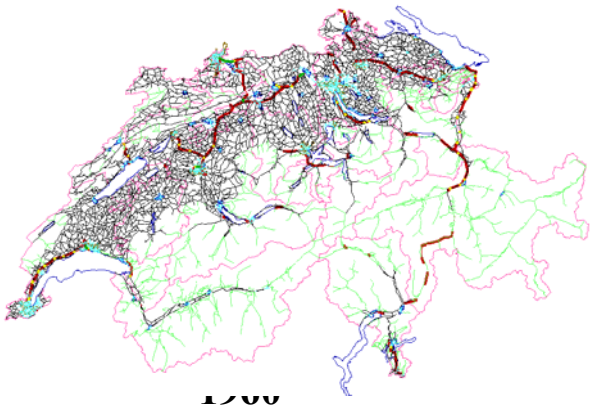
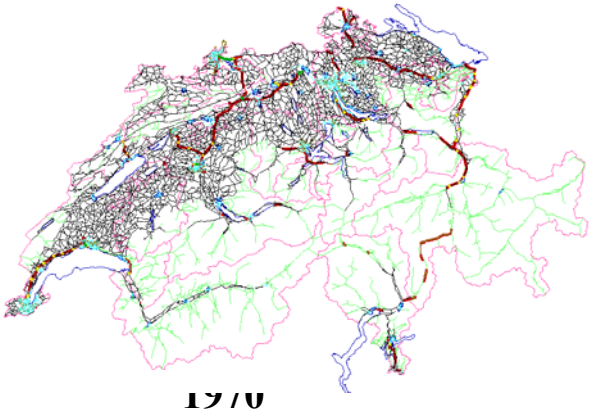
Appendixes

