Seismic stations in Switzerland 1996-2007

Swiss Seismological Service – ETH Zürich *

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Introduction

The Swiss Seismological Service operates two separate nationwide seismic networks, an online network that transmits its data in real-time to the recording center in Zurich and a low-gain accelerograph network, whose data is stored locally and must be downloaded by telephone or retrieved on site. The former is designed to continuously monitor the ongoing earthquake activity down to magnitudes well below the human perception threshold, whereas the latter is principally aimed at engineering concerns and thus only records so-called strong motions. The documentation presented here concerns only the real-time monitoring network. The strong-motion network is documented separately (see `http://www.seismo.ethz.ch/networks/homepage.html`). Here we give a brief overview of the present status of the online network, followed by a station map and list for each year since 1996.

The new Swiss Digital Seismic Network SDSNet

Since 1998, the configuration of the national online network has undergone a fundamental change. The analog data transmission technology of the mid-seventies, when the national telemetry network was first set up, posed severe restrictions on the dynamic range and frequency bandwidth of the recorded seismic data. With the advent of modern digital technology and broadband sensors, these restrictions could be overcome. As a consequence, recently the Swiss Seismological Service has modernized its entire network. Wherever possible, the new instruments are installed at the sites of the old analog stations. In some cases, because of inadequate infrastructure or unfavourable noise conditions at low frequencies, the old sites had to be abandoned in favour of more suitable locations. The new sites have been selected on the basis of extensive test measurements with portable recorders equipped with STS-2 seismometers. The block diagram in Figure 1 shows the basic configuration of the new system.

The former short-period seismometers have been replaced by three-component STS-2 broad-band instruments. These sensors feature nearly constant sensitivity to ground velocity over the range from 120 s to 50 Hz. The signals are digitized at the remote recording sites by a three-channel Nanometrics HRD24 digitizer. The initially oversampled signals are decimated to a sampling rate of 120 Hz using a digital anti-alias filter with a low-pass corner frequency at 48 Hz, which allows the entire frequency range of the STS-2 seismometers to be exploited. Time synchronization of the digitizers is provided by

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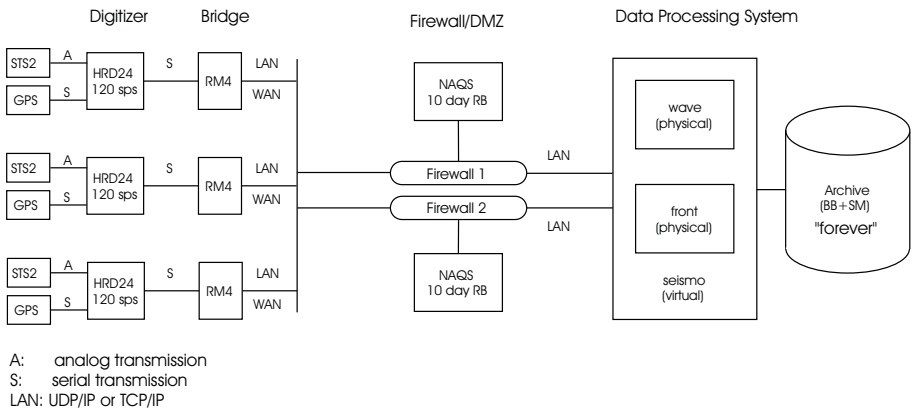

Figure 1: Schematic diagram of the new digital data acquisition system. A and S: analog and serial transmission; LAN and WAN: local and wide area communication networks; F: firewall; seismo, front and wave: high-availability data processing computer system.

a GPS receiver. The HRD24 digitizers are equipped with 4 Mb of solid state memory, which is sufficient to store 2 hours of three-channel data at the recording site. From the digitizer the signals are serially transmitted in packets of 1 to 2 seconds, depending on the compression efficiency, to a RM4 bridge. This device wraps the serial packets into UDP/IP packets, which can be sent to a maximum of four IP addresses, thus no point-to-point connection needs to be maintained. The serial link between the HRD24 and the RM4 can be either a short copper or fiber-optic cable, or a modem-modem connection via telephone or radio link. This provides great flexibility in station site selection. For most stations, the UDP/IP packets are sent to the recording site via the computer network of the Swiss federal government (BV-net), where the signals are recorded by the Nanometrics NAQS32 data acquisition software on two PC's. Both recording systems store the seismic signals locally in a 10-day circular disk buffer and continuously monitor the incoming signals with an event detection algorithm based on short-time/long-time (STA/LTA) amplitude ratios in several definable frequency bands. From these computers, which reside inside the federal government's secured computer network, the signals are retrieved by the data processing system (DPS) of the Seismological Service through firewalls operated by the Federal Office of Information Technology and Telecommunication (Bundesamt für Informatik und Telekommunikation, BIT). At the central data archiving site in Zürich, the DPS stores the continuous waveforms in 5-minute time-segments at the original sampling rate and in 24-hour blocks at 1 sample/second. Event detections of the NAQS-System are transferred immediately to the DPS, where the corresponding waveforms are automatically processed for source location and magnitude determination.

Data from foreign networks

For detailed studies of selected earthquakes and for constraining the location and the focal mechanisms of earthquakes situated on the periphery or outside the Swiss station networks, we use additional data obtained from the Erdbebendienst des Landesamtes für Geologie, Rohstoffe und Bergbau Baden Württemberg

in Freiburg, from the Zentralanstalt für Meteorologie und Geodynamik in Vienna, from the SISMALP array operated by the Laboratoire de Géophysique Interne et Tectonophysique, Observatoire de Grenoble, from the Laboratoire de Détection et Géophysique in Bruyères-le-Châtel, from the RENASS array operated by the Ecole et Observatoire des Sciences de la Terre in Strasbourg, from the Istituto Nazionale di Geofisica e Vulcanologìa in Rome and from the Istituto di Geofisica, Università di Genova.

To improve the reliability of automatic locations for events at the periphery or outside of Switzerland we have implemented an automatic system for retrieving foreign data. Many station and network operators make their waveforms available through AutoDRM, an e-mail based data transfer system (Kradolfer, 1996). Recently a Java program, CollectWaves (`http://www.seismo.ethz.ch/collectwaves`), has been developed, which allows to send e-mail requests to data centers based on preliminary hypocenter coordinates and origin time. CollectWaves can request all available data, all data within a distance range, all data within an azimuth range or data required to achieve the best azimuthal station coverage. The last option is implemented in the automatic location procedure of the Swiss Seismological Service. If the preliminary location for an earthquake returns a distance less than 35° and an azimuth range with no observations (*gap*) larger than 180°, CollectWaves is activated and determines which stations with data available in near real-time could decrease the *gap*. As soon as the requested data arrive by e-mail, they are merged into the existing waveform file and the automatic location procedure is repeated with the new data (Fig. 2).

As a second step towards improving the reliability of rapid locations of earthquakes outside the Swiss station network agreements with neighboring countries for real-time exchange of seismic data have been reached. Thus in 2005 we began to continuously record and archive the signals of two Austrian stations operated by ZAMG (DAVA and WTTA) as well as four stations in northern Italy operated by INGV (MABI, MDI, MONC and DOI). In 2006, two additional stations of INGV (MRGE and SALO) as well as six newly installed stations in Southern Tirol operated by the Zivilschutz der Autonomen Provinz Bozen-Südtirol (ABSI, BOSI, KOSI, MOSI, RISI and ROSI) were added to this set.

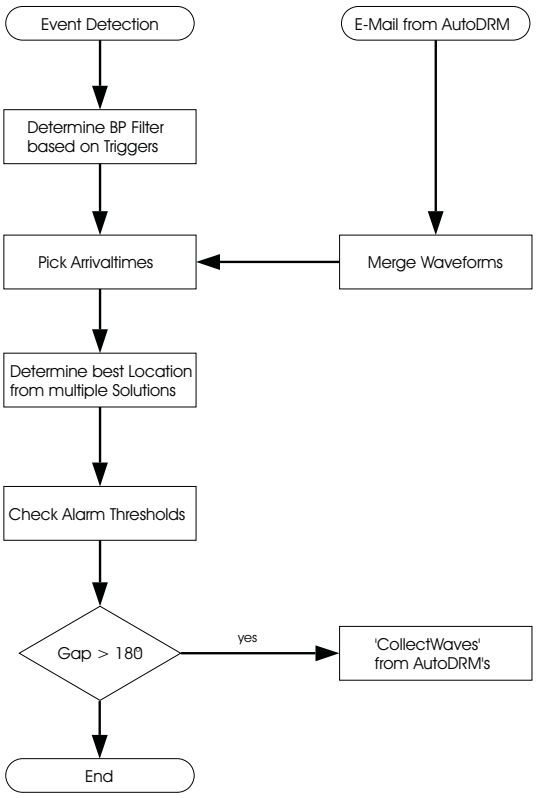

Figure 2: Diagram illustrating the automatic data processing system.

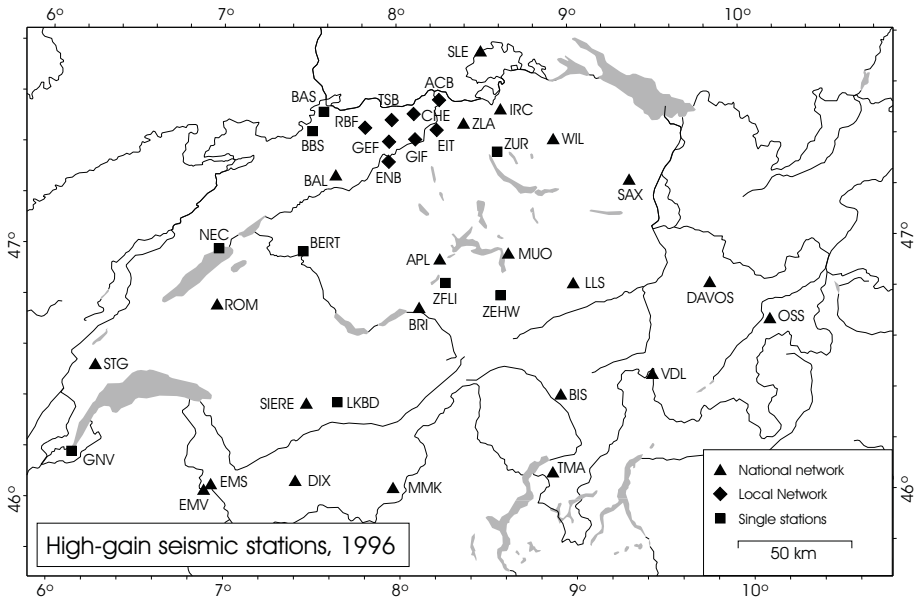

Figure 3: Seismograph stations operational in Switzerland during 1996.

