM, SURFRAD, Publications, etc.
Data format	ASCII
Data access	Guest account possible (login required)
Data quality	Multi-level quality control through GEBA (http://www.geba.ethz.ch/quality/index)
Online Performance Monitoring	No information
Benutzerstatistik	Not evident
Publications	Numerous reviewed publications (http://www.geba.ethz.ch/publications/index)
Contact	GEBA Martin Wild (martin.wild@env.ethz.ch)
Notes	GEBA Websites are under construction. The data base holds approx. 450'000 datasets based on monthly means of approx. 2500 stations.

2.2 UPPER AIR

2.2.1 Clouds

Sub parameters	Cloud cover, cloud type, cloud-top height, visibility, present and past weather, partly cloud-base height	Green
Network(s)	No designated GCOS monitoring network	Green
Stations	NBCN 28 stations (visual observation)	Green
Data centers	None determined	Red
Responsible institution for data submission	Swiss Federal Office of Meteorology and Climatology (MeteoSwiss)	Green
Data submission	--	Red
Data format	--	Red
Data access	--	Red
Data quality		Red
Online Performance Monitoring	--	Red
Publications	--	Red
User statistics	--	Red
Contact	MeteoSwiss Claudine Hotz (claudine.hotz@meteoswiss.ch)	Green
Notes		Grey

2.2.2 Water vapour

Sub parameters	Water vapour
Network(s)	GCOS Reference Upper Air Network (GRUAN) http://www.wmo.int/pages/prog/gcos/index.php?name=GRUAN
Stations	Payerne (06610)
Data centers	GRUAN Lead Center www.gruan.org (or www.dwd.de > Special Users > Intern. Projects)
Responsible institution for data submission	Swiss Federal Office of Meteorology and Climatology (MeteoSwiss)
Data submission	TEMP / BUFR via GTS; GRUAN-specific data files are submitted to the GRUAN Lead Centre (Lindenberg).
Data format	netCDF
Data access	After registration at www.gruan.org , at NCDC respectively
Data quality	See below: Publications
Online Performance Monitoring	Not yet available
Publications	<u>GRUAN-TD-4</u> ; Immler, F. J., et al. (2010), Reference Quality Upper-Air Measurements: guidance for developing GRUAN data products. Atmospheric Measurement Techniques, 2010, 3, 1217–1231, doi:10.5194/amt-3-1217-2010; GRUAN Manual (WMO 2011)
User statistics	Not evident
Contact	GRUAN Lead Centre Holger Vömel (gruan.lc@dwd.de) MeteoSwiss Rolf Philipona (rolf.philipona@meteoswiss.ch)
Notes	

Sub parameters	Water vapour
Network(s)	GCOS Upper Air Network (GUAN) http://gosis.org/content/gcos-upper-air-network-guan-program-overview
Stations	- Swiss station: Payerne (06610) - International stations: Harare (67774, Zimbabwe), Dar es Salaam (63894, Tanzania)
Data centers	Integrated Global Radiosonde Archive (IGRA) National Climatic Data Centre (NCDC), GUAN Archive (WDC for Meteorology, Asheville, US) http://www.ncdc.noaa.gov/oa/climate/igra/index.php IGRA contains quality-controlled data out of 11 different sources. Rigorous procedures are being conducted to ensure the correct identification of the stations, to eliminate redundancies in the different data sets on soundings, and to select one single value for each station, date, and time. Algorithms for quality assurance are applied to the control of the format, physical plausibility and consistency of data sets, of climatological outliers, and of discrepancies regarding temporal and vertical distribution of temperature data. (ftp://ftp.ncdc.noaa.gov/pub/data/igra/igra-overview.pdf (Durre et al., 2006, J. Climate, 53-68).
Responsible institution for data submission	Swiss Federal Office of Meteorology and Climatology (MeteoSwiss)
Data submission	TEMP / BUFR via GTS
Data format	ASCII, see ftp://ftp.ncdc.noaa.gov/pub/data/igra/readme.txt
Data access	http://www1.ncdc.noaa.gov/pub/data/igra/data-por/06610.dat.gz Payerne: 1963 - 2010/10) or ftp://ftp.ncdc.noaa.gov/pub/data/igra/data-por/06610.dat.gz
Data quality	QC procedures are described at ftp://ftp.ncdc.noaa.gov/pub/data/igra/igra-qc.pdf
Online Performance Monitoring	Online Performance Monitoring: http://gosis.org/content/gcos-upper-air-network-guan-stations-performance-indicators (Overview)
Publications	Some publications are listed at ftp://ftp.ncdc.noaa.gov/pub/data/igra/
User statistics	Not evident
Contact	IGRA Daten Imke Durre (imke.durre@noaa.gov) IGRA Website Jon Burroughs (jon.burroughs@noaa.gov) MeteoSwiss Rolf Philipona (rolf.philipona@meteoswiss.ch)
Notes	ftp://ftp.ncdc.noaa.gov/pub/data/igra/readme.txt ftp://ftp.ncdc.noaa.gov/pub/data/igra/ FTP access to data and metadata

2.3 COMPOSITION

2.3.1 Ozone

Sub parameters	Ozone (total), UV radiation
Network(s)	WMO/GAW GCOS Global Baseline Total Ozone Network
Stations	WMO/GAW GCOS Global Baseline Total Ozone Network: Arosa, Jungfraujoch
Data centers	World Ozone and Ultraviolet Radiation Data Centre (WOUDC) Environment Canada, Toronto, Canada http://www.woudc.org/index_e.html
Responsible institution for data submission	Arosa Swiss Federal Office of Meteorology and Climatology (MeteoSwiss) Jungfraujoch Université de Liège
Data submission	E-mail, FTP
Data format	ASCII (based on NASA Ames)
Data access	FTP download of different formats (e.g. csv), alternatively via GAW SIS
Data quality	The data center conducts plausibility tests. Calibrations of the Dobson and Brewer instruments are documented for many years and supported by numerous comparisons.
Online Performance Monitoring	Plots of time series are available at http://es-ee.tor.ec.gc.ca/cgi-bin/totalozone/
Publications	http://www.woudc.org/publications_e.html
User statistics	Not evident
Contact	WOUDC Mr Ed Hare (ed.hare@ec.gc.ca) MeteoSwiss René Stübi (rene.stuebi@meteoswiss.ch) Université de Liège Philippe Démoulin (demoulin@astro.ulg.ac.be)
Notes	Some ozone data are also available at the WRMC-BSRN data center (See chapter 2.1.5)

Sub parameters	Ozone (vertical profile), UV radiation
Network(s)	WMO/GAW GCOS Global Baseline Profile Ozone Network
Stations	WMO/GAW GCOS Global Baseline Profile Ozone Network: Arosa (Umkehr), Payerne, Thalwil (historic)
Data centers	World Ozone and Ultraviolet Radiation Data Centre (WOUDC) Environment Canada, Toronto, Canada http://www.woudc.org/index_e.html
Responsible institution for data submission	Arosa, Payerne Swiss Federal Office of Meteorology and Climatology (MeteoSwiss) Thalwil Swiss Federal Office of Meteorology and Climatology (MeteoSwiss)
Data submission	E-mail, FTP
Data format	ASCII (based on NASA Ames)
Data access	FTP download of different formats (e.g. csv), alternatively via GAWSIS
Data quality	„Scientific sponsorship statements“, mainly UV radiation, partly ozone soundings, describes stations and data quality, available at ftp://ftp.tor.ec.gc.ca/pub/woudc/Metadata/Agencies/AWI-NM/AWIPMR-SSS.htm . The data center conducts plausibility tests.
Online Performance Monitoring	Not evident
Publications	http://www.woudc.org/publications_e.html
User statistics	Not evident
Contact	WOUDC Mr Ed Hare (ed.hare@ec.gc.ca) MeteoSwiss René Stübi (rene.stuebi@meteoswiss.ch)
Notes	Some ozone data are also available at the WRMC-BSRN data center (see chapter 2.1.5)