Appendix 1 Development of the freeway network

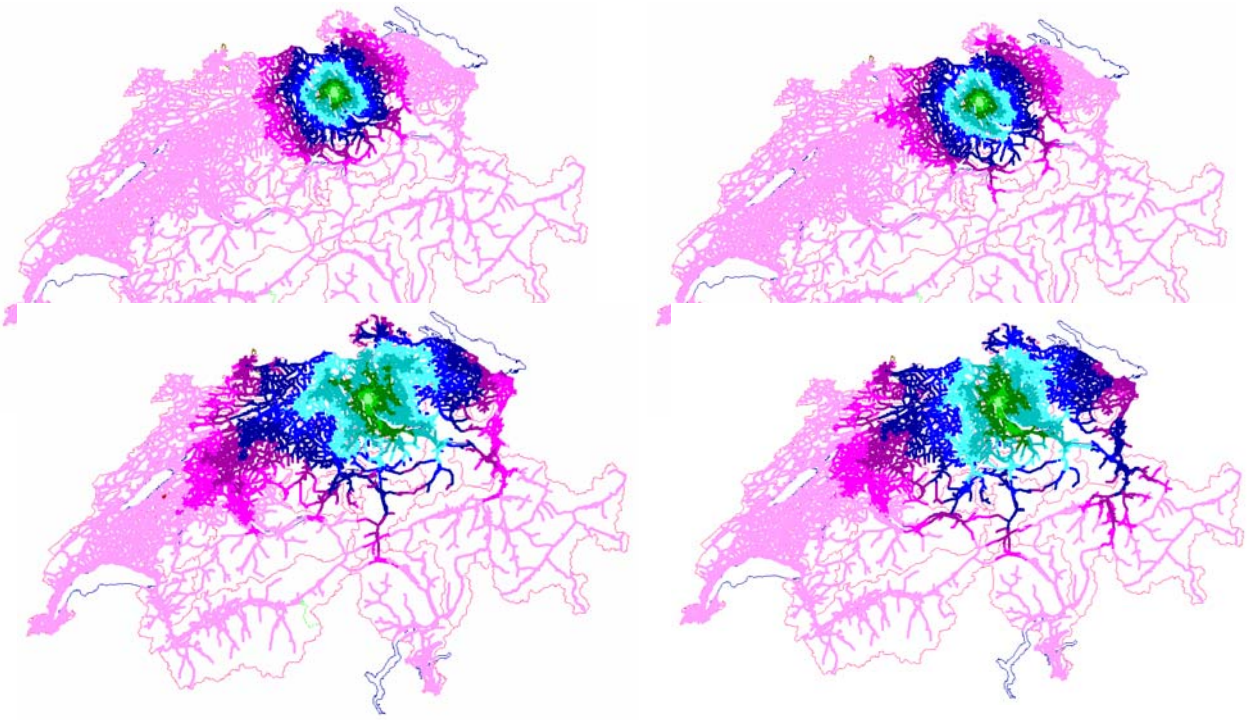




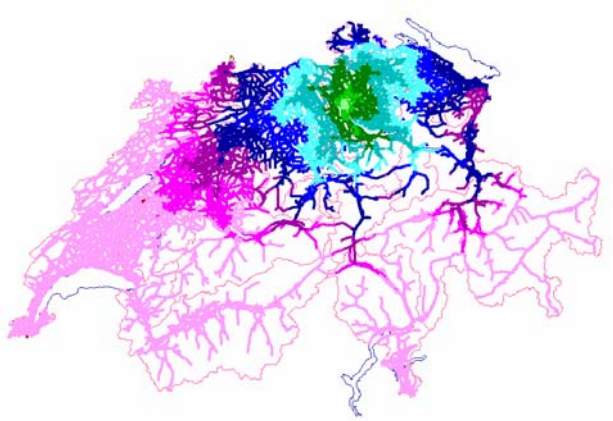
1980

2000

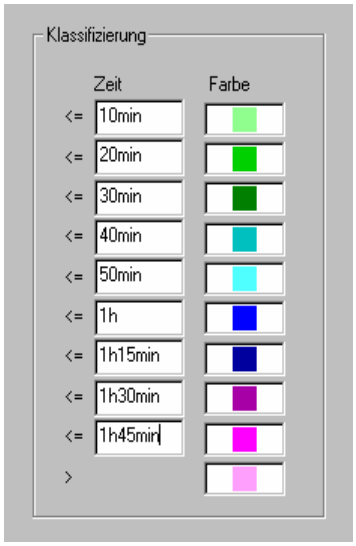
Appendix 2. Isocrhones from Zurich



1980 **1990**



2000



Appendix 3. SAS program – first draft

```
/*VISUM - PW-MATRIX*/



data ETC.COST1;
%let _EFIERR_ = 0; /* set the ERROR detection macro variable */
infile 'H:\Netz\Nationalstrassen\ttimes\Swissroutes2000.txt'
delimiter='09'x MISSOVER
DSD lrecl=32767 firstobs=2 ;
format VONBEZNR best12. ;
format NACHBEZNR best12. ;
format ZEIT TIME8. ;
format LAENGE best12. ;
informat VONBEZNR best32. ;
informat NACHBEZNR best32. ;
informat ZEIT TIME8. ;
informat LAENGE best32. ;
input
VONBEZNR
NACHBEZNR
ZEIT
LAENGE
;
if _ERROR_ then call symput('_EFIERR_',1);  /* set ERROR detection macro
variable */

run;



data DUMMY1;  /* bEVÖLKERUNGSDATEI */
%let _EFIERR_ = 0; /* set the ERROR detection macro variable */
infile 'H:\Bevölkerung\freeways_pop\swiss2000.TXT' delimiter='09'x
MISSOVER
DSD lrecl=32767 firstobs=2 ;
format NACHBEZNR best12. ;
format BEV best12. ;
informat NACHBEZNR best32. ;
informat BEV best32. ;
input
NACHBEZNR
BEV
;
if _ERROR_ then call symput('_EFIERR_',1);  /* set ERROR detection macro
variable */
run;
```

```
proc sort data=dummy1; by nachbeznr; run;
proc sort data=etc.cost1; by nachbeznr; run;

proc summary data = etc.cost1;
      class vonbeznr;
      output
      out=gemeinden;
run;

data gemeinden;
      set gemeinden;
      if vonbeznr = . then delete;
      nachbeznr = vonbeznr;
      zeit = 900;
            drop _type_ _freq_;
run;


data etc.cost1;
      set etc.cost1 gemeinden;
run;

proc sort data = etc.cost1;
      by nachbeznr vonbeznr;
run;



DATA etc.cost1;
      SET ETC.COST1;
      FORMAT ZEIT2 8.2;
      ZEIT2 = ZEIT/60;
RUN;




data dummy2;
      merge etc.cost1 dummy1;
      by nachbeznr;
      if zeit2=. then delete;
      if bev=. then bev=0;
      acc_pop=bev*2.718**(-0.1*zeit2);
run;




proc summary data=dummy2;
      var   acc_pop;
      class vonbeznr;
      output      out=etc.cost2
                  sum= accpop;
run;


data etc.cost2;
```

```
      set etc.cost2;
      if vonbeznr = . then delete;
      drop _freq_ _type_;
run;

proc print data=etc.cost2;
 run;
```

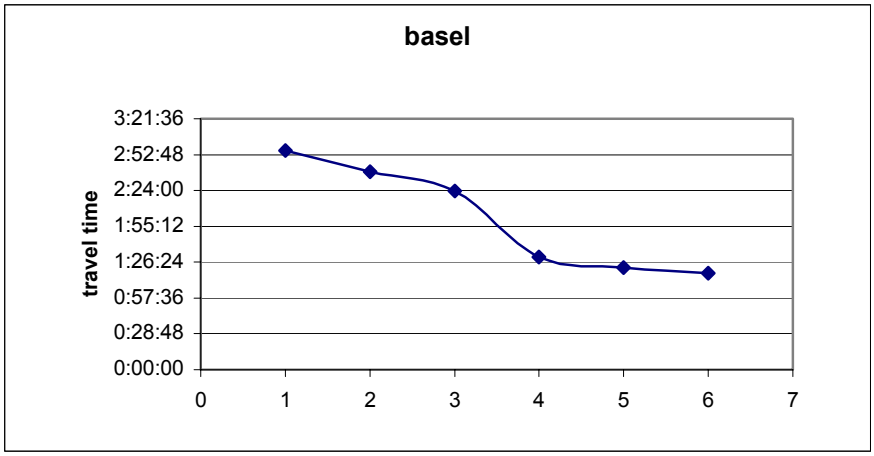
Appendix 4. SAS program – second draft

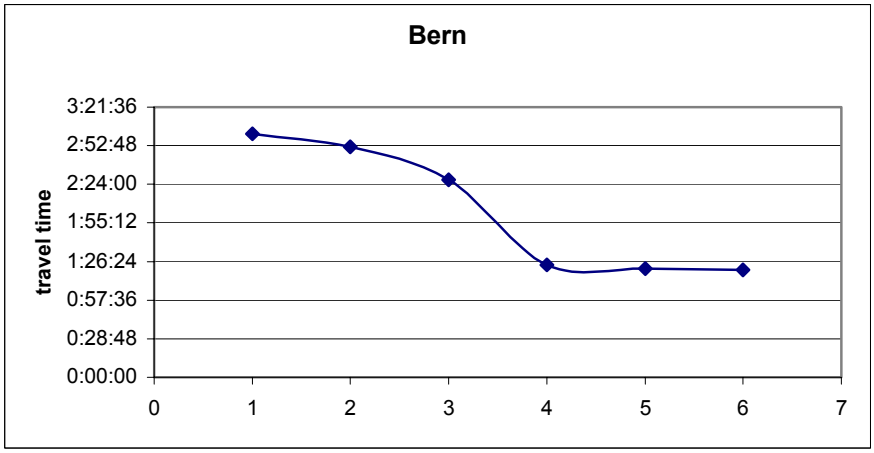
```
/*VISUM - PW-MATRIX*/



data ETC.COST1;
%let _EFIERR_ = 0; /* set the ERROR detection macro variable */
infile 'E:\Netz\Nationalstrassen\ttimes\Swissroutes2000.txt'
delimiter='09'x MISSOVER
DSD lrecl=32767 firstobs=2 ;
format VONBEZNR best12. ;
format NACHBEZNR best12. ;
format ZEIT TIME8. ;
format LAENGE best12. ;
informat VONBEZNR best32. ;
informat NACHBEZNR best32. ;
informat ZEIT TIME8. ;
informat LAENGE best32. ;
input
VONBEZNR
NACHBEZNR
ZEIT
LAENGE
;
if _ERROR_ then call symput('_EFIERR_',1);  /* set ERROR detection macro
variable */

run;


data etc.pop_nr2000;  /* bEVÖLKERUNGSDATEI */
%let _EFIERR_ = 0; /* set the ERROR detection macro variable */
infile 'E:\Bevölkerung\freeways_pop\pop_nr2000.txt' delimiter='09'x
MISSOVER
DSD lrecl=32767 firstobs=2 ;
format NACHBEZNR best12. ;
format BEV best12. ;
format CLASS best12. ;
informat NACHBEZNR best32. ;
informat BEV best32. ;
informat CLASS best32. ;
input
NACHBEZNR
BEV
CLASS
;
if _ERROR_ then call symput('_EFIERR_',1);  /* set ERROR detection macro
variable */
run;
```