Seismic stations in operation during 1996

Figure 3 shows the distribution of the high-gain seismograph stations in Switzerland that were operational at the end of 1996. As listed in Table 1, the data from most of the stations are telemetered continuously to the recording center in Zürich, where the signals are digitized and processed by computer. To overcome the limitations imposed by the low dynamic range of the analog telemetry system, selected stations feature an additional low-gain channel for the vertical component of ground motion, which extends the range of on-scale recordings for local earthquakes to a magnitude of about 4.5. Except for station ZUR, which is a broadband station with an STS-1 seismometer, all sites are equipped with a short-period sensor with a natural period of 1 or 2 seconds. For enhanced monitoring capabilities in the vicinity of some of the large hydroelectric reservoirs in the Swiss Alps, the stations marked as *dam sites* in Table 1 are equipped with an additional vertical component seismometer within about 1 km of the main site.

All stations are operated by the Swiss Seismological Service, except for GNV, which is operated by the University of Geneva, and station BAS, which is part of a network of locally recording instruments operated by the Landeserdbebendienst (LED) in Freiburg, Germany. In addition to the paper records recorded locally, the signals of station BBS are telemetered also to station BAS and to Freiburg, where they are recorded in digital form.

National telemetry network recorded in Zürich			
Code	Station name	Components	Remarks
APL	Alpnach	SP-4	
BAL	Balsthal	SP-4	
BIS	Biasca	SP-3	
BRI	Brienz	SP-4	
DAVOS	Davos	SP-4	
DIX	Grande Dixence	SP-1	dam site
EMS	Emosson	SP-1	
EMV	Vieux Emosson	SP-1	
IRC	Irchel	SP-1	
LLS	Linth-Limmern	SP-3	dam site
MMK	Mattmark	SP-3	dam site
MUO	Muotathal	SP-1	
OSS	Ova Spin	SP-1	dam site
ROM	Romont	SP-4	
SAX	Säntis	SP-3	
SIERE	Sierre	SP-4	
SLE	Schleitheim	SP-3	
STG	Saint Georges	SP-3	
TMA	Monte Tamaro	SP-3	
VDL	Valle di Lei	SP-1	dam site
WIL	Wil	SP-4	
ZLA	Zürich-Lägern	SP-1	
Local telemetry network recorded at station CHE			
Code	Station name	Components	Remarks
ACB	Acheberg	SP-3	
CHE	Cheisacher	SP-6	
EIT	Eiteberg	SP-1	
ENB	Engelberg	SP-1	
GEF	Geissflue	SP-1	
GIF	Gisliflue	SP-1	
RBF	Rickenbacherflue	SP-1	
TSB	Tiersteinberg	SP-1	
Single stations recorded on site			
Code	Station name	Components	Remarks
BAS	Basel	SP-3	digital
BBS	Basel-Blauen	SP-1	paper records
BERT	Bern	SP-3	paper records
GNV	Geneva	SP-1	paper records
LKBD	Leukerbad	SP-3	digital
NEC	Neuchatel	SP-3	paper records
ZEHW	Erstfeld	SP-1	analog magnetic tape
ZFLI	Flüheli	SP-1	analog magnetic tape
ZUR	Zürich	VBB-3	digital broad-band

Table 1: Seismograph stations operational at the end of 1996. Instrument types: SP = short period, VBB = broad band (STS-1), 1 = vertical component only, 3 = vertical and horizontal components, 4 = additional low-gain vertical component channel, 6 = all three components recorded at high and low gain.

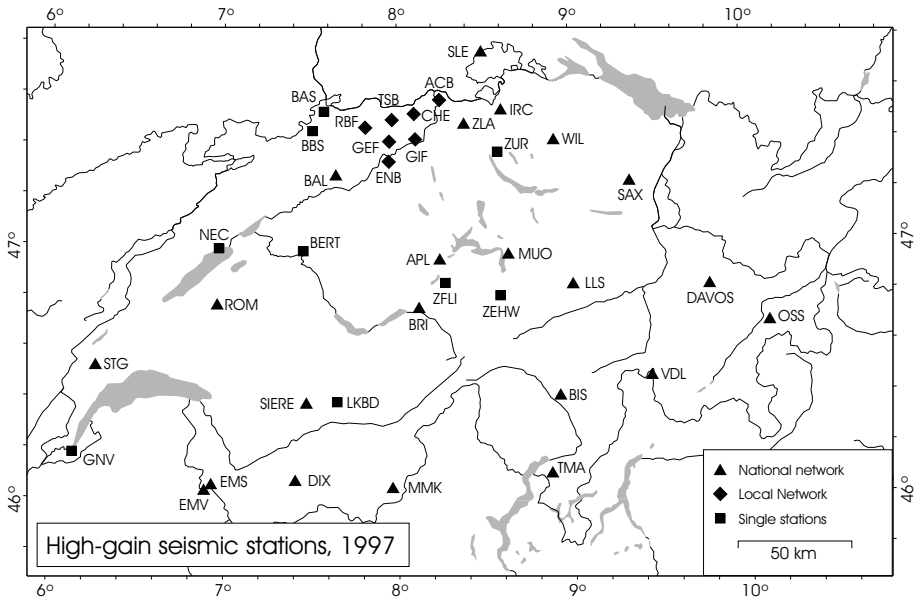

Figure 4: Seismograph stations operational in Switzerland during 1997.

Seismic stations in operation during 1997

The number and configuration of the high-gain stations in operation during 1997 was essentially the same as during the previous year. The only changes concern stations EIT (Eiteberg) and ACB (Acheberg) of the local network in northern Switzerland. Station EIT, which also functioned as telemetry relais between ACB and the central recording site, broke down in October and needed major repairs. Since EIT is a relatively noisy site and has repeatedly been subject to vandalism in the past, it was closed as a seismic station and the telemetry relais has been moved to a more convenient location nearby.

National telemetry network recorded in Zürich			
Code	Station name	Components	Remarks
APL	Alpnach	SP-4	
BAL	Balsthal	SP-4	
BIS	Biasca	SP-3	
BRI	Brienz	SP-4	
DAVOS	Davos	SP-4	
DIX	Grande Dixence	SP-1	dam site
EMS	Emosson	SP-1	
EMV	Vieux Emosson	SP-1	
IRC	Irchel	SP-1	
LLS	Linth-Limmern	SP-3	dam site
MMK	Mattmark	SP-3	dam site
MUO	Muotathal	SP-1	
OSS	Ova Spin	SP-1	dam site
ROM	Romont	SP-4	
SAX	Säntis	SP-3	
SIERE	Sierre	SP-4	
SLE	Schleitheim	SP-3	
STG	Saint Georges	SP-3	
TMA	Monte Tamaro	SP-3	
VDL	Valle di Lei	SP-1	dam site
WIL	Wil	SP-4	
ZLA	Zürich-Lägern	SP-1	
Local telemetry network recorded at station CHE			
Code	Station name	Components	Remarks
ACB	Acheberg	SP-3	
CHE	Cheisacher	SP-6	
ENB	Engelberg	SP-1	
GEF	Geissflue	SP-1	
GIF	Gisliflue	SP-1	
RBF	Rickenbacherflue	SP-1	
TSB	Tiersteinberg	SP-1	
Single stations recorded on site			
Code	Station name	Components	Remarks
BAS	Basel	SP-3	digital
BBS	Basel-Blauen	SP-1	paper records
BERT	Bern	SP-3	paper records
GNV	Geneva	SP-1	paper records
LKBD	Leukerbad	SP-3	digital
NEC	Neuchatel	SP-3	paper records
ZEHW	Erstfeld	SP-1	analog magnetic tape
ZFLI	Flüheli	SP-1	analog magnetic tape
ZUR	Zürich	VBB-3	digital broad-band

Table 2: Seismograph stations operational at the end of 1997. Instrument types: SP = short period, VBB = broad band (STS-1), 1 = vertical component only, 3 = vertical and horizontal components, 4 = additional low-gain vertical component channel, 6 = all three components recorded at high and low gain.

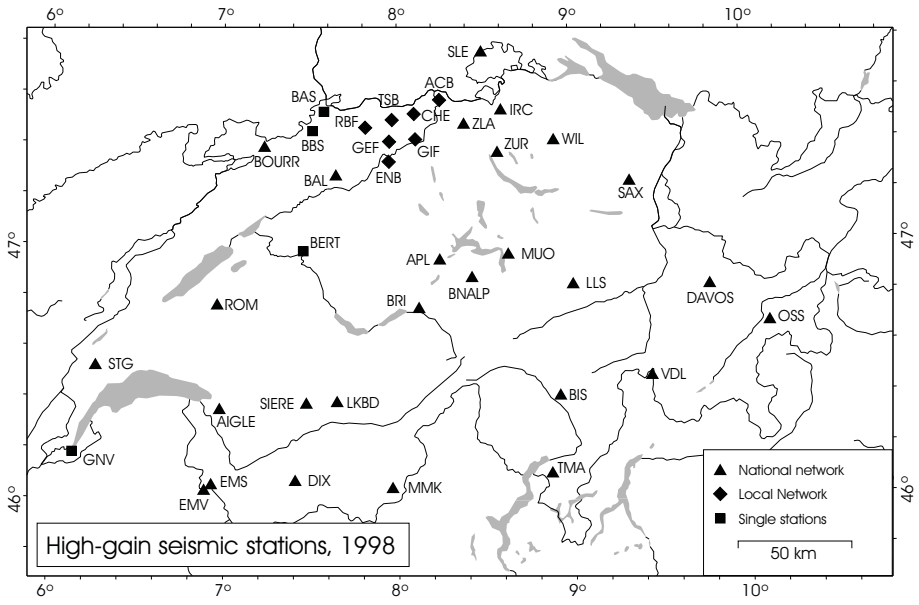

Figure 5: Seismograph stations operational et the end of 1998.