Sub parameters	Ozone (vertical profile, total)
Network(s)	Network for the Detection of Atmospheric Composite Change (NDACC)
Stations	Bern/Zimmerwald Ozone, water vapour (microwave) Payerne, Arosa Ozone (Dobson, Brewer) Jungfraujoch Ozone and other gases (SAOZ/DOAS, FTIR)
Data centers	Network for the Detection of Atmospheric Composite Change (NDACC) National Oceanic and Atmospheric Administration (NOAA), Camp Springs (MD), US http://www.ndsc.ncep.noaa.gov/
Responsible institution for data submission	Bern/Zimmerwald University of Bern Arosa, Payerne Swiss Federal Office of Meteorology and Climatology (MeteoSwiss) Jungfraujoch Université de Liège
Data submission	E-mail, FTP
Data format	ASCII (NASA Ames)
Data access	FTP download of different formats (e.g. hdf) ftp://ftp.cpc.ncep.noaa.gov/ndacc/station/bern ftp://ftp.cpc.ncep.noaa.gov/ndacc/station/payerne ftp://ftp.cpc.ncep.noaa.gov/ndacc/station/arosa ftp://ftp.cpc.ncep.noaa.gov/ndacc/station/jungfrau Alternatively via GAW SIS NDACC data are available for free at latest two years after measuring.
Data quality	Different NDACC Working Groups are responsible for the compliance of quality objectives.
Online Performance Monitoring	Not yet available
Publications	Not evident
User statistics	Not evident
Contact	NDACC Jeannette Wild (jeannette.wild@noaa.gov) Bern Niklaus Kämpfer (niklaus.kaempfer@iap.unibe.ch), Klemens Hocke (klemens.hocke@iap.unibe.ch) MeteoSwiss Payerne Dominique Ruffieux (dominique.ruffieux@meteoswiss.ch), Pierre Jeannet (pierre.jeannet@meteoswiss.ch) MeteoSwiss Arosa René Stübi (rene.stuebi@meteoswiss.ch) Jungfraujoch Philippe Demoulin (demoulin@astro.ulg.ac.be), Rudy Zander (zander@astro.ulg.ac.be), Emmanuel Mahieu (mahieu@atmosfer.astro.ulg.ac.be), Martine DeMaziere (Martine.DeMaziere@bira-iasb.oma.be)
Notes	NDACC stations are part of GAW SIS

2.3.2 Carbon dioxide

Sub parameters	Carbon dioxide (CO ₂) concentration, carbon dioxide isotopes
Network(s)	WMO/GAW GCOS Global CO₂ Observation Network
Stations	Jungfrauoch
Data centers	World Data Centre for Greenhouse Gases (WDCGG) Japan Meteorological Agency (JMA), Tokyo, Japan http://ds.data.jma.go.jp/gmd/wdcgg/
Responsible institution for data submission	University of Bern Swiss Federal Laboratories for Materials Science and Technology (Empa) (with financial support of FOEN)
Data submission	E-mail or FTP
Data format	ASCII, comma-separated See http://www.wmo.int/pages/prog/arep/gaw/documents/GAW_188_web_20100128.pdf
Data access	Data are not yet available. Online access to provisional data (http://www.climate.unibe.ch/?L1=research&L2=NRT)
Data quality	The data center conducts plausibility tests. The CO ₂ concentration is determined twice independently. Comparisons of data (University of Bern – Empa, University of Bern – MPI Jena respectively) are conducted regularly. The data center conducts plausibility tests.
Online Performance Monitoring	Available on a limited scope. E-mails, concerning information on newly available data or meta data, are being sent monthly by WDCGG (see http://ds.data.jma.go.jp/wdcgg/update/update.html).
Publications	http://ds.data.jma.go.jp/gmd/wdcgg/products/publication.html
User statistics	Number of downloads available for every data file
Contact	WDCGG Mr Hiroshi Koide (hkoide@met.kishou.go.jp) University of Bern Markus Leuenberger (leuenberger@climate.unibe.ch) Empa Brigitte Buchmann (brigitte.buchmann@empa.ch)
Notes	All stations are part of GAWSIS. Other data centers for greenhouse gases are the Carbon Dioxide Information Analysis Center (CDIAC, Oak Ridge, Tennessee, US), and NOAA-ESRL (Boulder, Colorado, US), no Swiss data in both of them.

2.3.3 Greenhouse gases

Sub parameters	CH ₄ , CFCs, HCFCs, HFCs, PFCs, N ₂ O, SF ₆
Network(s)	WMO/GAW Global Greenhouse Gas Observation Network AGAGE/SOGE/NIES
Stations	Jungfraujoch
Data centers	WDCGG See chapter 2.3.2 AGAGE Data Base Georgia Institute of Technology, Atlanta, Georgia, US; Massachusetts Institute of Technology, MIT, Cambridge, US http://agage.eas.gatech.edu/data_archive/agage/ or https://agage.mit.edu/
Responsible institution for data submission	Swiss Federal Laboratories for Materials Science and Technology (Empa) (with financial support of FOEN)
Data submission	E-mail
Data format	ASCII
Data access	WDCGG via HTTP, per station Jungfraujoch: http://ds.data.jma.go.jp/gmd/wdcgg/pub/products/cd-rom/dvd_04/metadata/met/data/200905270058.html Alternative access via FTP http://ds.data.jma.go.jp/gmd/wdcgg/pub/data/current/ AGAGE/SOGE/NIES Two years after the monitoring, the dataset is freely available via FTP
Data quality	WDCGG See chapter 2.3.2 AGAGE has earned an outstanding reputation among the research community. Statements on data quality can be found in the literature.
Online Performance Monitoring	WDCGG See chapter 2.3.2 AGAGE The performance of the monitoring network is discussed in regular meetings.
Publications	WDCGG See chapter 2.3.2 AGAGE literature, list available at http://agage.mit.edu/research/publications
User statistics	Not evident
Contact	WDCGG See chapter 2.3.2 AGAGE Ronald G. Prinn (rprinn@mit.edu) AGAGE Archive Hsiang J. (Ray) Wang (raywang@eas.gatech.edu) Empa Stefan Reimann (Stefan.reimann@empa.ch), Martin Vollmer (martin.vollmer@empa.ch)
Notes	Alternative access via GAW SIS.

2.3.4 Air pollutants

Sub parameters	Ground-level ozone (in situ surface ozone, O ₃), ozone precursor (CO, NO, NO ₂ , VOC), SO ₂
Network(s)	WMO/GAW Network (global and regional), EMEP
Stations	WMO/GAW Network (global and regional) Jungfrauoch, Payerne, Rigi EMEP/NABEL Chaumont, Jungfrauoch, Payerne, Rigi, Sion (historic), Tänikon
Data centers	WDCGG See chapter 2.3.2 EBAS Norsk institutt for luftforskning (NILU), Kjeller, Norway http://ebas.nilu.no/Default.aspx
Responsible institution for data submission	Swiss Federal Laboratories for Materials Science and Technology (Empa) (with financial support of FOEN)
Data submission	WDCGG See chapter 2.3.2 EBAS E-mail
Data format	WDCGG See chapter 2.3.2 EBAS ASCII (EBAS NASA Ames)
Data access	WDCGG via HTTP, per Station - Jungfrauoch: http://ds.data.jma.go.jp/gmd/wdcgg/pub/products/cd-rom/dvd_04/metadata/met/data/200905270058.html - Payerne: http://ds.data.jma.go.jp/gmd/wdcgg/pub/products/cd-rom/dvd_04/metadata/met/data/200905270098.html - Rigi: http://ds.data.jma.go.jp/gmd/wdcgg/pub/products/cd-rom/dvd_04/metadata/met/data/200905270103.html Alternative access via FTP http://ds.data.jma.go.jp/gmd/wdcgg/pub/data/current/ EBAS via search function via EMEP description of stations (not up-to-date) - Chaumont: http://www.nilu.no/projects/ccc/sitedescriptions/ch/ch0004.html - Jungfrauoch: http://www.nilu.no/projects/ccc/sitedescriptions/ch/ch0001.html - Payerne: http://www.nilu.no/projects/ccc/sitedescriptions/ch/ch0002.html - Rigi: http://www.nilu.no/projects/ccc/sitedescriptions/ch/ch0005.html - Tänikon: http://www.nilu.no/projects/ccc/sitedescriptions/ch/ch0003.html NABEL Online query of provisional data (near real time) via FOEN website http://www.bafu.admin.ch/luft/luftbelastung/blick_zurueck/datenabfrage/index.html?lang=en Current description of stations (NABEL): Chaumont: http://www.bafu.admin.ch/luft/00612/00625/00630/02163/index.html?lang=de Jungfrauoch: http://www.bafu.admin.ch/luft/00612/00625/00630/02168/index.html?lang=de Rigi: http://www.bafu.admin.ch/luft/00612/00625/00630/02165/index.html?lang=de Tänikon: http://www.bafu.admin.ch/luft/00612/00625/00630/02162/index.html?lang=de
Data quality	WDCGG See chapter 2.3.2 EBAS Not evident NABEL Uncertainties of measurements are documented in the report of the national observation network for air pollutants (NABEL) (http://www.empa.ch/plugin/template/empa/699/). Regular participation at international round-robin comparisons.