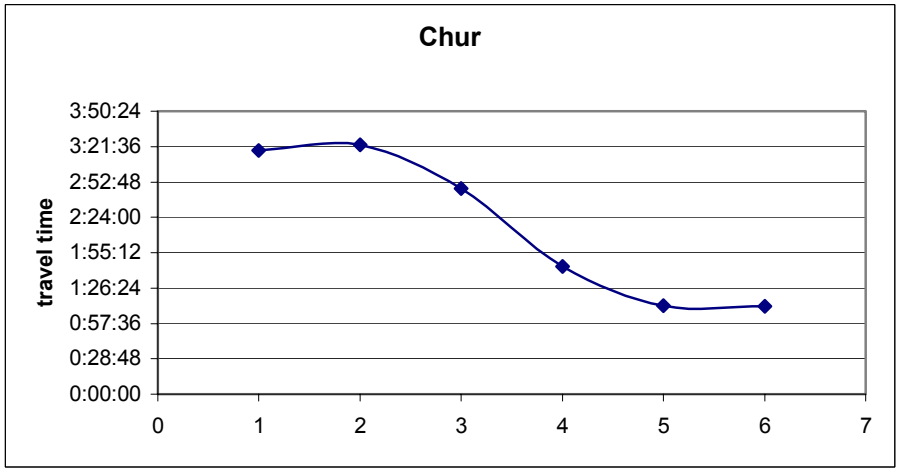
```
proc sort data=etc.pop_nr2000; by nachbeznr; run;
proc sort data=etc.cost1; by nachbeznr; run;

proc summary data = etc.cost1;
      class vonbeznr;
      output
      out=gemeinden;
run;

data gemeinden;
      set gemeinden;
      if vonbeznr = . then delete;
      nachbeznr = vonbeznr;
      if class = 1 then zeit = 900; /* class 1 = Grosstädte */
            else if class = 2 then zeit = 600 ; /* 2 = Mittelstädte */
                  else if class = 3 then zeit = 420; /* 3 => pop 5000-
30000 */
                        else if class = 4 then zeit = 240; /* 4 => wenig
als 5000 */
      drop _type_ _freq_;
run;


data etc.cost1;
      set etc.cost1 gemeinden;
run;

proc sort data = etc.cost1;
      by nachbeznr vonbeznr;
run;



DATA etc.cost1;
      SET ETC.COST1;
      FORMAT ZEIT2 8.2;
      ZEIT2 = ZEIT/60;
RUN;




data etc.cost_pop;
      merge etc.cost1 etc.pop_nr2000;
      by nachbeznr;
      if zeit2=. then delete;
      if bev=. then bev=0;
      acc_pop=bev*2.718**(-0.1*zeit2);
run;




proc summary data=etc.cost_pop;
```

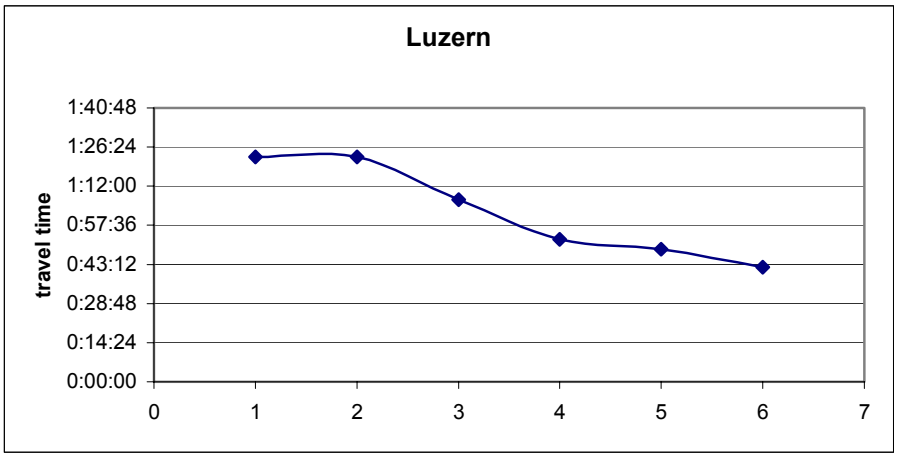
```
      var   acc_pop;
      class vonbeznr;
      output      out=etc.cost2
                  sum= accpop;
run;


data etc.cost2;
      set etc.cost2;
      if vonbeznr = . then delete;
      drop _freq_ _type_;
run;

proc print data=etc.cost2; run;
```