Seismic stations in operation during 1998

During 1998, the Swiss Seismological Service began to modernize its entire network, which entails replacing most of the existing short-period sensors by three-component STS-2 broad-band instruments. During Autumn of 1998, five of the new stations have been put into operation: AIGLE, BNALP, BOURR, VDL and ZUR. The first three are new sites, whereas VDL is operating in parallel to the old short-period instrument and at station ZUR the existing STS-1 broad-band sensor has been supplemented by an STS-2 sensor, whose signals are now available on-line. Station BNALP replaces the two analog magnetic tape recorders installed as temporary stations ZFLI and ZEHW in central Switzerland in the context of monitoring the local seismic activity in the neighborhood of the proposed site for low-level nuclear waste disposal. A complete list of the seismic stations in operation at the end of 1998 and an updated station map are given in Table 3 and Figure 5.

National telemetry network recorded in Zürich			
Code	Station name	Type	Remarks
AIGLE	Aigle	BB-3	
APL	Alpnach	SP-4	
BAL	Balsthal	SP-4	
BNALP	Bannalpsee	BB-3	
BIS	Biasca	SP-3	
BOURR	Bourrignon	BB-3	
BRI	Brienz	SP-4	
DAVOS	Davos	SP-4	
DIX	Grande Dixence	SP-1	dam site
EMS	Emosson	SP-1	dam site
EMV	Vieux Emosson	SP-1	
IRC	Irchel	SP-1	
LLS	Linth-Limmern	SP-3	dam site
MMK	Mattmark	SP-3	dam site
MUO	Muotathal	SP-1	
OSS	Ova Spin	SP-1	dam site
ROM	Romont	SP-4	
SAX	Säntis	SP-3	
SIERE	Sierre	SP-4	
SLE	Schleitheim	SP-3	
STG	Saint Georges	SP-3	
TMA	Monte Tamaro	SP-3	
VDL	Valle di Lei	SP-1, BB-3	dam site
WIL	Wil	SP-4	
ZLA	Zürich-Lägern	SP-1	
ZUR	Zürich-Degenried	BB-3	

Local telemetry network recorded at station CHE			
Code	Station name	Type	Remarks
ACB	Acheberg	SP-3	
CHE	Cheisacher	SP-6	
ENB	Engelberg	SP-1	
GEF	Geissflue	SP-1	
GIF	Gisliflue	SP-1	
RBF	Rickenbacherflue	SP-1	
TSB	Tiersteinberg	SP-1	

Single stations			
Code	Station name	Type	Remarks
BAS	Basel	SP-3	digital (LED)
BBS	Basel-Blauen	SP-1	digital (LED)
BERT	Bern	SP-3	paper records
GNV	Geneva	SP-1	paper records
LKBD	Leukerbad	SP-3	digital
ZUR	Zürich-Degenried	VBB-3	digital VBB

Table 3: Seismograph stations operational at the end of 1998. Instrument types: SP = short period, BB = broad band, 1 = vertical component only, 3 = vertical and horizontal components, 4 = additional low-gain vertical component channel, 6 = all three components recorded at high and low gain.

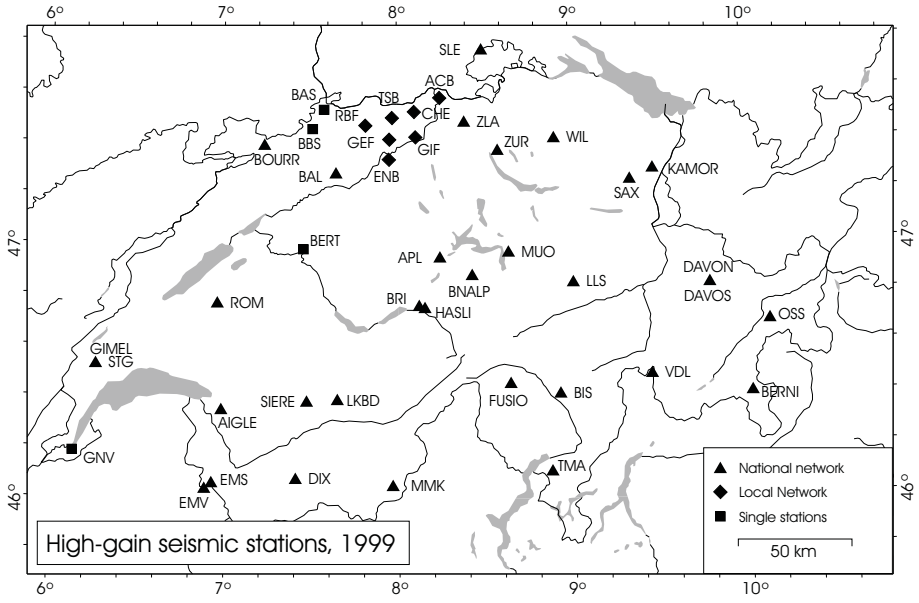

Figure 6: Seismograph stations operational at the end of 1999.

Seismic stations in operation during 1999

Starting in 1998, the Swiss Seismological Service began to modernize its entire network, which entails replacing most of the existing short-period sensors by three-component STS-2 broad-band instruments. A list and map of the seismic stations in operation at the end of 1999 are given in Table 4 and Figure 6. By the end of 1999, 17 broad-band stations were operational: of these, 6 are installed at the sites of the old telemetry network (DIX, EMV, LLS, MMK, MUO, VDL), while the rest are new sites.

National telemetry network recorded in Zürich			
Code	Station name	Type	Remarks
AIGLE	Aigle	BB-3	
APL	Alpnach	SP-4	
BAL	Balsthal	SP-4	
BERNI	Bernina	BB-3	
BNALP	Bannalpsee	BB-3	
BIS	Biasca	SP-3	
BOURR	Bourrignon	BB-3	
BRI	Brienz	SP-4	
DAVOS	Davos	SP-4	
DAVON	Davos	BB-3	
DIX	Grande Dixence	SP-1, BB-3	dam site
EMS	Emosson	SP-1	
EMV	Vieux Emosson	SP-1, BB-3	
FUSIO	Fusio	BB-3	
GIMEL	Gimel	BB-3	
HASLI	Hasliberg	BB-3	
KAMOR	Kamor	BB-3	
LKBD	Leukerbad	BB-3	
LLS	Linth-Limmern	SP-3, BB-3	dam site
MMK	Mattmark	SP-3, BB-3	dam site
MUO	Muotathal	SP-1, BB-3	
OSS	Ova Spin	SP-1	dam site
ROM	Romont	SP-4	
SAX	Säntis	SP-3	
SIERE	Sierre	SP-4	
SLE	Schleitheim	SP-3	
STG	Saint Georges	SP-3	
TMA	Monte Tamaro	SP-3	
VDL	Valle di Lei	SP-1, BB-3	dam site
WIL	Wil	SP-4	
ZLA	Zürich-Lägern	SP-1	
ZUR	Zürich-Degenried	BB-3	

Local telemetry network recorded at station CHE			
Code	Station name	Type	Remarks
ACB	Acheberg	SP-3	
CHE	Cheisacher	SP-6	
ENB	Engelberg	SP-1	
GEF	Geissflue	SP-1	
GIF	Gisliflue	SP-1	
RBF	Rickenbacherflue	SP-1	
TSB	Tiersteinberg	SP-1	

Single stations			
Code	Station name	Type	Remarks
BAS	Basel	SP-3	digital (LED)
BBS	Basel-Blauen	SP-1	telemetry (LED)
BERT	Bern	SP-3	paper records
GNV	Geneva	SP-1	paper records

Table 4: Seismograph stations operational at the end of 1999. Instrument types: SP = short period, BB = broad band, 1 = vertical component only, 3 = vertical and horizontal components, 4 = additional low-gain vertical component channel, 6 = all three components recorded at high and low gain.

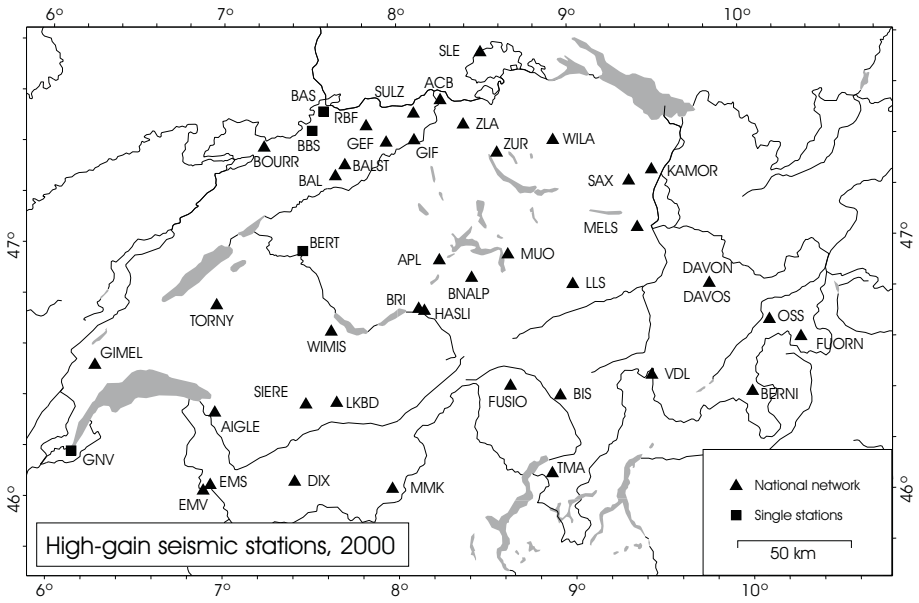

Figure 7: Seismograph stations in Switzerland operational at the end of 2000.