Online Performance Monitoring	<p>WDCGG See chapter 2.3.2</p> <p>EBAS Not evident</p>	
Publications	<p>WDCGG See chapter 2.3.2</p> <p>EBAS Not evident</p> <p>NABEL Annual reports on air pollution http://www.bafu.admin.ch/publikationen/00016/index.html?lang=en</p>	
User statistics	<p>WDCGG See chapter 2.3.2</p> <p>EBAS Not evident</p>	
Contact	<p>WDCGG See chapter 2.3.2</p> <p>EBAS Aasmund Fare Vik (afv@nilu.no)</p> <p>Empa/NABEL Brigitte Buchmann (brigitte.buchmann@empa.ch)</p>	
Notes	<p>Alternative access via GAWSIS.</p> <p>EBAS is a regional data center based on CLRTAP. It predominantly serves EMEP, but additionally operates the WDCA (see chapter 2.3.5) and GEOmon data center (see chapter 2.3.1) since 2010. Data should as well be delivered to WDCGG (see chapter 2.3.2), however, at the moment no agreement between EBAS and WDCGG exists.</p>	

2.3.5 Aerosols

Sub parameters	Aerosols (optical, physical, chemical)
Network(s)	WMO/GAW Aerosol Network, EMEP
Stations	WMO/GAW Aerosol Network Jungfrauoch EMEP/NABEL Chaumont, Jungfrauoch, Payerne, Rigi, Tänikon
Data centers	World Data Centre for Aerosols (WDCA) Norwegian Institute for Air Research, NILU, Kjeller, Norway http://www.gaw-wdca.org/ The data center itself is the EBAS data base where WDCA is listed as a project (see chapter 2.3.4)
Responsible institution for data submission	Aerosol mass concentration Swiss Federal Laboratories for Materials Science and Technology (Empa) Aerosol chemical, physical characteristics Paul Scherrer Institute (PSI) Aerosol optical depth Physical Meteorological Observatory Davos/World Radiation Center (PMOD/WRC)
Data submission	E-mail
Data format	ASCII (EBAS NASA Ames)
Data access	Via web-interface
Data quality	Not evident
Online Performance Monitoring	Not evident
Publications	WDCA The WDCA website lists links referring to reports, guidelines, etc. NABEL Annual reports on air pollution http://www.bafu.admin.ch/publikationen/00016/index.html?lang=en
User statistics	Not evident
Contact	WDCA Markus Fiebig (markus.fiebig@nilu.no) Jungfrauoch Urs Baltensperger (urs.baltensperger@psi.ch), Ernest Weingartner (ernest.weingartner@psi.ch), Brigitte Buchmann (brigitte.buchmann@empa.ch), Christoph Wehrli (christoph.wehrli@pmodwrc.ch) Chaumont, Jungfrauoch, Payerne, Rigi, Tänikon Brigitte Buchmann (brigitte.buchmann@empa.ch)
Notes	On March 8th, 2011, WDCA listed 8077 data sets. Yet WDCA lists e.g. under optical measurements each wave length as separate data set. Additionally it lists statistical parameters as separate data set as well. Via EBAS, WDCA is part of GAW SIS

Sub parameters	Aerosol optical depth (AOD), particle size (Ångström parameter); Inversions like size distribution, single scattering albedo, phase functions and complex index of refraction
Network(s)	AERONET
Stations	Davos (2001 - today), Lägeren (1995 - 2010), Jungfrauoch (only 1996)
Data centers	AERONET Aerosol Robotic Network, NASA GSFC, Greenbelt (MD), US http://aeronet.gsfc.nasa.gov/new_web/index.html
Responsible institution for data submission	Davos Physical Meteorological Observatory Davos/World Radiation Center (PMOD/WRC) Lägeren University of Bern, Department of Geography
Data submission	E-mail
Data format	ASCII, custom
Data access	AOD data can be selected at http://aeronet.gsfc.nasa.gov/cgi-bin/webtool_opera_v2_new . A compressed data file is further provided for download purposes via HTTP.
Data quality	All observations follow a strict protocol, which guaranties a high data quality
Online Performance Monitoring	The status of every instrument within the network is available at http://aeronet.gsfc.nasa.gov/cgi-bin/sort_status_page_new2?owner=0
Publications	Access to reports and science papers, references respectively via http://aeronet.gsfc.nasa.gov/new_web/publications.html
User statistics	Not evident
Contact	AERONET Brent Holben (Brent.N.Holben@nasa.gov) Davos Christoph Wehrli (christoph.wehrli@pmodwrc.ch) Jungfrauoch Didier Tanri (tanre@loa.univ-lille1.fr) Lägeren Stefan Wunderle (stefan.wunderle@giub.unibe.ch)
Notes	AERONET is partly taken into account in GAW SIS

Sub parameters	AOD, Ångström coefficients alpha and beta
Network(s)	GAW Precision Filter Radiation (PFR) Network
Stations	Jungfraujoch
Data centers	WDCA See p. 28 WORCC World Optical Depth Research and Calibration Centre, PMOD/WRC, Davos http://www.pmodwrc.ch/worcc/index.html
Responsible institution for data submission	Physical Meteorological Observatory Davos/World Radiation Center (PMOD/WRC)
Data submission	Automatically or manually via FTP, E-mail
Data format	ASCII
Data access	AOD hourly means via WDCA. Data of WORCC with a 1-minute-resolution are available on request.
Data quality	Central calibration of the instruments, quality control through PMOD/WRC
Online Performance Monitoring	WDCA Not evident WORCC ftp://ftp.pmodwrc.ch/pub/gawpfr/quicklook_graphs/JFJ_N26_daily_L2.png (PFR signal) ftp://ftp.pmodwrc.ch/pub/gawpfr/quicklook_graphs/JFJ_N26_daily_L3.png (AOD, Ångström coef.) ftp://ftp.pmodwrc.ch/pub/gawpfr/quicklook_graphs/JFJ_monthly_L3.png ((AOD, Ångström coef.)
Publications	http://www.pmodwrc.ch/worcc/pmod.php?topic=publications_menu
User statistics	Not evident
Contact	WDCA See above WORCC Christoph Wehrli (christoph.wehrli@pmodwrc.ch)
Notes	WORCC is not a data center in the proper sense, but more likely some kind of a 'processing hub'. The data files are achieved in WDCA

Sub parameters	Vertical profiles of aerosol backscatter and extinction coefficients	
Network(s)	GAW Aerosol Lidar Observation Network (GALION) European Aerosol Research Lidar Network (EARLINET)	
Stations	Jungfraujoch	
Data centers	General information: http://alg.umbc.edu/galion/ and http://www.earlinet.org/ GALION GALION does not have its own data center EARLINET-ASOS Database NILU http://access.earlinet.org/EARLINET/Default.aspx	
Responsible institution for data submission	Swiss Federal Office of Meteorology and Climatology (MeteoSwiss)	
Data submission	MeteoSwiss	
Data format	netCDF	
Data access	Login required. EARLINET data files are available for free, an application is necessary	
Data quality	Not evident	
Online Performance Monitoring	Not evident	
Publications	Not evident	
User statistics	Not evident	
Contact	GALION Gelsomina Pappalardo (pappalardo@imaa.cnr.it) EARLINET Gelsomina Pappalardo (pappalardo@imaa.cnr.it) EARLINET-ASOS Database Holger Linne (Holger.Linne@zmaw.de), Aasmund Fare Vik (afv@nilu.no) MeteoSwiss Alexander Haefele (alexander.haefele@meteoswiss.ch)	
Notes		