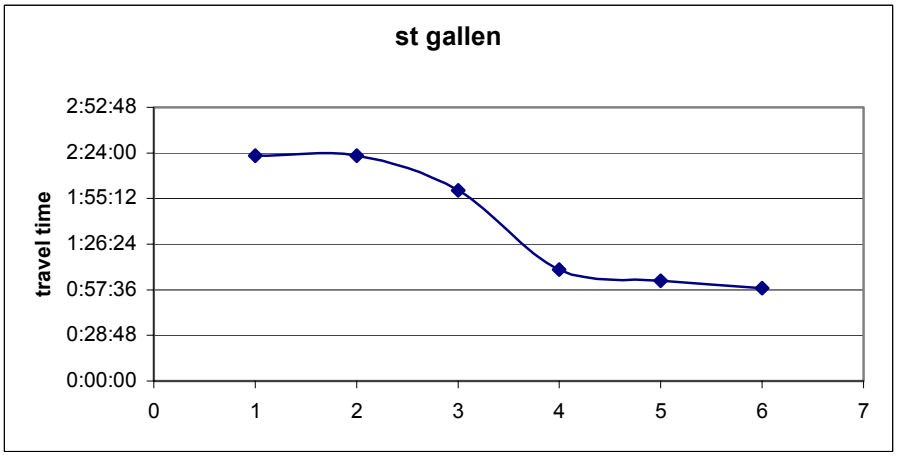
Appendix 5. Travel times from Zurich

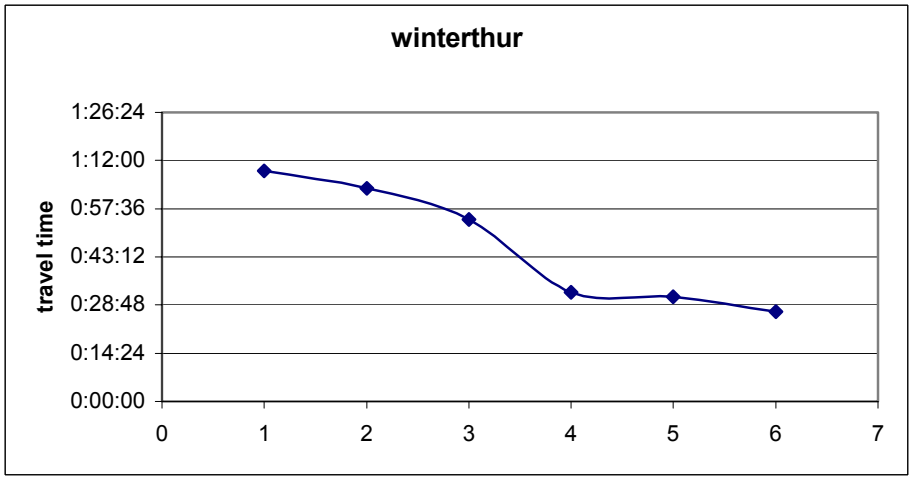




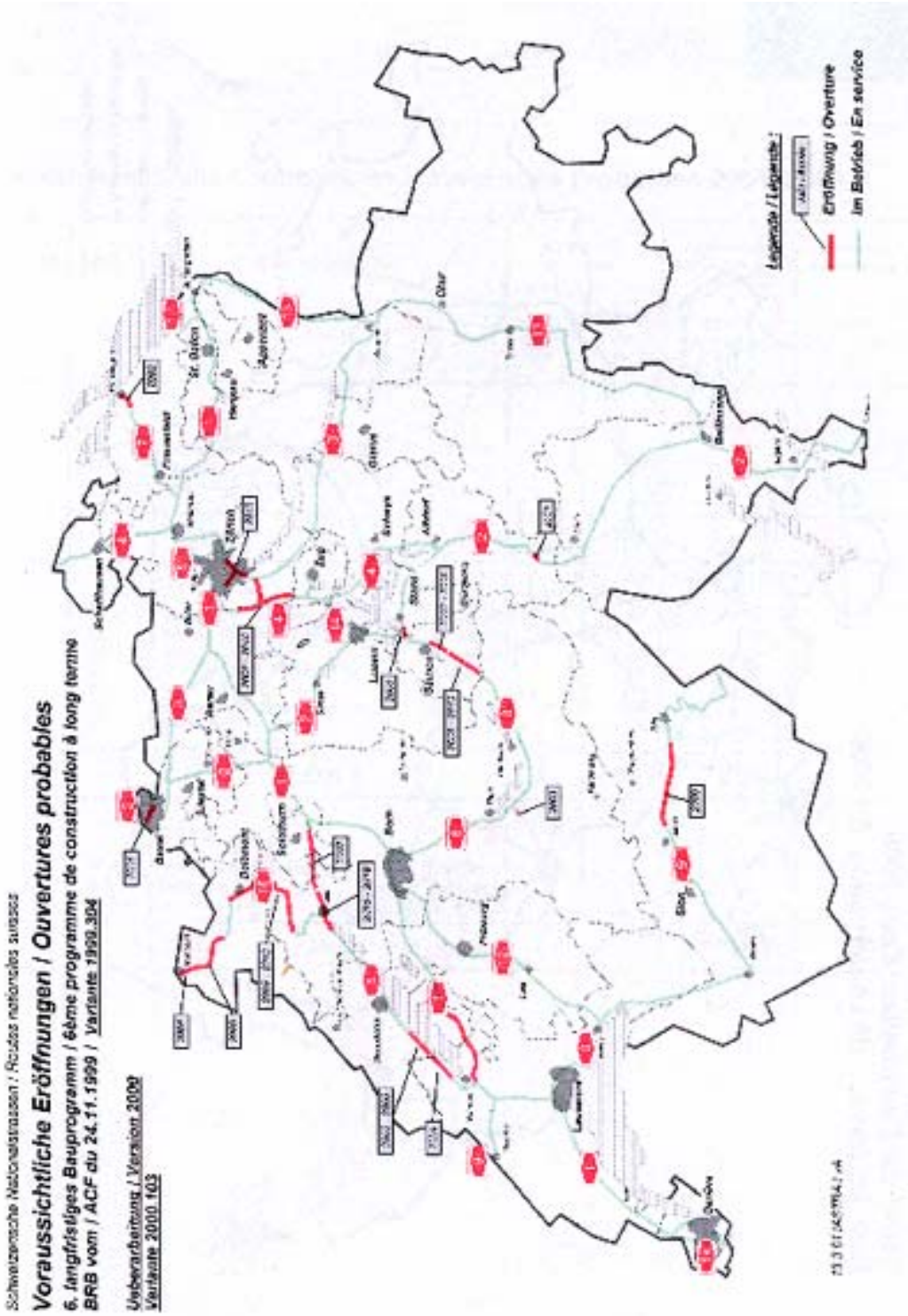



Luzern
travel time
1:40:48
1:26:24
1:12:00
0:57:36
0:43:12
0:28:48
0:14:24
0:00:00
0
1
2
3
4
5
6
7


st gallen
travel time
2:52:48
2:24:00
1:55:12
1:26:24
0:57:36
0:28:48
0:00:00
0
1
2
3
4
5
6
7


winterthur
travel time
1:26:24
1:12:00
0:57:36
0:43:12
0:28:48
0:14:24
0:00:00
0
1
2
3
4
5
6
7

Apendix 6. Highway network



Appendix 7. Evolution of vehicle numbers since 1950

Number of vehicles on September 30 th; incl. Fed. Govt. vehicles (excl. army vehicles)

Year	Vehicles								
	Total	of which motor vehicles							of which trailers 2)
		Total	of which						
			Passenger cars	Passenger vehicles	Goods vehicles	Agric. vehicles 1)	Industrial vehicles 1)	Motor-cycles	
1950	...	251,952	146,998	2,028	36,472	3,014		63,440	...
1955	...	485,130	279,517	2,502	41,921	3,950		157,240	...
1960	...	865,106	509,279	3,127	55,150	6,224		3) 291,326	...
1965	...	1,216,473	919,110	4,018	84,014	17,666		191,665	...
1970	...	1,666,143	1,383,204	5,542	106,997	28,293		142,107	...
1975	...	2,121,366	1,794,255	9,758	139,413	87,615		90,325	...
1980	2,839,474	2,702,266	2,246,752	11,087	169,402	137,685		137,340	137,208
1985	3,392,447	3,221,607	2,617,164	10,771	200,537	175,161		217,974	170,840
1990	3,998,867	3,776,951	2,985,399	31,293	252,136	162,939	45,920	299,264	221,916
1991	4,110,890	3,881,365	3,057,800	33,626	257,646	165,576	46,938	319,779	229,525
1992	4,169,870	3,935,588	3,109,230	34,738	256,611	169,280	47,281	336,448	234,282
1993	4,204,628	3,965,095	3,109,524	35,305	253,461	171,417	47,229	348,159	239,533
1994	4,281,081	4,034,342	3,165,043	36,086	256,285	172,303	47,373	357,252	246,739
1995	4,376,424	4,120,906	3,229,169	36,967	262,352	174,026	47,693	370,699	255,518
1996	4,435,010	4,172,607	3,268,073	4) 37,662	263,019	174,247	47,622	381,984	262,403
1997	4,528,062	4,260,309	3,323,421	4) 38,508	264,199	175,689	47,743	410,749	267,753
1998	4,622,922	4,349,173	3,383,273	4) 39,012	267,380	176,712	47,754	435,042	273,749
1999	4,750,586	4,470,691	3,467,275	4) 39,692	273,954	177,148	48,265	464,357	279,895
2000	4,870,940	4,584,718	3,545,247	4) 40,260	278,518	177,963	48,949	493,781	286,222
2001	5,001,828	4,706,561	3,629,713	4) 41,342	285,246	179,321	49,549	521,390	295,267

1) Different classification until 1988
2) 1980 to 1989, trailers published separately
3) 1960: incl. mopeds
4) Since 1996 not including trolleybuses and articulated trolleybuses

Appendix 8. Traffic services

In millions of passenger kilometres or millions of tonne-kilometres

	Passengers		*Goods transport*	
Year	*Rail*[1]	*Road*[2]	*Rail*[1]	*Road*
1960	7,973	18,590	4,315	2,152
1970	9,339	45,882	6,983	4,846
1980	9,964	67,041	7,799	7,287
1990	12,678	77,759	8,862	11,548
1991	13,834	79,147	8,728	11,720
1992	13,209	77,734	8,277	12,555
1993	13,384	75,703	7,883	13,013
1994	13,836	77,675	8,648	14,356
1995	13,408	79,510	8,686	14,956
1996	13,326	80,510	7,907	16,289
1997	14,104	80,715	8,688	17,863
1998	...	81,557	...	19,504
1999	...	82,570	...	20,487[3]
2000	...	...	...	21,949[3]

[1] Railways only
[2] Private transport
[3] Extrapolation

Appendix 9. Mountain Passes.