Seismic stations in operation during 2000

A complete list of the seismic stations in operation at the end of 2000 and an updated station map are given in Table 5 and Figure 7. In the course of the year 2000, four new sites have been added to the network (FUORN, MELS, TORNY and WIMIS), thus increasing the total number of broad-band stations to 24. Of the stations comprising the local network in northern Switzerland, TSB and ENB were closed, and CHE, which has been renamed SULZ, was converted to a broad-band station with an STS-2 seismometer and a nine-channel digitizer. The additional 6 channels are used to digitize the signals of the three-component station ACB as well as of the 3 single-component stations RBF, GEF and GIF. All nine channels are transmitted to the central recording site in Zürich along with the data from the national network.

National telemetry network recorded in Zürich			
Code	Station name	Type	Remarks
ACB	Acheberg, AG	SP-3	
AIGLE	Aigle, VD	BB-3	
APL	Alpnach, OW	SP-4	
BAL	Balsthal, SO	SP-4	
BALST	Balsthal, SO	BB-3	
BERNI	Bernina, GR	BB-3	
BNALP	Bannalpsee, NW	BB-3	
BIS	Biasca, TI	SP-3	
BOURR	Bourrignon, JU	BB-3	
BRI	Brienz, BE	SP-4	
DAVOS	Davos, GR	SP-4	
DAVON	Davos, GR	BB-3	
DIX	Grande Dixence, VS	SP-1, BB-3	dam site
EMS	Emosson, VS	SP-1	
EMV	Vieux Emosson, VS	SP-1, BB-3	
FUORN	Ofenpass, GR	BB-3	
FUSIO	Fusio, TI	BB-3	
GEF	Geissflue, SO	SP-1	
GIF	Gisliflue, AG	SP-1	
GIMEL	Gimel, VD	BB-3	
HASLI	Hasliberg, BE	BB-3	
KAMOR	Kamor, SG	BB-3	
LKBD	Leukerbad, VS	BB-3	
LLS	Linth-Limmern, GL	SP-3, BB-3	dam site
MELS	Mels, SG	BB-3	
MMK	Mattmark, VS	SP-3, BB-3	dam site
MUO	Muotathal, SZ	SP-1, BB-3	
OSS	Ova Spin, GR	SP-1	dam site
RBF	Rickenbacherflue, BL	SP-1	
ROM	Romont, FR	SP-4	coloc. TORNY
SAX	Säntis, AI	SP-3	
SIERE	Sierre, VS	SP-4	
SLE	Schleitheim, SH	SP-3	
STG	Saint Georges, VD	SP-3	coloc. GIMEL
SULZ	Cheisacher, AG	BB-3	
TMA	Monte Tamaro, TI	SP-3	
TORNY	Torny, FR	BB-3	
VDL	Valle di Lei, GR	SP-1, BB-3	dam site
WIL	Wil, SG	SP-4	coloc. WILA
WILA	Wil, SG	BB-3	
WIMIS	Wimmis, BE	BB-3	
ZLA	Zürich-Lägern, ZH	SP-1	
ZUR	Zürich-Degenried, ZH	BB-3	

Single stations			
Code	Station name	Type	Remarks
BAS	Basel, BS	SP-3	digital (LED)
BBS	Basel-Blauen, BL	SP-1	telemetry (LED)
BERT	Bern, BE	SP-3	paper records
GNV	Geneva, GE	SP-1	paper records

Table 5: Seismograph stations operational at the end of 2000. Instrument types: SP = short period, BB = broad band, 1 = vertical component only, 3 = vertical and horizontal components, 4 = additional low-gain vertical component channel.

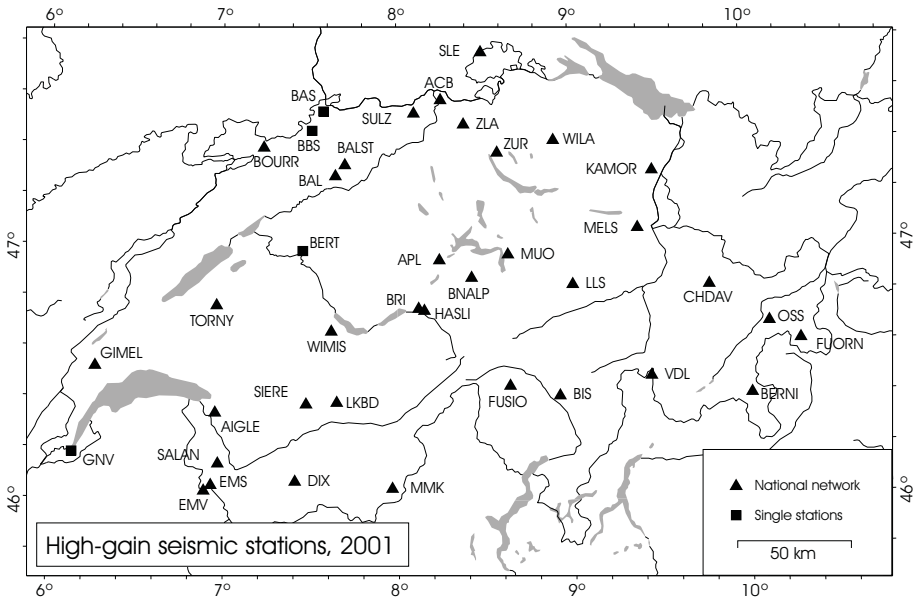

Figure 8: Seismograph stations in Switzerland operational at the end of 2001.

Seismic stations in operation during 2001

Since 1998, the configuration of the national high-gain network has undergone a transformation from a short-period analog telemetry system to a digital high-dynamic-range network equipped almost entirely with broad-band STS-2 sensors. By the end of 2001, the installation of the new network was almost completed (Table 6 and Figure 8) and the two systems were operating in parallel. In the course of the year 2001, two additional sites have been equipped with the new system (SLE and SALAN), thus increasing the total number of digital stations to 26 (BB and EB in Table 6). Of the stations that were part of the local network operating since the end of 1983 in northern Switzerland, only two were still operational by the end of 2001: ACB and SULZ (the latter was formerly called CHE and has been converted to a broad-band station).

National high-gain network recorded in Zürich			
Code	Station name	Type	Remarks
ACB	Acheberg, AG	SP-3	
AIGLE	Aigle, VD	BB-3	
APL	Alpnach, OW	SP-4	
BAL	Balsthal, SO	SP-4	
BALST	Balsthal, SO	BB-3	
BERNI	Bernina, GR	BB-3	
BNALP	Bannalpsee, NW	BB-3	
BIS	Biasca, TI	SP-3	
BOURR	Bourrignon, JU	BB-3	
BRI	Brienz, BE	SP-4	
CHDAV	Davos, GR	BB-3	temporary
DIX	Grande Dixence, VS	SP-1, BB-3	dam site
EMS	Emosson, VS	SP-1	
EMV	Vieux Emosson, VS	SP-1, BB-3	
FUORN	Ofenpass, GR	BB-3	
FUSIO	Fusio, TI	BB-3	
GIMEL	Gimel, VD	BB-3	
HASLI	Hasliberg, BE	BB-3	
KAMOR	Kamor, SG	BB-3	
LKBD	Leukerbad, VS	BB-3	
LLS	Linth-Limmern, GL	SP-3, BB-3	dam site
MELS	Mels, SG	BB-3	
MMK	Mattmark, VS	SP-3, BB-3	dam site
MUO	Muotathal, SZ	SP-1, BB-3	
OSS	Ova Spin, GR	SP-1	dam site
ROM	Romont, FR	SP-4	coloc. TORNY
SALAN	Lac de Salanfe, VS	EB-3	
SIERE	Sierre, VS	SP-4	
SLE	Schleitheim, SH	SP-3, BB-3	
STG	Saint Georges, VD	SP-3	coloc. GIMEL
SULZ	Cheisacher, AG	BB-3	
TORNY	Torny, FR	BB-3	
VDL	Valle di Lei, GR	SP-1, BB-3	dam site
WIL	Wil, SG	SP-4	coloc. WILA
WILA	Wil, SG	BB-3	
WIMIS	Wimmis, BE	BB-3	
ZLA	Zürich-Lägern, ZH	SP-1	
ZUR	Zürich-Degenried, ZH	BB-3	
Single stations			
Code	Station name	Type	Remarks
BAS	Basel, BS	SP-3	digital (LED)
BBS	Basel-Blauen, BL	SP-1	telemetry (LED)
BERT	Bern, BE	SP-3	paper records
GNV	Geneva, GE	SP-1	paper records

Table 6: Seismograph stations operational at the end of 2001. Instrument types: SP = 1 - 2 seconds, EB = 5 seconds, BB = broad band, 1 = vertical component only, 3 = vertical and horizontal components, 4 = additional low-gain vertical component channel.

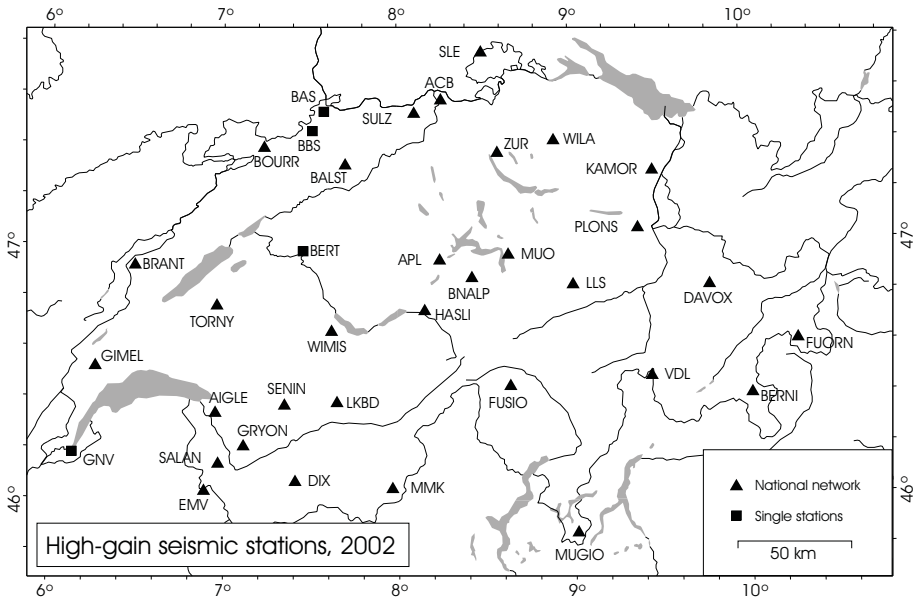

Figure 9: Seismograph stations in Switzerland operational at the end of 2002.