2.3.6 Pollen

Sub parameters	Airborne pollen number concentration of 45 pollen taxa
Network(s)	European Aeroallergen Network (EAN) , MeteoSwiss-NAPOL (Swiss National Pollen Monitoring Network)
Stations	MeteoSwiss-NAPOL (Swiss National Pollen Monitoring Network) Basel, Bern, Buchs, Davos, Davos-Platz (inactive), Geneva, La Chaux de Fonds, Lausanne, Locarno, Lugano, Luzern, Münsterlingen, Neuchâtel, Visp, Zurich, Nyon (inactive), Payerne (inactive), Samedan (inactive), Wiesen (inactive)
Data centers	European Aeroallergen Network (EAN) https://ean.polleninfo.eu/Ean/ PollenInfo.org http://www.polleninfo.org/
Responsible institution for data submission	Swiss Federal Office of Meteorology and Climatology (MeteoSwiss)
Data submission	EAN E-mail on a weekly basis with information on daily means from 14 types of pollen (monitoring of 45 types of pollen by MeteoSwiss, as of 2011, monitoring of the concentration on a 2-hourly basis)
Data format	polleninfo.org ASCII Files
Data access	EAN Login required polleninfo.org no single data available but a lot of information for the end user.
Data quality	Recommendations of the EAS European Aerobiology Society
Online Performance Monitoring	Not evident
Publications	Not evident
User statistics	Available at EAN
Contact	MeteoSwiss Regula Gehrig (regula.gehrig@meteoswiss.ch), Bernard Clot (bernard.clot@meteoswiss.ch)
Notes	

Sub parameters	Pollen concentration of sediment cores	
Network(s)	Not specified	
Stations	7 Swiss lakes	
Data centers	European Pollen Database (EPD) (paleoclimatological applications) http://www.europeanpollendatabase.net/	
Responsible institution for data submission	University of Bern, Institute of Plant Science, Paleoecology	
Data submission	Not evident	
Data format	ASCII Files	
Data access	Single data files for Swiss stations are available at http://www.europeanpollendatabase.net/data/sitefiles/europe/ch/	
Data quality	Not evident	
Online	Not evident	
Performance		
Monitoring		
Publications	Not evident	
User statistics	Not evident	
Contact	EPD Richard Bradshaw (richard.bradshaw@liv.ac.uk), Valérie Andrieu-Ponel (valerie.andrieu@univ-cezanne.fr) Institute of Plant Science Bern Pim van der Knaap (pim.vanderknaap@ips.unibe.ch), Willy Tinner (willy.tinner@ips.unibe.ch)	
Notes		

3 Terrestrial Domain

3.1 HYDROSPHERE

3.1.1 River discharge

Sub parameters	Discharge (most important rivers)
Network(s)	GCOS/GTOS Baseline Global Terrestrial Network - Rivers (GTN-R)
Stations	A catalogue of GRDC stations is available at http://www.bafg.de/GRDC/EN/02_srvcs/21_tmsrs/211_ctlgs/catalogues_node.html Within these data files are 48 of Switzerland's most important stations
Data centers	Global Runoff Data Centre (GRDC) Federal Institute of Hydrology, Koblenz, Germany http://grdc.bafg.de
Responsible institution for data submission	Swiss Federal Office for the Environment (FOEN), Hydrology Division
Data submission	Data are submitted annually as quality-controlled daily means E-mail (grdc@bafg.de) or via individual FTP accounts
Data format	ASCII
Data access	Monthly data based on long term measurement series and characteristics of GRDC stations are available at ftp://ftp.bafg.de/pub/REFERATE/GRDC/ldata/europe.zip . See catalogue of GRDC stations above.
Data quality	Quality-controlled data
Online Performance Monitoring	Not evident, information on the stations listed above.
Publications	None
User statistics	Not evident
Contact	FOEN hydrologie@bafu.admin.ch
Notes	

3.1.2 Lakes

Sub parameters	Water level	
Network(s)	GCOS/GTOS Baseline Global Lake Network (GTN-L, under GTN-H)	
Stations	GTN-L: Bodensee-Constance, Lemman (Geneva), Maggiore http://www.wmo.int/pages/prog/gcos/documents/List%20of%20GTNLakes%202010.pdf	
Data centers	HYDROLARE International Data Centre on the Hydrology of Lakes and Reservoirs, State Hydrological Institute, ROSHYDROMET, St. Petersburg, Russia http://www.hydrolare.net/	
Responsible institution for data submission	Swiss Federal Office for the Environment (FOEN), Hydrology Division	
Data submission	FOEN annually supplies data as quality-controlled daily means to Hydrolare E-mail (fdc@hydrolare.net) or via individual FTP accounts.	
Data format	Exel templates of HYDROLARE	
Data access	HYDROLARE Data of 26 Swiss Lakes are available on the HYDROLARE data portal http://www.hydrolare.net/data_availability.php A user declaration has to be signed and submitted to HYDROLARE to get the data http://www.hydrolare.net/data_policy.php	
Data quality	Quality-controlled data	
Online Performance Monitoring	Under construction	
Publications	http://www.hydrolare.net/reports.php lists meeting reports	
User statistics	Not evident	
Contact	FOEN hydrologie@bafu.admin.ch	
Notes		

Sub parameters	Lake surface and lake temperature	
Network(s)	GCOS/GTOS Baseline Global Lake Network (GTN-L, under GTN-H)	
Stations	Bodensee-Constance, Lemman (Geneva), Maggiore http://www.wmo.int/pages/prog/gcos/documents/List%20of%20GTNLakes%202010.pdf Long time series for temperature exist for Lake Zurich (since 1936, data belong to Water Supply Zurich), Lake Greifen (since 1956), Lake Walenstadt (since 1972), Upper Lake Zurich (since 1972), Lake Neuchâtel (data belong to the canton of Neuchâtel) and for some other, smaller lakes, e.g. in the canton of Zurich (data belong to the AWEL)	
Data centers	HYDROLARE International Data Centre on the Hydrology of Lakes and Reservoirs, State Hydrological Institute, ROSHYDROMET, St. Petersburg, Russia http://www.hydrolare.net	
Responsible institution for data submission	Unclear situation	
Data submission	Format template in Excel (HYDROLARE)	
Data format	Excel files	
Data access	HYDROLARE So far, no data sets of Swiss lakes are available at Hydrolare http://www.hydrolare.net/data_availability.php	
Data quality	Not evident	
Online Performance Monitoring	Under construction	
Publications	http://www.hydrolare.net/reports.php lists meeting reports	
User statistics	Not evident	
Contact	Eawag David Livingstone (david.livingstone@eawag.ch) University of Bern, Institute of Geography Stefan Wunderle (stefan.wunderle@giub.unibe.ch) HYDROLARE Prof. Valery Vuglinsky (idc@hydrolare.ru)	
Notes	Currently data are achieved as follows: <ul style="list-style-type: none"> - Bodensee/Constance (No 8): Bernd Wahl, Institute for Lake Research, Langenargen, Germany; partly Dietmar Straile, Institute of Limnology at the University of Constance; - Genfersee/Léman (No 41): Data for Lake Geneva are monitored and managed by the official Franco-Swiss organisation CIPEL (http://www.cipel.org/sp/) - Langensee/Maggiore (No 43): maybe Pallanza (CNR Istituto Italiano di Idrobiologia, L.go V. Tonolli 50, 28922 Verbania-Pallanza, Italy). Possible contacts: Marco Simona (marco.simona@supsi.ch) and/or Mauro Veronesi (mauro.veronesi@supsi.ch) from Scuola Universitaria Professionale della Svizzera Italiana (SUPSI). Further Lakes outside of Switzerland with Swiss activities: No 33 (Issyk-Kul) and No 76 (Van), contact: Rolf Kipfer (rolf.kipfer@eawag.ch)	