Switzerland is famous for its alpine passes. Ever since people move around, these passes are important pathways between the northern and the southern part of Europe.

Name	From	To	Max. Elevation	Length	Max. grade	Open
Umbrail	Sta. Maria, Münstertal (GR)	Bormio (Italy)	2501 m	33 km	12%	May - Nov
Nufenen	Ulrichen (VS)	Airolo (TI)	2478 m	36 km	11%	Jun - Oct
Grosser St. Bernhard (Tunnel)	Martini (VS)	Aosta (italy)	2469 m (1924 m)	79 km (5.8 km)	11%	May - Oct (all year)
Furka	Gletsch (VS)	Hospental (UR)	2431 m	28 km	11%	May - Oct
Flüela	Davos Dorf (GR)	Susch (GR)	2383 m	26 km	12%	all year
Bernina	Pontresina (GR)	Poschiavo (GR)	2323 m	33 km	12%	all year
Albula	Bergün (GR)	La Punt-Chamues-ch (GR)	2312 m	23 km	12%	Jun - Nov
Julier	Tiefencastel (GR)	Silvaplana (GR)	2284 m	43 km	13%	all year
Susten	Innertkirchen (BE)	Wassen (UR)	2224 m	46 km	9%	May - Nov
Grimsel	Innertkirchen (BE)	Oberei (BE)	2165 m	33 km	11%	May - Oct
Ofenpass	Zernez (GR)	Sta. Maria, Münstertal (GR)	2149 m	36 km	12%	all year
Splügen	Splügen (GR)	Chiavenna (Italy)	2113 m	39 km	13%	May - Nov
St. Gotthard (Tunnel)	Andermatt (UR)	Airolo (TI)	2108 m (1175 m)	27 km (16.9 km)	11%	May - Nov (all year)
San Bernardino (Tunnel)	Hinterrhein (GR)	Soazza (GR)	2065 m (1644 m)	32 km (6.6 km)	12%	May - Dec (all year)

Oberalp	Andermatt (UR)	Disentis (GR)	2044 m	32 km	10%	May - Nov
Simplon	Brig (VS)	Iselle (Italy)	2005 m	46 km	10%	all year
Klausenpass	Altdorf (UR)	Linthal (GL)	1948 m	47 km	10%	May - Oct
Lukmanier	Disentis (GR)	Acquarossa (TI)	1916 m	48 km	10%	Apr - Dec
Maloja	Chiavenna (Italy)	Silvaplana (GR)	1815 m	43 km	11%	all year
Col de la Croix	Villars-sur-Ollon (VD)	Les Diableres (VD)	1780 m	18 km	12%	May - Nov
Lenzerheide	Chur (GR)	Tiefencastel (GR)	1549 m	28 km	11%	all year
Col du Pillon	Aigle (VD)	Gstaad (BE)	1546 m	42 km	11%	all year

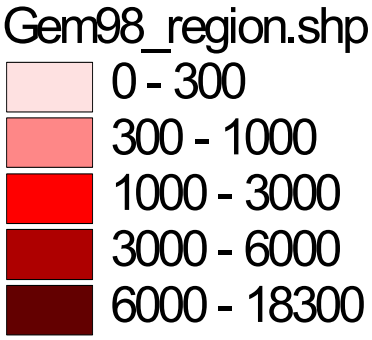
Appendix 10. Road lengths by canton (2000)

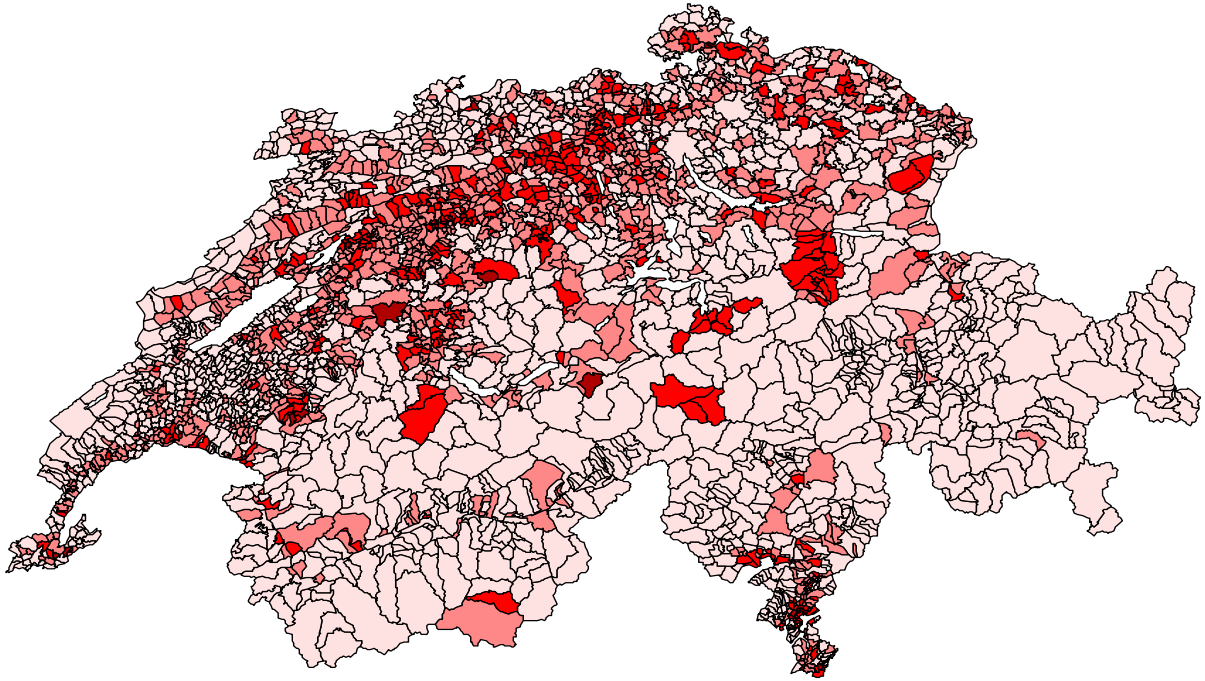
Road lenghts by canton	National highways	Cantonal highways	Local roads	Total
Switzerland	**1,638.0**	**18,134**	**51,356**	**71,128**
Aargau (AG)	99.3	1152	4,339	5,591
Appenzell Ausserrhoden (AR)	-	229	203	432
Appenzell Innerrhoden (AI)	-	48	91	139
Basel-City (BS)	8.4	307	61	376
Basel-Country (BL)	30.2	472	1,551	2,052
Berne (BE)	183.0	2,089	9,609	11,883
Fribourg (FR)	73.3	677	2,677	3,427
Geneva (GE)	27.2	267	1,064	1,358
Glarus (GL)	16.6	125	266	408
Graubünden (GR)	128.5	1,503	2,046	3,678
Jura (JU)	22.6	443	1,185	1,651
Lucerne (LU)	58.5	510	2,66	3,229
Neuchâtel (NE)	24.5	464	1,366	1,855
Nidwalden (NW)	23.8	74	140	238
Obwalden (OW)	32.1	78	420	530
Schaffhausen (SH)	17.2	222	1,374	1,613
Schwyz (SZ)	49.7	209	630	889
Solothurn (SO)	33.1	623	1,844	2,496
St.Gallen (SG)	142.2	631	2,148	2,921
Thurgau (TG)	38.5	804	2,322	3,163
Ticino (TI)	136.8	1,053	1,944	3,13
Uri (UR)	67.5	180	121	369
Valais (VS)	101.8	2,029	2,064	4,195
Vaud (VD)	183.9	2,134	5,366	7,684
Zug (ZG)	17.7	141	398	557
Zurich (ZH)	121.6	1,666	5,476	7,264