Seismic stations in operation during 2002

By the beginning of 2002, the installation of the new digital network was almost completed and was being operated in parallel with the old analog telemetry network. After the new system had demonstrated its reliability, the old network, except for stations ACB and APL, was decommissioned in February 2002 (Table 7 and Figure 9). In the course of the year 2002, four additional sites have been equipped with the new digital instruments (BRANT, GRYON, MUGIO and SENIN), thus increasing the total number of digital stations to 29 (BB and EB in Table 7). Moreover, the two preliminary sites CHDAV and MELS, that were in operation earlier, were replaced by stations DAVOX and PLONS. An additional three-component short-period seismometer with an analog telemetry link has been installed near Leukerbad, 3 km south of the existing site (LKBD), to monitor the local microseismic activity in the context of the construction of the new railway tunnel through the Lötschberg.

National high-gain network recorded in Zürich			
Code	Station name	Type	Remarks
ACB	Acheberg, AG	SP-3	analog telem.
AIGLE	Aigle, VD	BB-3	
APL	Alpnach, OW	SP-3	analog telem.
BALST	Balsthal, SO	BB-3	
BERNI	Bernina, GR	BB-3	
BNALP	Bannalpsee, NW	BB-3	
BOURR	Bourrignon, JU	BB-3	
BRANT	Les Verrières, NE	BB-3	
DAVOX	Davos, GR	BB-3	
DIX	Grande Dixence, VS	BB-3	
EMV	Vieux Emosson, VS	BB-3	
FUORN	Ofenpass, GR	BB-3	
FUSIO	Fusio, TI	BB-3	
GIMEL	Gimel, VD	BB-3	
GRYON	Gryon, VS	EB-3	
HASLI	Hasliberg, BE	BB-3	
KAMOR	Kamor, SG	BB-3	
LKBD	Leukerbad, VS	EB-3	
LLS	Linth-Limmern, GL	BB-3	
PLONS	Mels, SG	BB-3	
MMK	Mattmark, VS	BB-3	
MUO	Muotathal, SZ	BB-3	
SALAN	Lac de Salanfe, VS	EB-3	
SENIN	Senin, VS	BB-3	
SLE	Schleitheim, SH	BB-3	
SULZ	Cheisacher, AG	BB-3	
TORNY	Torny, FR	BB-3	
VDL	Valle di Lei, GR	BB-3	
WILA	Wil, SG	BB-3	
WIMIS	Wimmis, BE	BB-3	
ZUR	Zürich-Degenried, ZH	BB-3	
Single stations			
Code	Station name	Type	Remarks
BAS	Basel, BS	SP-3	digital (LED)
BBS	Basel-Blauen, BL	SP-1	telemetry (LED)
BERT	Bern, BE	SP-3	paper records
GNV	Geneva, GE	SP-1	paper records

Table 7: Seismograph stations operational at the end of 2002. Instrument types: SP = 1 second, EB = 5 seconds, BB = broad band, 1 = vertical component only, 3 = vertical and horizontal components.

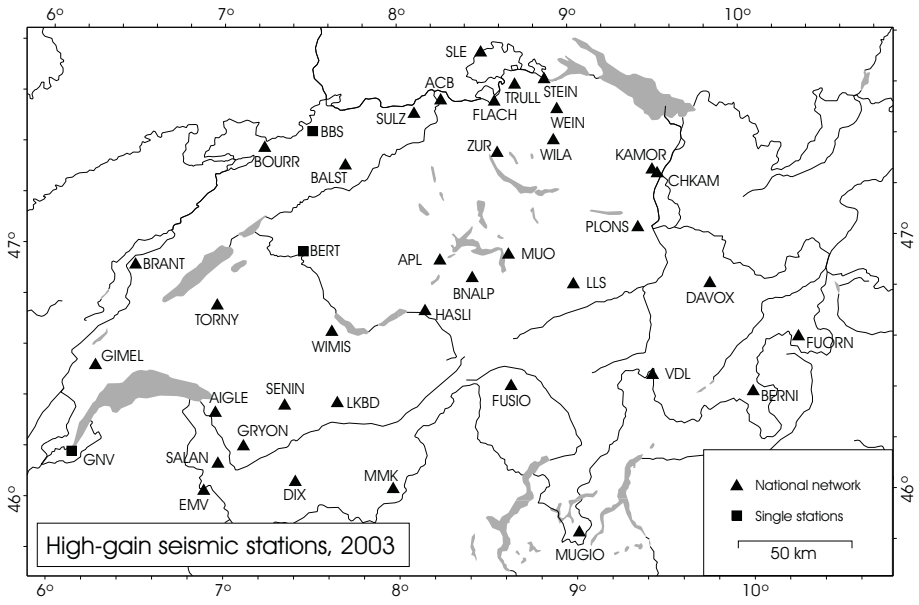

Figure 10: Seismograph stations in Switzerland operational at the end of 2003.

Seismic stations in operation during 2003

The configuration of the new digital seismic network of Switzerland at the end of 2003 is shown in Figure 10 and listed in Table 8.

Since February 2002, the national high-gain network consists almost entirely of digital data acquisition systems with high dynamic range and with either three-component broad-band STS-2 seismometers or Lennartz 5-second sensors (BB and EB in Table 8). In the course of the year 2003, one of the remaining analog short-period stations (ACB) and four additional sites (FLACH, STEIN, TRULL and WEIN) have been equipped with the new digital instruments. An additional broad-band instrument (CHKAM) was installed for test purposes in the vicinity of and as a possible alternative to the excessively noisy station KAMOR. Thus the total number of digital stations in operation in Switzerland had increased to 36 by the end of 2003 (Table 8 and Figure 10). The only two remaining short-period analog stations were APL and the additional station (LKBD2) installed in 2002 near Leukerbad (Baer et al. 2003). Station BAS, a short-period three-component instrument with on-site PCM recording, operated in Basel for many years first by the University of Karlsruhe and then by the Landeserdbebendienst in Freiburg, Germany, was removed in August 2003.

The data of the national strong-motion network is recorded on site or can be downloaded interactively by telephone (Wyss 2004). To complement this acceleration data with signals that are available in real-time, the four stations BOURR, MMK, SENIN and VDL of the broad-band network have been equipped in 2003 with an additional three-component Kinemetrics EpiSensor accelerometer (Table 8).

National high-gain network recorded in Zürich		
Code	Station name	Type
ACB	Acheberg, AG	EB-3
AIGLE	Aigle, VD	BB-3
APL	Alpnach, OW	SP-3
BALST	Balsthal, SO	BB-3
BERNI	Bernina, GR	BB-3
BNALP	Bannalpsee, NW	BB-3
BOURR	Bourrignon, JU	BB-3, SM-3
BRANT	Les Verrières, NE	BB-3
CHKAM	Kamor, SG	BB-3
DAVOX	Davos, GR	BB-3
DIX	Grande Dixence, VS	BB-3
EMV	Vieux Emosson, VS	BB-3
FLACH	Flach, ZH	EB-3
FUORN	Ofenpass, GR	BB-3
FUSIO	Fusio, TI	BB-3
GIMEL	Gimel, VD	BB-3
GRYON	Gryon, VS	EB-3
HASLI	Hasliberg, BE	BB-3
KAMOR	Kamor, SG	BB-3
LKBD	Leukerbad, VS	EB-3
LKBD2	Leukerbad, VS	SP-3
LLS	Linth-Limmern, GL	BB-3
PLONS	Mels, SG	BB-3
MMK	Mattmark, VS	BB-3, SM-3
MUGIO	Muggio, TI	BB-3
MUO	Muotathal, SZ	BB-3
SALAN	Lac de Salanfe, VS	EB-3
SENIN	Senin, VS	BB-3, SM-3
SLE	Schleitheim, SH	BB-3
STEIN	Stein am Rhein, SH	EB-3
SULZ	Cheisacher, AG	BB-3
TORNY	Torny, FR	BB-3
TRULL	Trullikon, ZH	EB-3
VDL	Valle di Lei, GR	BB-3, SM-3
WEIN	Weingarten, TG	EB-3
WILA	Wil, SG	BB-3
WIMIS	Wimmis, BE	BB-3
ZUR	Zürich-Degenried, ZH	BB-3
Single stations		
Code	Station name	Type
BBS	Basel-Blauen, BL	SP-1
BERT	Bern, BE	SP-3
GNV	Geneva, GE	SP-1

Table 8: Seismograph stations operational at the end of 2003. Instrument types: SP = 1 second, EB = 5 seconds, BB = broad band, SM = accelerometer, 1 = vertical component only, 3 = vertical and horizontal components. Signals of APL, LKBD2 and BBS are transmitted via analog telemetry; data of BBS are recorded by the Landeserdbebendienst Baden-Würtemberg and those of BERT and GNV are recorded locally on paper.