Sub parameters	Lake freeze-up data	
Network(s)	GCOS/GTOS Baseline Global Lake Network (GTN-L, under GTN-H)	
Stations	Lej da San Murezzan, Lej da Silvaplauna (historic), Lej da Segl (historic)	
Data centers	National Snow and Ice Data Centre (NSIDC) – World Glacier Inventory CIRES, University of Colorado, Boulder (CO), US http://nsidc.org/data/lake_river_ice/	
Responsible institution for data submission	No institution defined, preliminary data submissions by D. Livingstone (Eawag)	
Data submission	Not evident	
Data format	ASCII	
Data access	Data are available at http://nsidc.org/data/lake_river_ice/freezethaw.html Lej da San Murezzan (1831 - 2012) Lej da Silvaplauna (1864 - 1943) Lej da Segl (1864 - 1945)	
Data quality	Not evident	
Online Performance Monitoring	Not evident	
Publications	None	
User statistics	Not evident	
Contact	NSIDC NSIDC User Service (nsidc@nsidc.org) Eawag David Livingstone (david.livingstone@eawag.ch)	
Notes	A comprehensive overview of the wide range of Swiss lakes in Franssen and Scherrer (2008) Int. J. Climat. 28, 421-433, doi: 10.1002/joc.1559	

3.1.3 Groundwater

Sub parameters	Groundwater level, spring discharge, groundwater recharge
Network(s)	Global Terrestrial Network – Groundwater (GTN-GW, under GTN-H) NAQUA
Stations	GTN-GW Swiss stations are not apparent National Groundwater Observation NAQUA, Module QUANT (Groundwater quantity) as part of the Federal Office for the Environment (FOEN) (59 monitoring stations from the federal government, 30 monitoring stations from the cantonal government) Additional 400 cantonal stations for level and spring discharge observations.
Data centers	International Groundwater Resources Assessment Centre (IGRAC) WMO / UNESCO http://www.igrac.net/ Water Information System for Europe (WISE) of the European Environment Agency EEA http://www.eea.europa.eu/themes/water/dc The data of 50 NAQUA monitoring stations are submitted to the EEA annually, although the EEA is not an official international GCOS data center.
Responsible institution for data submission	Swiss Federal Office for the Environment (FOEN), Hydrology Division
Data submission	Data are annually submitted as quality-controlled monthly means E-Mail (nienke.ansems@un-igrac.org)
Data format	ASCII
Data access	IGRAC Not evident (http://ggms.e-id.nl/ggms/GGMS.html login required) WISE EEA http://www.eea.europa.eu/themes/water/dc Aggregate data is listed in accordance with EEA-Guidelines. In Switzerland via Hydroweb FOEN http://www.hydrodaten.admin.ch/de/index.html?lang=de Raw data and validated data is listed and is available for download purposes.
Data quality	Validated data
Online Performance Monitoring	Not evident
Publications	GTOS report on ground water: GTOS Report V5 (2008)
User statistics	Not evident
Contact	FOEN , Hydrology Division, Marc Schürch (hydrogeologie@bafu.admin.ch)
Notes	

3.1.4 Water use

Sub parameters	Irrigated areas, water use in agriculture; withdrawal, treatment, supply of drinking and process water	
Network(s)	Global Terrestrial Network – Hydrology (GTN-H), Water Use	
Stations	Not evident	
Data centers	AQUASTAT Food and Agricultural Organization of the United Nations (FAO) http://www.fao.org/nr/water/aquastat/main/index.stm http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=en	
Responsible institution for data submission	Data on water use in agriculture was collected by the Federal Office for Agriculture (FOAG) in 2007. It was published in GCOS Switzerland Progress Report 2008 for the attention of UNFCCC. For now, further data collection as well as regularly data submissions to the FAO (AQUASTAT) is not planned by FOAG.	
Data submission	Irregularly	
Data format	ASCII	
Data access	Via web interface an HTML table can be generated	
Data quality	Not evident	
Online Performance Monitoring	Not evident	
Publications	http://www.fao.org/nr/water/aquastat/catalogues/index2.stm	
User statistics	Not evident	
Contact	FOAG Christine Zundel christine.zundel@blw.admin.ch	
Notes		

3.1.5 Isotopes

Sub parameters	Isotopes of hydrogen (2-H) and oxygen (18-O) in precipitation and rivers	
Network(s)	Global Network of Isotopes in Precipitation (GNIP) ; Global Network of Isotope in Rivers (GNIR)	
Stations	National observation of ground water, NAQUA, module ISOT (Isotopes) of the Federal Office for the Environment (FOEN); 13 stations for precipitation and 9 stations for rivers	
Data centers	WISER (Water Isotope System for Data Analysis, Visualization, and Electronic Retrieval) International Atomic Energy Agency (IAEA) http://www-naweb.iaea.org/naweb/ih/IHS_resources_isohis.html Data is supplied annually.	
Responsible institution for data submission	Swiss Federal Office for the Environment (FOEN), Hydrology Division	
Data submission	E-mail	
Data format	ASCII, Excel	
Data access	WISER database is under construction, availability of precipitation data only until 2008, data of river monitoring sites currently not available Login required (account is opened immediately) Monthly mean of 2-H, 18-O, precipitation, temperature, vapour pressure	
Data quality	Validated data	
Online Performance Monitoring	Not evident	
Publications	Not evident	
User statistics	Not evident	
Contact	FOEN , Hydrology Division, Marc Schürch (hydrogeologie@bafu.admin.ch)	
Notes		

3.1.6 Soil moisture

Sub parameters	In-situ soil moisture	
Network(s)	Global Terrestrial Network on Soil Moisture (GTN-SM) , planned	
Stations	National Soil Monitoring Network of chemical, physical and biological parameters (NABO-Reference Network) Swiss Soil Moisture Experiment (SwissSMEX): Automatic soil moisture observations with TDR-probes in 5-100cm depth at 19 different observation stations (grassland, forest and arable); NFP “Sustainable Use of Soil Resources: New Challenges”; In ISMN no Swiss station is listed.	
Data centers	International Soil Moisture Network (ISMN) Institute of Photogrammetry and Remote Sensing Vienna University of Technology (TU Vienna) http://www.ipf.tuwien.ac.at/insitu/data_viewer/visualizer_v0.9.5_js.php	
Responsible institution for data submission	Swiss Federal Institute of Technology Zurich (ETH Zurich) Agroscope Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) Swiss Federal Office of Meteorology and Climatology (MeteoSwiss)	
Data submission	Not evident	
Data format	Not evident	
Data access	Not evident, data can be visualized.	
Data quality	Not evident	
Online Performance Monitoring	Not evident	
Publications	http://www.iac.ethz.ch/groups/seneviratne/research/SwissSMEX	
User statistics	Not evident	
Contact	ETH Zurich S. Seneviratne (sonia.seneviratne@env.ethz.ch) MeteoSwiss C. Spirig (christoph.spirig@meteoswiss.ch), Y.-A. Roulet (yves-alain.roulet@meteoswiss.ch) WSL E. Graf Pannatier (elisabeth.pannatier@wsl.ch) ISMN Wouter Dorigo (wd@ipf.tuwien.ac.at) Research Station Agroscope Reckenholz-Tänikon ART Jürg Fuhrer (juerg.fuhrer@art.admin.ch)	
Notes	SwissSMEX ended in summer 2011, yet the continuation of observations and long term monitorings is still open. In-situ soil moisture is not monitored by NABO. NABO specifies soil qualities on a basis of 1-3 soil samples a year.	