Appendix 11. Accessibility 1960 – 2000 in Switzerland

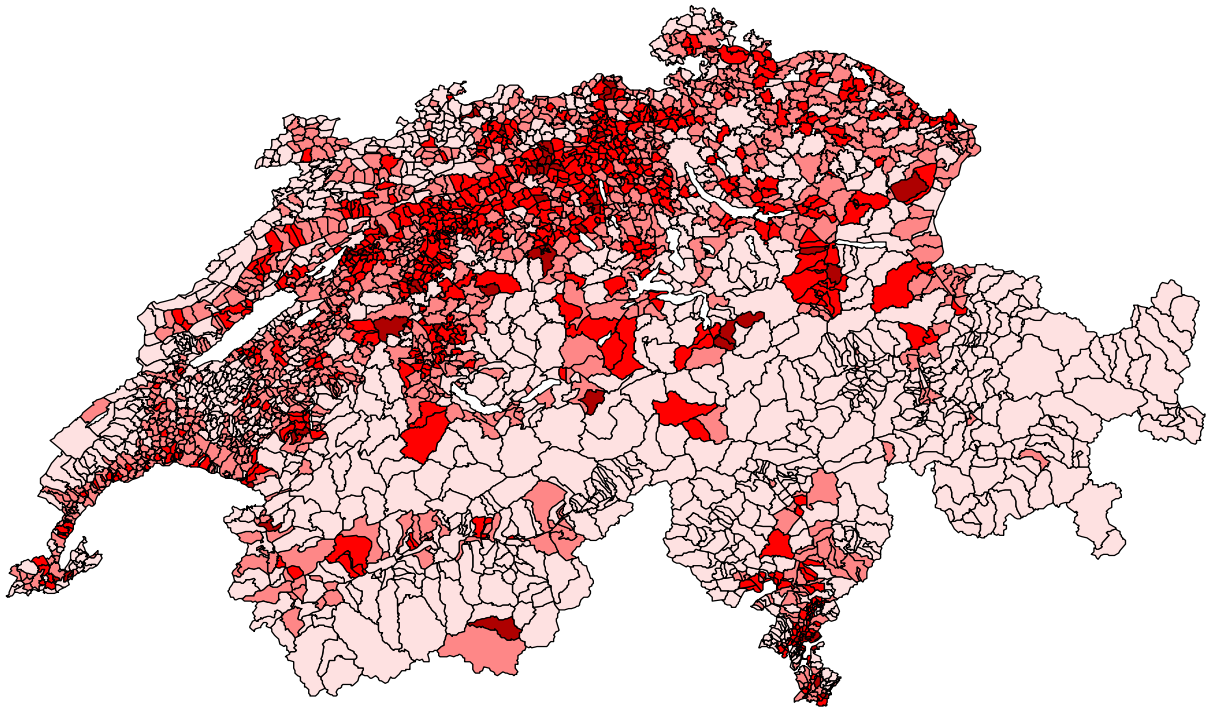
Next the figures for the accessibility are shown.