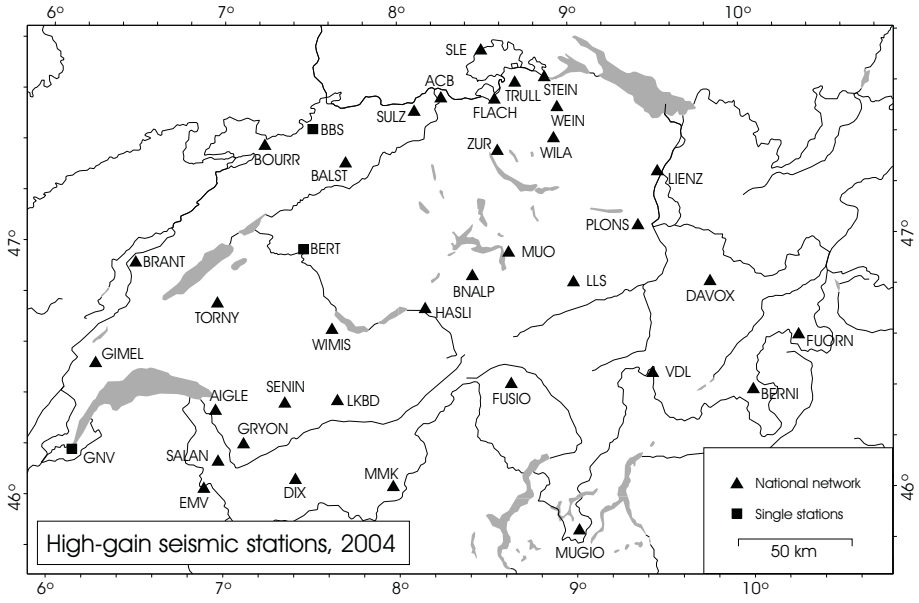

Figure 11: Seismograph stations in Switzerland operational at the end of 2004.

Seismic stations in operation during 2004

Since February 2002, the national high-gain network consists almost entirely of digital data acquisition systems with high dynamic range and with either three-component broad-band STS-2 seismometers or Lennartz 5-second sensors (BB and EB in Table 9).

In August 2004, station APL located near Alpnach, OW, which was one of the last two short-period instruments with analog data transmission, ceased functioning and was decommissioned. The only other significant change with respect to the previous year consisted in the replacement of the excessively noisy station KAMOR by a new station (LIENZ), located close to the site (CHKAM) that had been instrumented temporarily in 2003 (Deichmann et al. 2004). Thus the total number of digital stations in operation in Switzerland remained at 36 during 2004 and the only short-period analog telemetry station left is LKBD2 near Leukerbad (Table 9 and Figure 11).

The data of the national strong-motion network is recorded on site and can be downloaded interactively by telephone (Wyss 2005). To complement this acceleration data with signals that are available in real-time, seven more stations of the broad-band network (BNALP, DIX, EMV, LIENZ, LLS, SULZ and ZUR) have been equipped in 2004 with an additional three-component Kinemetrics EpiSensor accelerometer (Table 9).

National high-gain network recorded in Zürich		
Code	Station name	Type
ACB	Acheberg, AG	EB-3
AIGLE	Aigle, VD	BB-3
BALST	Balsthal, SO	BB-3
BERNI	Bernina, GR	BB-3
BNALP	Bannalpsee, NW	BB-3, SM-3
BOURR	Bourrignon, JU	BB-3, SM-3
BRANT	Les Verrières, NE	BB-3
CHKAM	Kamor, SG	BB-3
DAVOX	Davos, GR	BB-3
DIX	Grande Dixence, VS	BB-3, SM-3
EMV	Vieux Emosson, VS	BB-3, SM-3
FLACH	Flach, ZH	EB-3
FUORN	Ofenpass, GR	BB-3
FUSIO	Fusio, TI	BB-3
GIMEL	Gimel, VD	BB-3
GRYON	Gryon, VS	EB-3
HASLI	Hasliberg, BE	BB-3
LIENZ	Kamor, SG	BB-3, SM-3
LKBD	Leukerbad, VS	EB-3
LKBD2	Leukerbad, VS	SP-3
LLS	Linth-Limmern, GL	BB-3, SM-3
PLONS	Mels, SG	BB-3
MMK	Mattmark, VS	BB-3, SM-3
MUGIO	Muggio, TI	BB-3
MUO	Muotathal, SZ	BB-3
SALAN	Lac de Salanfe, VS	EB-3
SENIN	Senin, VS	BB-3, SM-3
SLE	Schleitheim, SH	BB-3
STEIN	Stein am Rhein, SH	EB-3
SULZ	Cheisacher, AG	BB-3, SM-3
TORNY	Torny, FR	BB-3
TRULL	Trullikon, ZH	EB-3
VDL	Valle di Lei, GR	BB-3, SM-3
WEIN	Weingarten, TG	EB-3
WILA	Wil, SG	BB-3
WIMIS	Wimmis, BE	BB-3
ZUR	Zürich-Degenried, ZH	BB-3, SM-3
Single stations		
Code	Station name	Type
BBS	Basel-Blauen, BL	SP-1
BERT	Bern, BE	SP-3
GNV	Geneva, GE	SP-1

Table 9: Seismograph stations operational at the end of 2004. Instrument types: SP = 1 second, EB = 5 seconds, BB = broad band, SM = accelerometer, 1 = vertical component only, 3 = vertical and horizontal components. Signals of LKBD2 and BBS are transmitted via analog telemetry; data of BBS are recorded by the Landeserdbebendienst Baden-Würtemberg and those of BERT and GNV are recorded locally on paper.

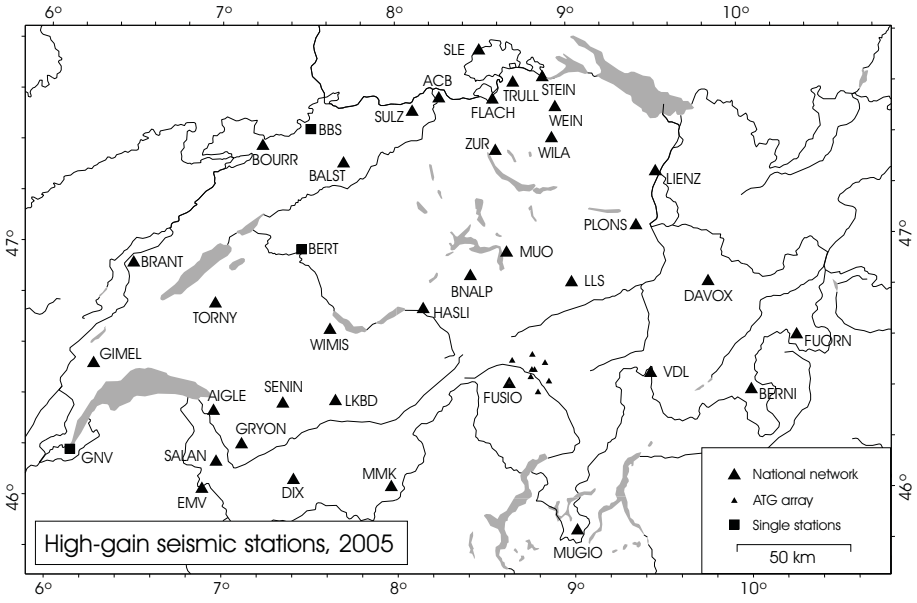

Figure 12: Seismograph stations in Switzerland operational at the end of 2005. The set of small triangles without station labels corresponds to the AlpTransit-Gotthard network.

Seismic stations in operation during 2005

In 2005, the national high-gain network continued to operate in the same configuration as in the previous year. It consisted almost entirely of digital data acquisition systems with high dynamic range and with either three-component broad-band STS-2 seismometers or Lennartz 5-second sensors (BB and EB in Table 11).

In the order to monitor with greater precision an ongoing sequence of earthquakes in the immediate vicinity of the southern segment of the new Gotthard railway tunnel that is still under construction, an additional set of eight stations with short-period seismometers and in part with three-component accelerometers was installed during the late Fall of 2005 in the region between the Lukmanier Pass and the Leventina Valley (Table 10 and Figure 12). In addition, an accelerometer has been installed in the tunnel itself (MFSFA in Table 10). These eight stations are operated under a contract with AlpTransit-Gotthard AG. The signals of six of these stations are integrated in realtime in the national high-gain network, while the data of one station (LUKA1) is downloaded per telephone, and two stations (CHAT1 and CHAT2) store the data on site.

Thus, by the end of 2005, the number of stations transmitting data in realtime to the recording center of Swiss Seismological Service in Zurich included 28 broad-band instruments (STS2), 8 five-second seismometers, 6 short-period sensors and one accelerometer (Tables 10 and 11 as well as Figure 12).

The data of the national strong-motion network is recorded on site and can be downloaded interactively by telephone. To complement this acceleration data with signals that are available in realtime, 12 stations of the broad-band network are equipped with an additional three-component Kinemetrics EpiSensor

AlpTransit-Gotthard Network		
Code	Station name	Type
CHAT1	Predelp, TI	SP-3
CHAT2	Alpe di Cari, TI	SP-3
CHIR1	Chironico, TI	SP-3, SM-3
DOETR	Doetra, TI	SP-3, SM-3
LUKA1	Lucomagno, TI	SP-3, SM-3
MFSFA	Faido (Tunnel), TI	SM-3
NARA	Leontica, TI	SP-3
RITOM	Lago Ritom, TI	SP-3, SM-3
TONGO	Tortengo, TI	SP-3

Table 10: Station network operational at the end of 2005 to monitor the local seismicity in the area of the southern segment of the Gotthard railway tunnel, that is under construction. Instrument types: SP = 1 second, SM = accelerometer, 3 = vertical and horizontal components.

accelerometer (Table 11). In 2005, FUSIO was added to this set of stations.