3.2 CRYOSPHERE

3.2.1 Snow cover

Sub parameters	Snow depth, new snow depth, snow water equivalent	
Network(s)	WWW/GOS Synoptic Network (WWW/GOS) GTN-Snow non-existent	
Stations	- Definition of the most important Swiss monitoring stations on snow in a climatological context (among other: GCOS snow stations): see Progress Report 233 of MeteoSwiss in cooperation with SLF (2010) (in German) - Near real-time snow monitoring data of 23 Swiss SYNOP stations (new snow and snow depth are monitored manually) are delivered to DWD by MeteoSwiss via GTS	
Data centers	National Snow and Ice Data Centre (NSIDC) CIRES, University of Colorado, Boulder (CO), US http://nsidc.org/ National Climatic Data Center (NCDC) Global Surface Summary of Day (GSOD), Ashville (NC), US http://www.ncdc.noaa.gov/	
Responsible institution for data submission	Swiss Federal Institute for Forest, Snow and Landscape Research - Institute for Snow and Avalanche Research (WSL-SLF) Swiss Federal Office of Meteorology and Climatology (MeteoSwiss)	
Data submission	Not evident, daily SYNOP respectively	
Data format	Not evident, SYNOP data format respectively	
Data access	- No international data center for in-situ snow observations. The NSIDC does not list any snow data from Switzerland. - Through the Global Surface Summary of Day (GSOD) of NCDC, information on stations and data availability of SYNOP reports, delivered to DWD, is available (no climatological information): ftp://ftp.ncdc.noaa.gov/pub/data/noaa/isd-history.txt	
Data quality	Not evident, SYNOP standards respectively	
Online Performance Monitoring	Not evident	
Publications	Not evident	
User statistics	Not evident	
Contact	WSL-SLF Christoph Marty (marty@slf.ch) MeteoSwiss Marc Musa (marc.musa@MeteoSwiss.ch) NSIDC User Services Office (nsidc@nsidc.org) NCDC User Services Office (ncdc.orders@noaa.gov)	
Notes	The European Centre for Medium-Range Weather Forecasts (ECMWF) asked their member states (incl. Switzerland) to improve the exchange of snow data for assimilation. MeteoSwiss is working on this request.	

3.2.2 Glaciers

Sub parameters	Inventory (area, length, elevation at a time) & fluctuations (changes in length, area, volume, mass, and flow velocity (only in Switzerland))
Network(s)	GCOS/GTOS Baseline Global Terrestrial Network for Glaciers (GTN-G)
Stations	<p>http://www.wgms.ch/fog/wgms_2012_fogX.pdf</p> <p>WGI-inventory Assessment of total glaciation; detailed information for approx. 100'000 glaciers (Switzerland: all 2057 for 1973)</p> <p>GLIMS-inventory Digital glacier outlines for approx. 93'000 glaciers (Switzerland: 1124 for 1998/99)</p> <p>Length change Approximately 1800 glaciers in total, at the moment determined for approx. 700 glaciers (Switzerland: currently approx. 110)</p> <p>Mass balance Approximately 250 glaciers in total, at the moment determined for approx. 110 glaciers (Switzerland: currently 8)</p>
Data centers	<p>World Glacier Monitoring Service (WGMS) Dept. of Geography, University of Zurich, Switzerland http://www.wgms.ch</p> <p>National Snow and Ice Data Centre (NSIDC) – World Glacier Inventory (WGI) CIRES, University of Colorado, Boulder (CO), US http://nsidc.org/data/g01130.html http://nsidc.org/data/glacier_inventory/index.html</p> <p>National Snow and Ice Data Centre (NSIDC) – Global Land Ice Measurements from Space (GLIMS) CIRES, University of Colorado, Boulder (CO), US http://glims.colorado.edu/glacierdata/</p> <p>National Snow and Ice Data Centre (NSIDC) – Glacier Photograph Collection CIRES, University of Colorado, Boulder (CO), US http://nsidc.org/data/glacier_photo/index.html</p> <p>Swiss Glacier Monitoring Network (GLAMOS) VAW, ETH Zurich, Switzerland http://glaciology.ethz.ch/swiss-glaciers/</p>
Responsible institution for data submission	<p>NSIDC WGI inventories</p> <p>GLIMS GLIMS inventories</p> <p>WGMS via GLAMOS Fluctuations, through National Correspondent</p>
Data submission	<p>WGMS Active, annual „calls for data“ via National Correspondents; format defined by WGMS</p> <p>NSIDC Passive, on request</p> <p>GLIMS Passive, on request</p> <p>GLAMOS Active, annual calls</p>
Data format	<p>WGMS, NSIDC XLS, ASCII</p> <p>GLIMS Different formats available (ESRI, MapInfo, GML, KML, GMT)</p> <p>GLAMOS XLS, ASCII, XML, KML</p>
Data access	<p>WGMS Access to data for most of the glaciers until 2009, order by e-mail.</p> <p>NSIDC http://nsidc.org/data/glacier_inventory/browse.html (direct access)</p> <p>GLIMS Direct access via search mask, for Switzerland 1124 records were found → www.gtn-g.org as „one-stop-portal“ for WGMS, NSIDC and GLIMS</p> <p>GLAMOS Instant access to data for every Swiss glacier http://glaciology.ethz.ch/swiss-glaciers/</p>

Data quality	<p>Plausibility and quality controls of submitted data are carried out by NSIDC, GLIMS and WGMS.</p> <p>Data quality is variable. There exist various case studies, published in peer-reviewed journals.</p> <p>For the mass balance series a catalogue of criteria from WGMS exists, which allows an assessment of the data quality.</p>
Online Performance Monitoring	Data availability is requested by WDS (ICSU) and IACS (IUGG) and is quality-controlled periodically.
Publications	<p>WGMS Fluctuations of Glaciers, every 5 years</p> <p>WGMS Glacier Mass Balance Bulletin, every 2 years World Glacier Inventory Status Report (1989) Global Glacier Changes: facts and figures (2008)</p> <p>Cryospheric Commission (EKK) of the Swiss Academy of Sciences (SCNAT) Glaciological Reports, "The Swiss Glaciers", Yearbooks, 1881-2009</p>
User statistics	<p>Scientists, governmental and non-governmental organizations, media, individuals</p> <p>WGMS website In 2010 approx. 3'800 visitors and 500 downloads of data reports per month</p> <p>GLIMS website In 2010 approx. 2'500 visitors per month</p>
Contact	<p>WGMS Michael Zemp (michael.zemp@geo.uzh.ch ; wgms@geo.uzh.ch),</p> <p>WGMS National Correspondent for Switzerland: Martin Hoelzle (martin.hoelzle@unifr.ch),</p> <p>NSIDC Richard Armstrong (rlax@nsidc.org)</p> <p>GLIMS Bruce Raup (braup@nsidc.org), Frank Paul (frank.paul@geo.uzh.ch)</p> <p>GLAMOS Andreas Bauder (bauder@vaw.baug.ethz.ch ; glacier@vaw.baug.ethz.ch)</p>
Notes	<p>Swiss institutions currently submitting data:</p> <ul style="list-style-type: none"> - Department of Geosciences, University of Fribourg - Department of Geography, University of Zurich - VAW, ETH Zurich - various forest service divisions of the cantons - various power plant companies - various scientists and individuals

3.2.3 Permafrost

Sub parameters	Measured: borehole temperatures, near surface temperatures, active layer thickness, electrical resistivity tomography (ERT) and change in unfrozen water content, permafrost creep Submitted: active layer thickness, mean annual permafrost temperature
Network(s)	GCOS/GTOS Baseline Global Terrestrial Network - Permafrost (GTN-P)
Stations	24 PERMOS locations with observations (Glaciological Report Permafrost No. 8/9). Temperature is measured in 27 boreholes at 14 locations (additional measurements of electrical resistivity tomography at 6 locations), creep movements are measured at 12 locations.
Data centers	Global Terrestrial Network for Permafrost (GTN-P) Geological Survey of Canada, Natural Resources Canada, Ottawa, Ontario, Canada http://gtnp.arcticportal.org/ National Snow and Ice Data Centre (NSIDC) CIRES, University of Colorado, Boulder (CO), US https://nsidc.org/cryosphere/sotc/permafrost.html (only for rock glacier inventories)
Responsible institution for data submission	Swiss Permafrost Monitoring Network (PERMOS) (c/o University of Zurich) http://www.permos.ch
Data submission	Via e-mail, no regular call and only occasional data submission, at last only submission of meta data.
Data format	ASCII
Data access	Meta data of Stockhorn (2001) and Schilthorn (2000-01): http://www.gtnp.org/temperature/swiss_e.html
Data quality	Not evident
Online Performance Monitoring	Not evident
Publications	No regular assessment, single scientific articles
User statistics	Not evident
Contact	GTN-P Sharon Smith (permafrost@nrcan.gc.ca), Hugues Lantuit (IPA secretariat, Hugues.Lantuit@awi.de) PERMOS Permos Office, c/o Dept. of Geography, University of Zurich, Switzerland Jeannette Nötzli (jeannette.noetzli@geo.uzh.ch)
Notes	The inventory of GTN-P borehole candidates is available via GTN-P (http://gtnp.arcticportal.org/index.php/resources/maps/12-resources/37-maps-boreholes). 37 Swiss stations are listed. Meta data is available for 16 of the mentioned 37 stations (on the subpage 'Meta data' only 15 stations are listed; stations 16/17, Muot da barba, Peider are listed only once). The inventory on the website as well as the numbers are not up-to-date. Some information is not true. Questionable is the listing of boreholes in GTN-P which are not part of PERMOS. Access via GOSIC (http://gtnp.arcticportal.org/index.php/resources/maps/12-resources/37-maps-boreholes) and International Permafrost Association (IPA) leads to GTN-P.