The same range of values is used for all of them

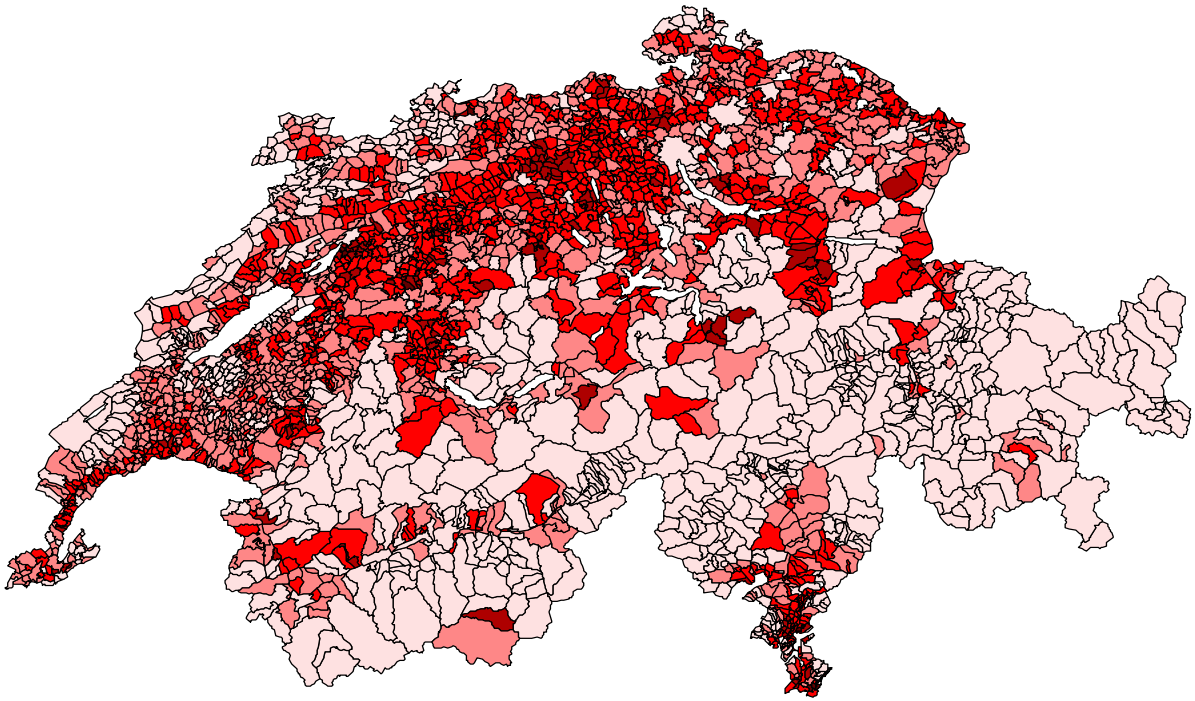




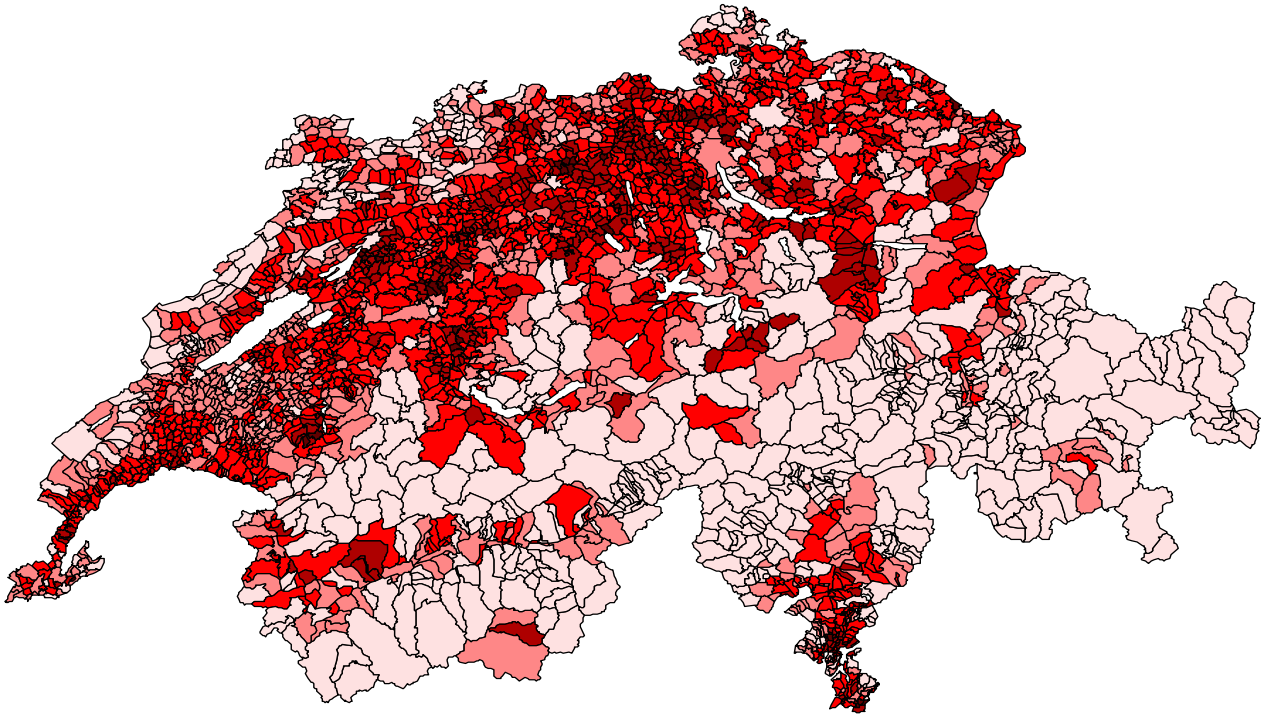
Absolute accessibility for the year 1960



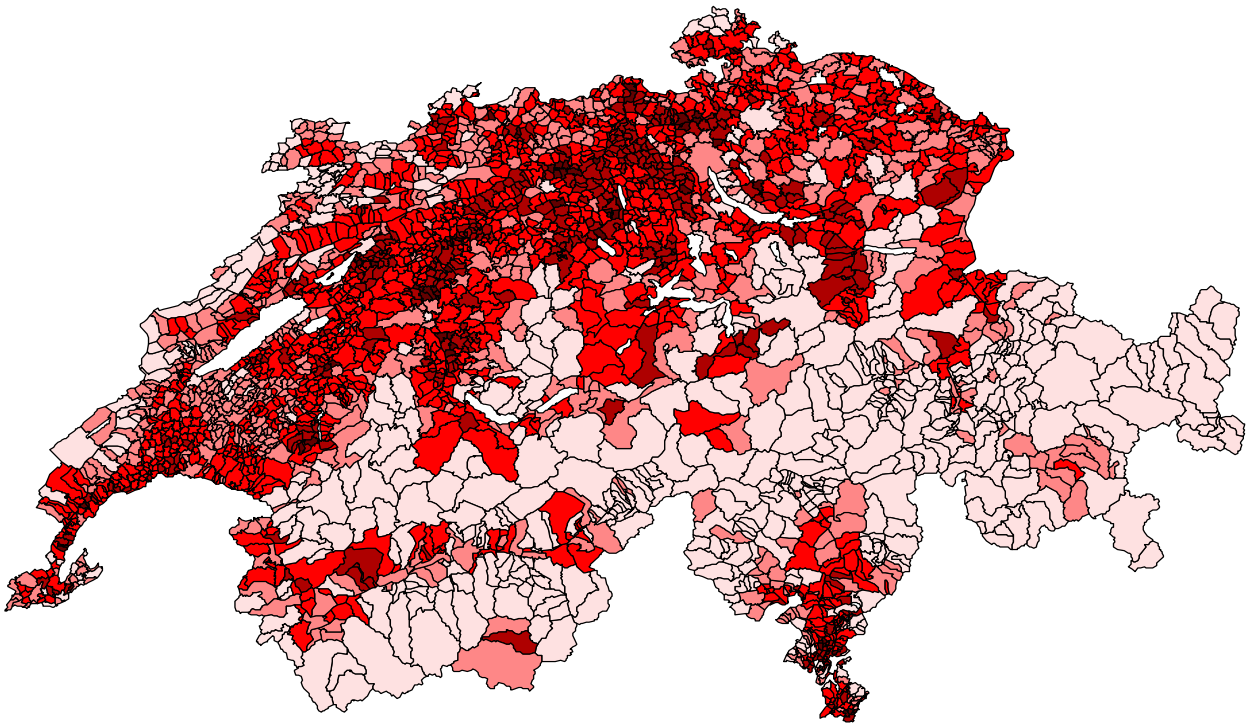
Absolute accessibility for the year 1970