National high-gain network recorded in Zürich		
Code	Station name	Type
ACB	Acheberg, AG	EB-3
AIGLE	Aigle, VD	BB-3
BALST	Balsthal, SO	BB-3
BERNI	Bernina, GR	BB-3
BNALP	Bannalpsee, NW	BB-3, SM-3
BOURR	Bourrignon, JU	BB-3, SM-3
BRANT	Les Verrières, NE	BB-3
CHKAM	Kamor, SG	BB-3
DAVOX	Davos, GR	BB-3
DIX	Grande Dixence, VS	BB-3, SM-3
EMV	Vieux Emosson, VS	BB-3, SM-3
FLACH	Flach, ZH	EB-3
FUORN	Ofenpass, GR	BB-3
FUSIO	Fusio, TI	BB-3, SM-3
GIMEL	Gimel, VD	BB-3
GRYON	Gryon, VS	EB-3
HASLI	Hasliberg, BE	BB-3
LIENZ	Kamor, SG	BB-3, SM-3
LKBD	Leukerbad, VS	EB-3
LKBD2	Leukerbad, VS	SP-3
LLS	Linth-Limmern, GL	BB-3, SM-3
PLONS	Mels, SG	BB-3
MMK	Mattmark, VS	BB-3, SM-3
MUGIO	Muggio, TI	BB-3
MUO	Muotathal, SZ	BB-3
SALAN	Lac de Salanfe, VS	EB-3
SENIN	Senin, VS	BB-3, SM-3
SLE	Schleitheim, SH	BB-3
STEIN	Stein am Rhein, SH	EB-3
SULZ	Cheisacher, AG	BB-3, SM-3
TORNY	Torny, FR	BB-3
TRULL	Trullikon, ZH	EB-3
VDL	Valle di Lei, GR	BB-3, SM-3
WEIN	Weingarten, TG	EB-3
WILA	Wil, SG	BB-3
WIMIS	Wimmis, BE	BB-3
ZUR	Zürich-Degenried, ZH	BB-3, SM-3
Single stations		
Code	Station name	Type
BBS	Basel-Blauen, BL	SP-1
BERT	Bern, BE	SP-3
GNV	Geneva, GE	SP-1

Table 11: Seismograph stations operational at the end of 2005. Instrument types: SP = 1 second, EB = 5 seconds, BB = broad band, SM = accelerometer, 1 = vertical component only, 3 = vertical and horizontal components. Signals of LKBD2 and BBS are transmitted via analog telemetry; data of BBS are recorded by the Landeserdbebendienst Baden-Würtemberg and those of BERT and GNV are recorded locally on paper.

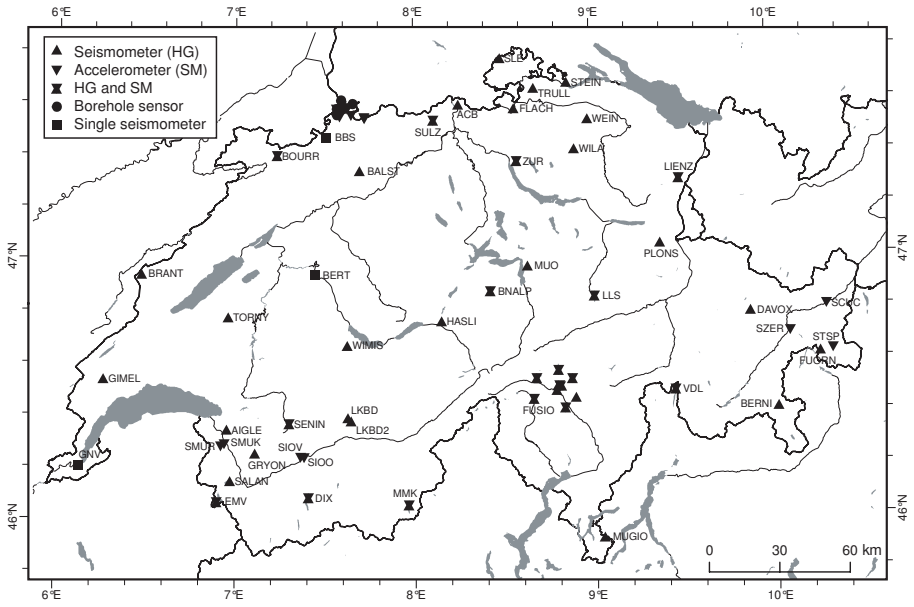

Figure 13: Seismograph stations in Switzerland operational at the end of 2006. The stations defined as high-gain (HG) are mostly equipped with broad-band or 5 second sensors, whereas the strong-motion stations (SM) are accelerometers.

Seismic stations in operation during 2006

Since February 2002, the national on-line network consists almost entirely of digital data acquisition systems with high dynamic range and with either three-component broad-band STS-2 seismometers or Lennartz 5-second sensors ("BB" and "EB" in Table 12). Despite the high dynamic range, a magnitude 5 event at a distance of a few km will clip the system. So beginning in 2003, to complement these high-gain signals with strong-motion data that are available in realtime, 12 stations of the broad-band network have been equipped with an additional three-component Kinemetrics EpiSensor accelerometer ("BB, SM" in Table 12).

Initially all the data of the separate strong-motion network were recorded locally and had to be retrieved manually on site or downloaded interactively by telephone. Moreover, these strong-motion instruments have only a limited sensitivity and dynamic range. So in 2006, ten of these strong-motion stations as well as six new sites have been equipped with high-dynamic-range digitizers and with the more sensitive EpiSensor accelerometers ("SM" in Table 12). Moreover, their signals are available in near-realtime, so that they are now also used routinely for determining hypocenter locations.

To monitor with greater precision an ongoing sequence of earthquakes in the immediate vicinity of the southern segment of the new Gotthard railway tunnel that is still under construction, a set of eight stations with short-period seismometers and in part with three-component accelerometers were installed during the late Fall of 2005 in the region between the Lukmanier Pass and the Leventina Valley (Table 13 and Figure 14). In addition, two accelerometers have been installed in the tunnel itself (MFSFA and MFSFB in Table 13). These ten stations are operated under a contract with AlpTransit-Gotthard AG. The

signals of seven of these stations are integrated in realtime in the national online network, while the data of one station (LUKA1) is downloaded per telephone, and two stations (CHAT1 and CHAT2) store the data on site.

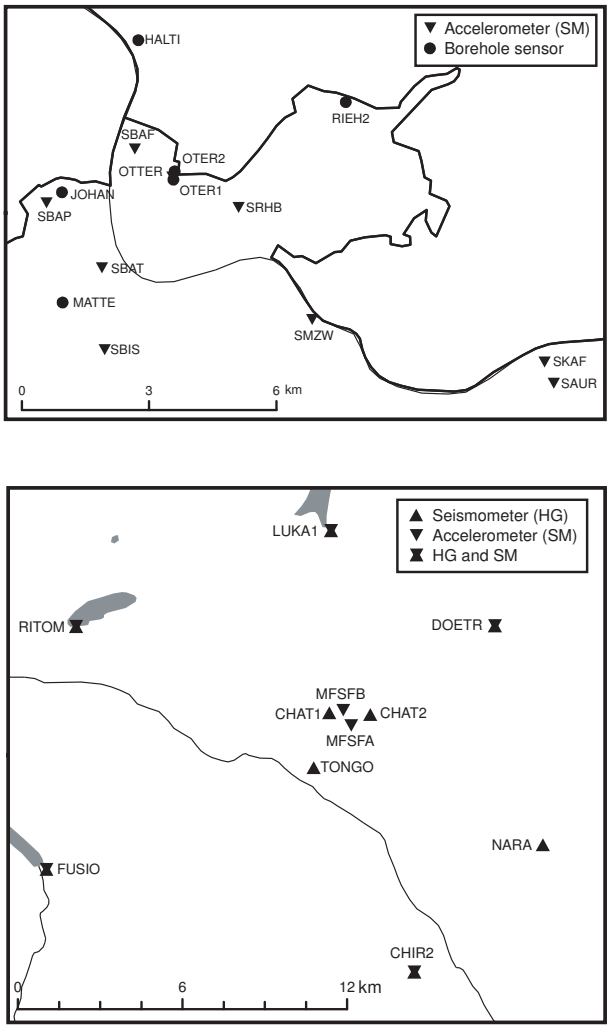

Figure 14: Top: borehole and surface strong-motion stations in the Basel region with near-realtime automatic data transmission to the SED. Bottom: station array for monitoring seismicity related to the construction of the new Gotthard railway tunnel (AlpTransit-Gotthard, ATG, array); except for CHAT1, CHAT2 and LUKA1, all signals are recorded in near-realtime at the Swiss Seismological Service; station FUSIO is part of the Swiss national network.

In the course of 2006 an additional array of seismic sensors was installed in six boreholes at depths between 317 and 2740 m below Basel. This array was designed to monitor the seismicity induced by the injection of large quantities of water at high pressure into a 5 km deep well in the context of a project initiated by Geopower Basel AG, a private/public consortium, to extract geothermal energy. The borehole array is operated by Geothermal Explorers Ltd in Prattteln. The signals of one of these sensors (OTER1 in Table 13 and Figure 14)

National online network recorded in Zürich		
Code	Station name	Type
ACB	Acheberg, AG	EB-3
AIGLE	Aigle, VD	BB-3
BALST	Balsthal, SO	BB-3
BERNI	Bernina, GR	BB-3
BNALP	Bannalpsee, NW	BB-3, SM-3
BOURR	Bourrignon, JU	BB-3, SM-3
BRANT	Les Verrières, NE	BB-3
DAVOX	Davos, GR	BB-3
DIX	Grande Dixence, VS	BB-3, SM-3
EMV	Vieux Emosson, VS	BB-3, SM-3
FLACH	Flach, ZH	EB-3
FUORN	Ofenpass, GR	BB-3
FUSIO	Fusio, TI	BB-3, SM-3
GIMEL	Gimel, VD	BB-3
GRYON	Gryon, VS	EB-3
HASLI	Hasliberg, BE	BB-3
LIENZ	Kamor, SG	BB-3, SM-3
LKBD	Leukerbad, VS	EB-3
LKBD2	Leukerbad, VS	SP-3
LLS	Linth-Limmern, GL	BB-3, SM-3
MMK	Mattmark, VS	BB-3, SM-3
MUGIO	Muggio, TI	BB-3
MUO	Muotathal, SZ	BB-3
OTTER	Otterbach, BS	SM-3
PLONS	Mels, SG	BB-3
SALAN	Lac de Salanfe, VS	EB-3
SAUR	Augst-Römermuseum, AG	SM-3
SBAF	Basel-Friedhofgasse, BS	SM-3
SBAP	Basel-PUK, BS	SM-3
SBAT	Basel-Tropenhaus, BS	SM-3
SBIS	Binningen, BS	SM-3
SCUC	Scuol-Clozza, GR	SM-3
SENIN	Senin, VS	BB-3, SM-3
SIOO	Sion-Ophtalmologie, VS	SM-3
SIOV	Sion-Valere, VS	SM-3
SLE	Schleitheim, SH	BB-3
SKAF	Kaiseraugst-Friedhof, AG	SM-3
SMUK	Muraz-Kläranlage, VS	SM-3
SMUR	Muraz-Reservoir, VS	SM-3
SMZW	Muttenz-Waldhaus, BL	SM-3
SRHB	Riehen-Bäumlihof, BS	SM-3
STEIN	Stein am Rhein, SH	EB-3
STSP	Tschierv, GR	SM-3
SULZ	Cheisacher, AG	BB-3, SM-3
SZER	Zernez, GR	SM-3
TORNY	Torny, FR	BB-3
TRULL	Trullikon, ZH	EB-3
VDL	Valle di Lei, GR	BB-3, SM-3
WEIN	Weingarten, TG	EB-3
WILA	Wil, SG	BB-3
WIMIS	Wimmis, BE	BB-3
ZUR	Zürich-Degenried, ZH	BB-3, SM-3

Table 12: Seismograph stations of the Swiss national network operational at the end of 2006. Instrument type: SP = 1 second, EB = 5 seconds, BB = broad band, SM = accelerometer, 1 = vertical component only, 3 = vertical and horizontal components. Signals of LKBD2 are transmitted via analog telemetry.