3.3 BIOSPHERE

3.3.1 Land use

Sub parameters	Land use, land use statistics, sources and sinks of carbon dioxide
Network(s)	Aerial photographs, 100m x 100 m sampling grid
Stations	Land Use Statistics of the Federal Statistical Office FSO national update 2004/09 in progress (completion in 2013), next update 2013/18 in preparation
Data centers	Global Land Cover Network (FAO) http://www.glcn.org/index_en.jsp European Environment Agency (EEA) CORINE Land Cover European Environment Agency, Copenhagen, Denmark http://www.eea.europa.eu/data-and-maps/data/corine-land-cover-3
Responsible institution for data submission	Swiss Federal Statistical Office FSO
Data submission	Annually, on order
Data format	GIS data (TXT), data tables (XLS), meta data (HTML, PDF)
Data access	Tables of cantons http://www.bfs.admin.ch/bfs/portal/de/index/themen/02/03/blank/data/01.html Tables of municipalities http://www.bfs.admin.ch/bfs/portal/de/index/themen/02/03/blank/data/gemeindedaten.html Geo data (data orders) http://www.bfs.admin.ch/bfs/portal/de/index/dienstleistungen/geostat/bestellungen.html
Data quality	Monitoring, plausibility check and evaluation of data according to defined standards; the sampling error can be calculated and estimated, depending on the density, the number of samples, the size of the area respectively (see http://www.bfs.admin.ch/bfs/portal/de/index/infothek/erhebungen_quellen/blank/blank/arealstatistik/05/05_06.html).
Online Performance Monitoring	Not evident (internal monitoring through the Federal Statistical Office FSO)
Publications	Online: http://www.bfs.admin.ch/bfs/portal/de/index/themen/02/03.html Printed publications: http://www.bfs.admin.ch/bfs/portal/en/index/themen/02/22/publ.html
User statistics	Not evident
Contact	Federal Statistical Office FSO , Felix Weibel (felix.weibel@bfs.admin.ch)
Notes	Input for UNFCCC LULUCF (Land Use, Land Use Change and Forestry)

3.3.2 Forest ecosystem

Sub parameters	Leaf Area Index (LAI), above-ground biomass, soil moisture, soil carbon, vegetation type
Network(s)	International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP-Forests; http://icp-forests.net/) International Long Term Ecological Research Network (ILTER)
Stations	18 areas within the scope of the research on long term forest ecosystems (LWF, since 1994)
Data centers	International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP-Forests) Institute for World Forestry, Hamburg, Germany http://icp-forests.net/page/plots-data Terrestrial Ecosystem Monitoring Sites database (GTOS-TEMS) http://www.fao.org/gtos/ Meta data on Swiss locations
Responsible institution for data submission	Swiss Federal Institute for Forest, Snow and Landscape Research (WSL)
Data submission	Annually (to ICP-Forests)
Data format	ASCII
Data access	LWF/Sanasilva Data request to WSL ICP-Forests Data request to martin.lorenz@vti.bund.de
Data quality	Plausibility checks according to ICP-Forests-Manual http://www.icp-forests.org/Manual.htm
Online Performance Monitoring	ICP-Forests (annual feedback in the form of ICP-Forests Technical Report, country-specific)
Publications	ICP-Forests Executive Report, ICP-Forests Technical Report, ICP-Forests Manual
User statistics	Not evident (ICP-Forests: on request)
Contact	WSL Peter Waldner (peter.waldner@wsl.ch) ICP-Forests (martin.lorenz@vti.bund.de)
Notes	There are differences within the temporal resolutions of the measurements of individual parameters. In line with the LWF network, additional ECVs are measured (but not submitted), e.g. temperature or photosynthetically active radiation (PAR; serving as basis for the derivation of the ECV 'FAPAR')

3.3.3 Forest fires

Sub parameters	Forest fire patch, date, causes
Network(s)	No GCOS monitoring network defined
Stations	Cantonal forest fire statistics (for the time being on the cantonal level); national forest fire database http://www.wsl.ch/swissfire (WSL); enlists 7450 forest fires (4170 with coordinates, 2290 with digitalized fire perimeter), partly since 1900.
Data centers	<p>European Forest Fire Information System (EFFIS) Data are submitted to the European Forest Fire Information System EFFIS (http://effis.jrc.ec.europa.eu/) which is part of the Joint Research Centre (JRC) of the European Commission.</p> <p>Global Fire Monitoring Center (GFMC) UN International Strategy for Disaster Reduction (UN-ISDR) Max-Planck-Institute for Chemistry c/o University of Freiburg, Freiburg, Germany http://www.fire.uni-freiburg.de/</p>
Responsible institution for data submission	Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) Swiss Federal Office for the Environment FOEN, Forest Products and Services and Forest Quality Section
Data submission	Annual raw data (quality-controlled) on forest fire patch, date and causes are submitted to EFFIS.
Data format	Until 2003, short reports including tables on forest fire statistics of Switzerland were delivered to GFMC as a contribution to UN-FAO/ECE International Forest Fire News (IFFN) http://www.fire.uni-freiburg.de/iffn/country/country.htm#SWITZERLAND Not evident (KML-files actual season). Data delivery to EFFIS as excel file.
Data access	Data request via e-mail to EFFIS necessary: jesus.san-miguel@jrc.ec.europa.eu Data are released only after consultation with the countries http://forest.jrc.ec.europa.eu/effis/applications/data-and-services/
Data quality	Not evident
Online	Not evident
Performance	
Monitoring	
Publications	Annual report on forest fires in Europe (Annual Fire Reports) with the contribution of Switzerland. Seasonal report with Switzerland's contribution available as Newsletter (currently not available online). UN-FAO/ECE International Forest Fire News (IFFN) of GFMC are no longer available online (Sep. 2011).
User statistics	Not evident
Contact	WSL-Location Bellinzona Boris Pezzatti boris.pezzatti@wsl.ch
Notes	The Fire Information for Resource Management System (FIRMS) is an information platform for visualizations of forest fires worldwide based on satellite data (MODIS). GFMC and EFFIS are working together within the scope of the Global Earth Observation System of Systems (GEOSS).

3.3.4 Phenology

Sub parameters	Date of leaf unfolding, flowering, fruit ripening, leaf colouring, leaf fall
Network(s)	<p>International Phenological Gardens (IPG)</p> <p>SPBN PHENOS Swiss Phenological Observation Network (MeteoSwiss)</p> <p>NOAA Paleoclimatology Stations not apparent, it is a reconstruction of spring phenology of the Swiss cherry blossom.</p>
Stations	<p>IPG Zurich-Birmensdorf</p> <p>SPBN PHENOS 160 monitoring stations</p> <p>NOAA Stations not apparent, it is a reconstruction of spring phenology of the Swiss cherry blossom.</p>
Data centers	<p>International Phenological Gardens Humboldt University of Berlin http://ipg.hu-berlin.de/</p> <p>European Phenological Database http://www.pep725.eu/</p> <p>NOAA Paleoclimatology National Environmental Satellite, Data and Information Service (NESDIS) National Oceanic and Atmospheric Agency (NOAA), US http://www.ncdc.noaa.gov/paleo/phenology.html</p>
Data format	ASCII, MS Excel
Responsible institution for data submission	<p>Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) (International phenological gardens)</p> <p>Swiss Federal Office of Meteorology and Climatology (MeteoSwiss) (European phenological database)</p> <p>University of Bern (NOAA Paleoclimatology)</p>
Data submission	<p>Annually (international phenological gardens, European phenological database)</p> <p>Unique data submission (NOAA Paleoclimatology)</p>
Data access	Online
Data quality	Self-control
Online Performance Monitoring	Not evident
Publications	Not evident
User statistics	Not evident
Contact	<p>MeteoSwiss Bernard Clot (bernard.clot@meteoswiss.ch)</p> <p>University of Bern and Commission for phenology and seasonality at SCNAT This Rutishauser (rutis@qiub.unibe.ch)</p>
Notes	

4 Conclusions

Switzerland's contribution to GCOS is diverse and firmly rooted in the activities of several Swiss institutions. GCOS is focused on climate-related observations of monitoring programs, some of which have existed for many decades. GCOS encourages and motivates the continuation of observations that may be in danger of being terminated and undertakes their coordination.