AlpTransit-Gotthard Network		
Code	Station name	Type
CHAT1	Predelp, TI	SP-3
CHAT2	Alpe di Cari, TI	SP-3
CHIR2	Chironico, TI	SP-3, SM-3
DOETR	Doetra, TI	SP-3, SM-3
LUKA1	Lucomagno, TI	SP-3, SM-3
MFSFA	Faido (Tunnel), TI	SM-3
MFSFB	Faido (Tunnel), TI	SM-3
NARA	Leontica, TI	SP-3
RITOM	Lago Ritom, TI	SP-3, SM-3
TONGO	Tortengo, TI	SP-3
Basel Borehole Network		
Code	Station name	Type
HALTI	Haltingen (542)	SP-3
JOHAN	Sankt Johann (317)	SP-3
MATTE	Schützenmatte (553)	SP-3
OTER1	Otterbach (500)	SP-3
OTER2	Otterbach (2740)	SP-3
RIEH2	Riehen (1213)	SP-3
Single stations		
Code	Station name	Type
BBS	Basel-Blauen, BL	SP-1
BERT	Bern, BE	SP-3
GNV	Geneva, GE	SP-1

Table 13: Local seismic networks and single stations operational at the end of 2006. Instrument type: SP = 1 second, SM = accelerometer, 1 = vertical component only, 3 = vertical and horizontal components. The numbers in parentheses next to the borehole stations are the sensor depth with respect to ground surface in meters. Signals of BBS are transmitted via analog telemetry and are recorded by the Landeserdbebendienst Baden-Würtemberg; those of BERT and GNV are recorded locally on paper.

are transmitted in realtime to the recording center of the Swiss Seismological Service, thus contributing to the event detection. The signals of the other five sensors are retrieved automatically immediately after the detection of an event, so that they are also available for the determination of hypocenter locations. For seismic events of potential or actual concern to the public in Basel it is thereby possible to provide reliable locations and magnitudes within a few minutes after the event.

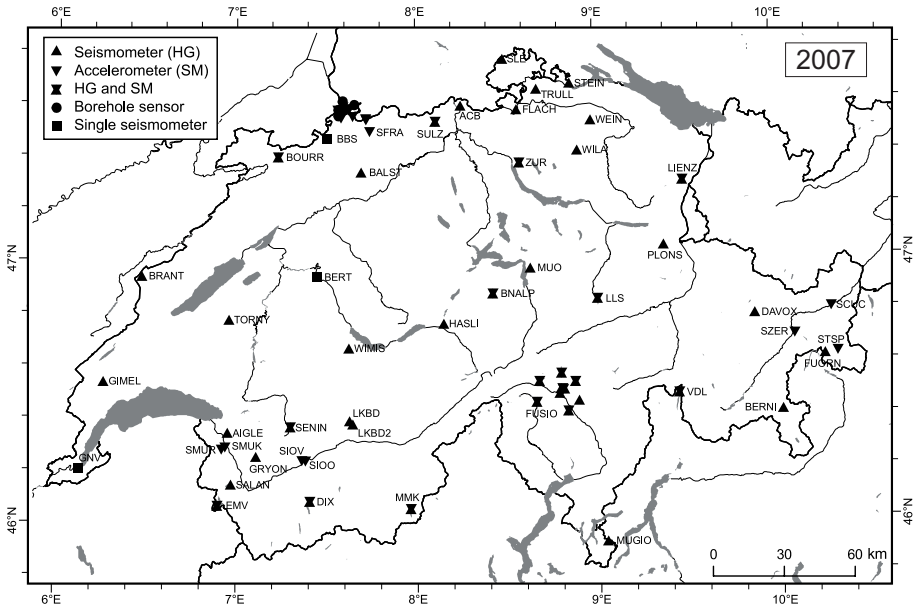

Figure 15: Seismograph stations in Switzerland operational at the end of 2007. The stations defined as high-gain (HG) are mostly equipped with broad-band or 5 second sensors, whereas the strong-motion stations (SM) are accelerometers.

Seismic stations in operation during 2007

The only changes to the network with respect to the previous year, that were made in 2007, are the removal of two borehole sensors in the Basel area during the course of the summer (RIEH2 and OTER1 – see Figure 2 of Baer et al. 2007) and the installation of an additional strong-motion station (SFRA) in Frenkendorf (BL), at the beginning of December (Figure 15. All high-gain and online strong-motion stations in operation in Switzerland at the end of 2007 are listed in Tables 14 and 15. Maps of the local networks are reproduced in Figure 14.

National online network recorded in Zürich		
Code	Station name	Type
ACB	Acheberg, AG	EB-3
AIGLE	Aigle, VD	BB-3
BALST	Balsthal, SO	BB-3
BERNI	Bernina, GR	BB-3
BNALP	Bannalpsee, NW	BB-3, SM-3
BOURR	Bourrignon, JU	BB-3, SM-3
BRANT	Les Verrières, NE	BB-3
DAVOX	Davos, GR	BB-3
DIX	Grande Dixence, VS	BB-3, SM-3
EMV	Vieux Emosson, VS	BB-3, SM-3
FLACH	Flach, ZH	EB-3
FUORN	Ofenpass, GR	BB-3
FUSIO	Fusio, TI	BB-3, SM-3
GIMEL	Gimel, VD	BB-3
GRYON	Gryon, VS	EB-3
HASLI	Hasliberg, BE	BB-3
LIENZ	Kamor, SG	BB-3, SM-3
LKBD	Leukerbad, VS	EB-3
LKBD2	Leukerbad, VS	SP-3
LLS	Linth-Limmern, GL	BB-3, SM-3
MMK	Mattmark, VS	BB-3, SM-3
MUGIO	Muggio, TI	BB-3
MUO	Muotathal, SZ	BB-3
OTTER	Otterbach, BS	SM-3
PLONS	Mels, SG	BB-3
SALAN	Lac de Salanfe, VS	EB-3
SAUR	Augst-Römermuseum, AG	SM-3
SBAF	Basel-Friedhofgasse, BS	SM-3
SBAP	Basel-PUK, BS	SM-3
SBAT	Basel-Tropenhaus, BS	SM-3
SBIS	Binningen, BS	SM-3
SCUC	Scuol-Clozza, GR	SM-3
SENIN	Senin, VS	BB-3, SM-3
SFRA	Frenkendorf, BL	SM-3
SIOO	Sion-Ophtalmologie, VS	SM-3
SIOV	Sion-Valere, VS	SM-3
SLE	Schleitheim, SH	BB-3
SKAF	Kaiseraugst-Friedhof, AG	SM-3
SMUK	Muraz-Kläranlage, VS	SM-3
SMUR	Muraz-Reservoir, VS	SM-3
SMZW	Muttenz-Waldhaus, BL	SM-3
SRHB	Riehen-Bäumlihof, BS	SM-3
STEIN	Stein am Rhein, SH	EB-3
STSP	Tschierv, GR	SM-3
SULZ	Cheisacher, AG	BB-3, SM-3
SZER	Zernez, GR	SM-3
TORNY	Torny, FR	BB-3
TRULL	Trullikon, ZH	EB-3
VDL	Valle di Lei, GR	BB-3, SM-3
WEIN	Weingarten, TG	EB-3
WILA	Wil, SG	BB-3
WIMIS	Wimmis, BE	BB-3
ZUR	Zürich-Degenried, ZH	BB-3, SM-3

Table 14: Seismograph stations of the Swiss national network operational at the end of 2007. Instrument type: SP = 1 second, EB = 5 seconds, BB = broad band, SM = accelerometer, 1 = vertical component only, 3 = vertical and horizontal components. Signals of LKBD2 are transmitted via analog telemetry.

AlpTransit-Gotthard Network		
Code	Station name	Type
CHAT1	Predelp, TI	SP-3
CHAT2	Alpe di Cari, TI	SP-3
CHIR2	Chironico, TI	SP-3, SM-3
DOETR	Doetra, TI	SP-3, SM-3
LUKA1	Lucomagno, TI	SP-3, SM-3
MFSFA	Faido (Tunnel), TI	SM-3
MFSFB	Faido (Tunnel), TI	SM-3
NARA	Leontica, TI	SP-3
RITOM	Lago Ritom, TI	SP-3, SM-3
TONGO	Tortengo, TI	SP-3
Basel Borehole Network		
Code	Station name	Type
HALTI	Haltingen (542)	SP-3
JOHAN	Sankt Johann (317)	SP-3
MATTE	Schützenmatte (553)	SP-3
OTER2	Otterbach (2740)	SP-3
Single stations		
Code	Station name	Type
BBS	Basel-Blauen, BL	SP-1
BERT	Bern, BE	SP-3
GNV	Geneva, GE	SP-1

Table 15: Local seismic networks and single stations operational at the end of 2007. Instrument type: SP = 1 second, SM = accelerometer, 1 = vertical component only, 3 = vertical and horizontal components. The numbers in parentheses next to the borehole stations are the sensor depth with respect to ground surface in meters. Signals of BBS are transmitted via analog telemetry and are recorded by the Landeserdbebendienst Baden-Würtemberg; those of BERT and GNV are recorded locally on paper.