The present report shows the complexity of data flows and responsibilities. Additionally it reflects also the major – mostly voluntary – efforts of institutions involved and it documents the diversity within the different GCOS domains. The GCOS domains have not developed simultaneously nor equally. This report identifies domains with insufficient information, and accordingly with the need for action, using a system of traffic-lights at the right margin of its tables.

At the moment, the best defined, and as a system most advanced, domain of GCOS is the *atmospheric domain*. However, for some GCOS essential climate variables (ECVs) of the atmospheric domain the occurrence of various potentially inconsistent data sets (→ temperature, precipitation, air pressure, sunshine duration) as well as the lack of an international data center (→ clouds) is possible. Furthermore there are variables with a primary international data center, but regarding their sub parameters, different international data centers – partly regional data centers as well - exist (→ radiation incl. UV radiation, aerosols, air pollutants). For some ECVs of the atmospheric composition, the Global Atmosphere Watch (GAW) World Data Centers serve as unique and well-organized archives (→ ozone, CO₂, other greenhouse gases). Bioaerosols (→ pollen) are not yet defined as an ECV. Accordingly only regional data centers are presently established. In Switzerland, bioaerosols have long been monitored and are therefore listed in this report. In some cases, GCOS data centers coexist with other well-established data centers on an international, regional or national level (→ air pollutants).

For some variables of the *terrestrial domain* of GCOS only regional data centers have been established. Accordingly the global coordination is only currently starting to develop, and a GCOS monitoring network is not yet defined (→ hydrosphere). Furthermore in one case, a long tradition of monitoring as well as a well-established international data center exist, but the variable is not yet defined as an ECV. Accordingly the data center is not recognised as an international GCOS data center (→ isotopes). The field of cryosphere has developed heterogeneously. On the one hand it is well-organized (→ glaciers), on the other hand it is covered inconsistently and often incompletely by various data centers (→ snow cover). Finally, data may be delivered to international or regional data centers, respectively, but not to data centers designated by GCOS (→ forest ecosystem, forest fires).

The need for a procedure, coordinated at a global level has been recognized. The WMO Information System (WIS) of the World Meteorological Organization is already well-advanced. The ambitious purpose of WIS is to provide a globally coordinated catalogue on available meteorological and climatological observations for internet-based queries. In the medium term, data centers, designated by GCOS, are expected to become compatible with this system. In the future, users may then be more confident that they have found all existing relevant data on the requested ECV observation.

For the Swiss GCOS Office the coordination of the ECV monitoring, the definition of monitoring networks, and the availability of the corresponding data in international data centers remains a priority. This report documents the current state of knowledge and therefore provides the basis for future improvements of the data flow. Not least the intention is to facilitate the orientation of inter-disciplinary users in search for climate relevant observations made in Switzerland.

5 List of international GCOS Data centers

5.1 ATMOSPHERIC DOMAIN

The following table corresponds to table 10 of the GCOS Implementation Plan [GCOS, 2010]. Minor changes have been made.

Network or System	International Data Centers and Archives	Coordinating Body
Atmosphere Surface		
GCOS Surface Network (GSN)	GSN Monitoring Centre (DWD, JMA) GSN Analysis Centre (NCDC) GSN Archive (WDC Asheville) WMO CBS GCOS Lead Centres (DWD, JMA, NCDC, DMN (Morocco), INM (Mozambique), IRIMO (Iran), DMC (Chile), BoM (Australia), BAS (UK))	AOPC with WMO CBS
Full WWW/GOS synoptic network	Integrated Surface Hourly (WDC Asheville) Global Precipitation Climatology Centre (GPCC) (DWD)	WMO CBS
National surface networks	National responsibility; Submission to WDC Asheville GPCC (DWD)	WMO CCI, WMO CBS and WMO RAs
Baseline Surface Radiation Network	World Radiation Monitoring Centre (Alfred Wegener Institute, AWI, Bremerhaven, Germany) World Radiation Data Centre (St. Petersburg, Russian Federation)	AOPC with WCRP
Atmosphere Upper-air		
GCOS Upper-air Network (GUAN)	GUAN Monitoring Centres (ECMWF) GUAN Analysis Centres (NCDC) GUAN Archive (WDC Asheville) WMO CBS GCOS Lead Centre (NCDC)	AOPC with WMO CBS
Full WWW/GOS Upper-air Network	WWW/Global Data Processing and Forecasting Systems (GDPFS) World Centres WWW/GDPFS Regional/Specialized Meteorological Centres WDC Asheville	WMO CBS
Reference network high-altitude radiosondes	GCOS Reference Upper Air Network (GRUAN Lead Centre, Lindenberg, Germany)	AOPC with WCRP
Aircraft (AMDAR etc.)	WWW/GDPFS World Centres WWW/GDPFS Regional/Specialized Meteorological Centres WDC Asheville	WMO CBS
Profiler (radar) network	WWW/GDPFS World Centres WWW/GDPFS Regional/Specialized Meteorological Centres WDC Asheville	WMO CBS
Ground-based GPS receiver network	None designated	WMO CBS
Atmosphere Composition		
WMO GAW Global Atmospheric CO ₂ and CH ₄ Monitoring Networks (GAW continuous surface monitoring network)	WDCGG (JMA) NOAA- ESRL (Boulder) Carbon Dioxide Information Analysis Center (Oak Ridge National Laboratory)	WMO CAS

Network or System	International Data Centers and Archives	Coordinating Body
WMO GAW Global Atmospheric CO ₂ and CH ₄ Monitoring Networks (GAW surface flask sampling network)	WDCGG (JMA) NOAA- ESRL (Boulder)	WMO CAS
WMO GAW GCOS Global Baseline Profile Ozone Network, WMO GAW GCOS Global Baseline Total Ozone Network, NDACC	World Ozone and Ultraviolet Radiation Data Centre (WOUDC) (European Commission) <i>Network for the Detection of Stratospheric Change (NDSC) Archive</i> [‡] Norwegian Institute for Air Research (NILU) Southern Hemisphere Additional Ozonesondes (SHADOZ – NASA) Archive	WMO CAS
Aerosols and Precursors: AERONET GAW baseline network GALION	World Data Centre for Aerosols (NILU)	WMO CAS

[‡] Correct designation: Network for the Detection of Atmospheric and Climate Change (NDACC)

5.2 TERRESTRIAL DOMAIN

The following table corresponds to table 14 of the GCOS Implementation Plan [GCOS, 2010]

Network or System	International Data Centres and Archives	Coordinating Body
Global Terrestrial Network – Rivers	GRDC	WMO CHy
Prospective Global Terrestrial Network – Lakes (in planning)	HYDROLARE100	WMO CHy, WMO CCI
Snow Cover (WWW/GOS surface synoptic network)	NSIDC, NCDC	WMO CBS, GTN-H
Global Terrestrial Network for Glaciers; National Glacier Monitoring Networks	World Glacier Monitoring Service (WGMS); National and other archives	ICSU (FAGS), IUGG (IACS), UNEP, UNESCO, WMO
Global Terrestrial Network for Permafrost; National Permafrost Monitoring Networks	NSIDC; National archives	International Permafrost Association
Global Land Cover Network	FAO; Global Land Cover Facility	GOFC-GOLD, FAO, UNEP
Fire Disturbance	GFM, FIRMS	UNEP, FAO
Forest Resource Assessment	Forest Resource Information System	FAO
FLUXNET	Oak Ridge National Laboratory, in collaboration with national and other archives	FLUXNET Steering Group

6 References

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