Absolute accessibility for the year 1980



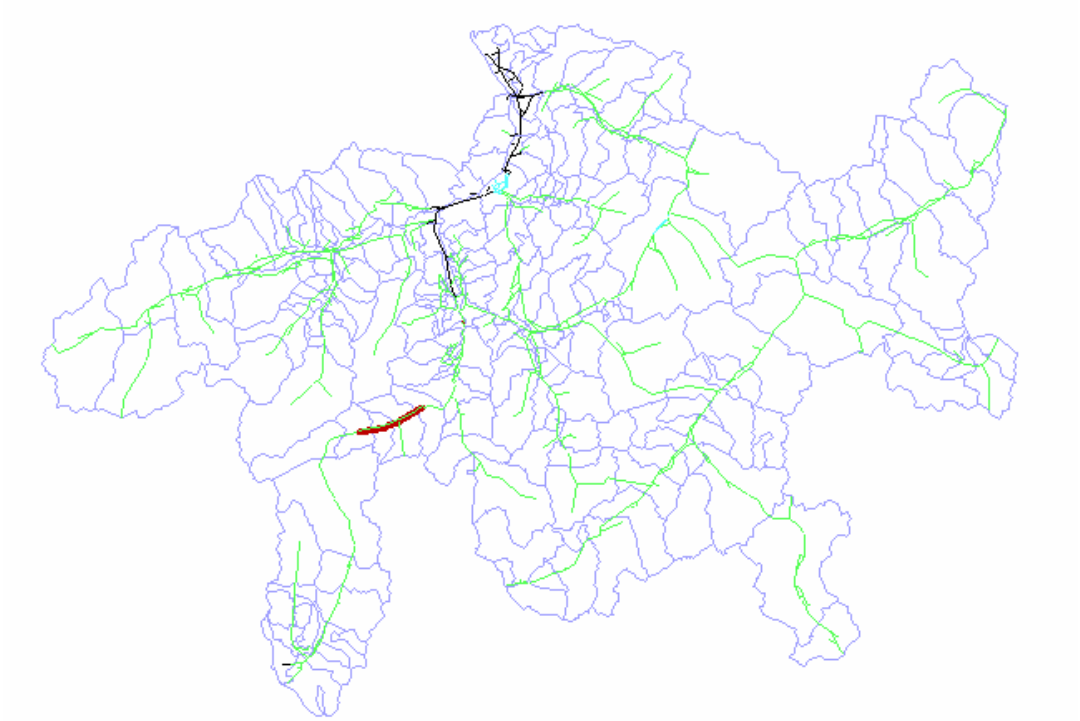
Absolute accessibility for the year 1990



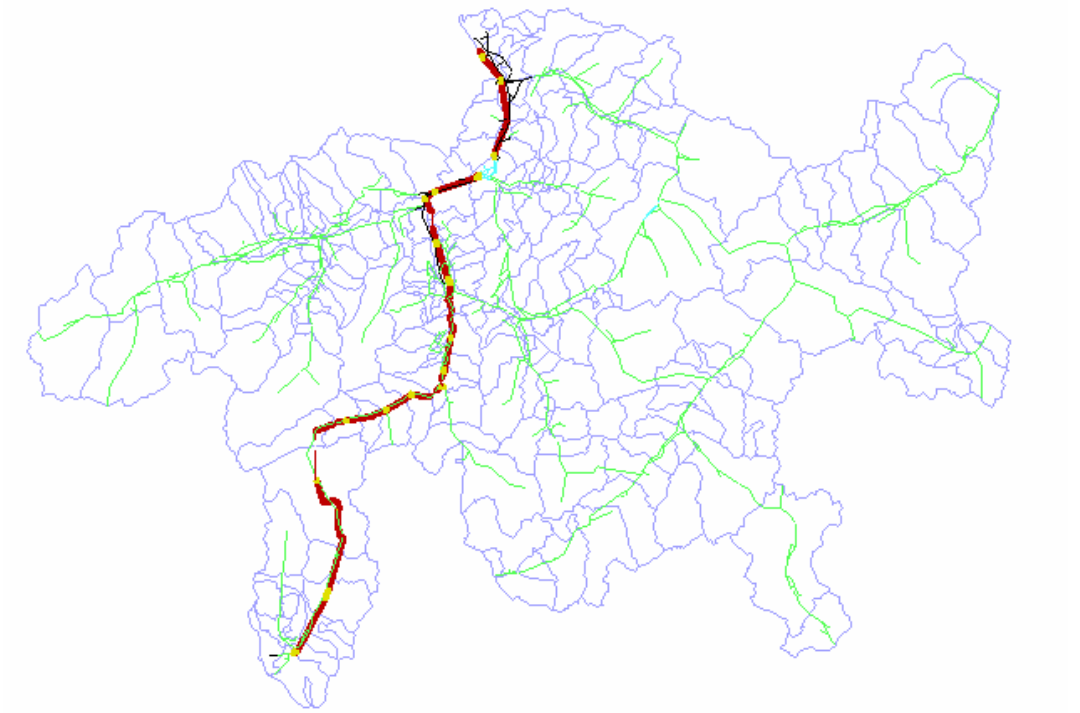
Absolute accessibility for the year 2000

Appendix 12. Graubunden network

1960

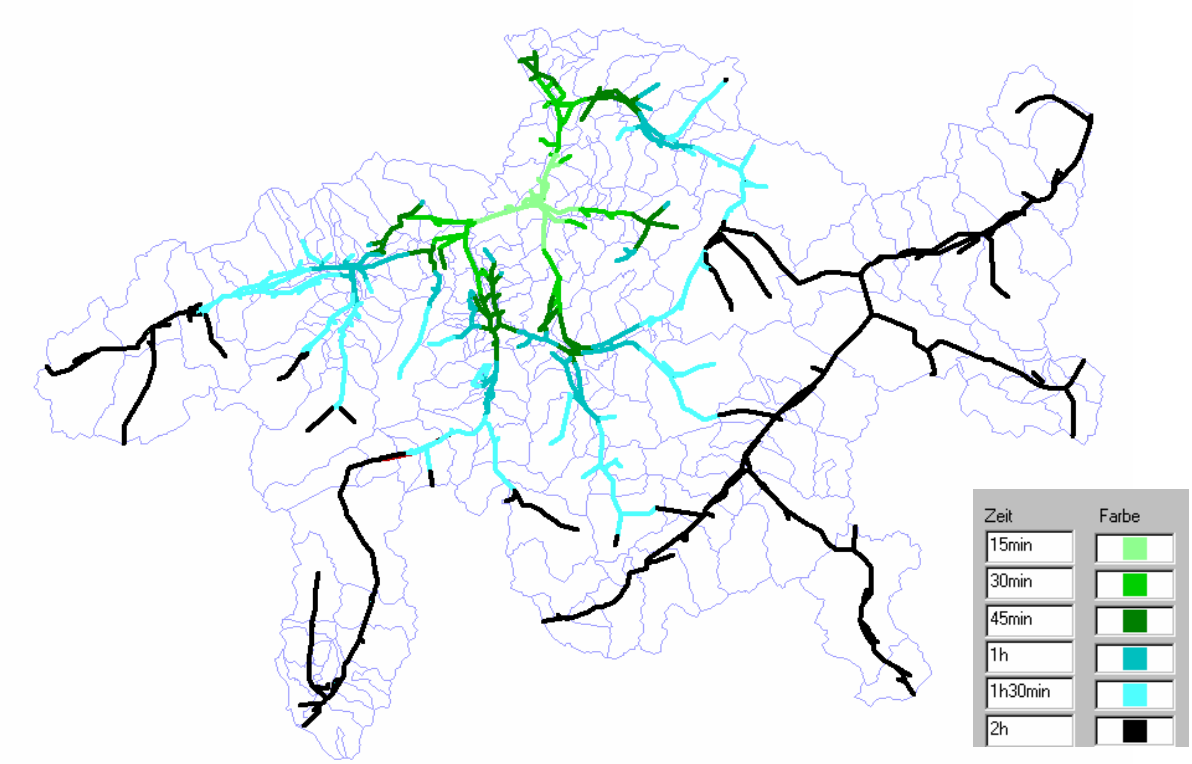


2000

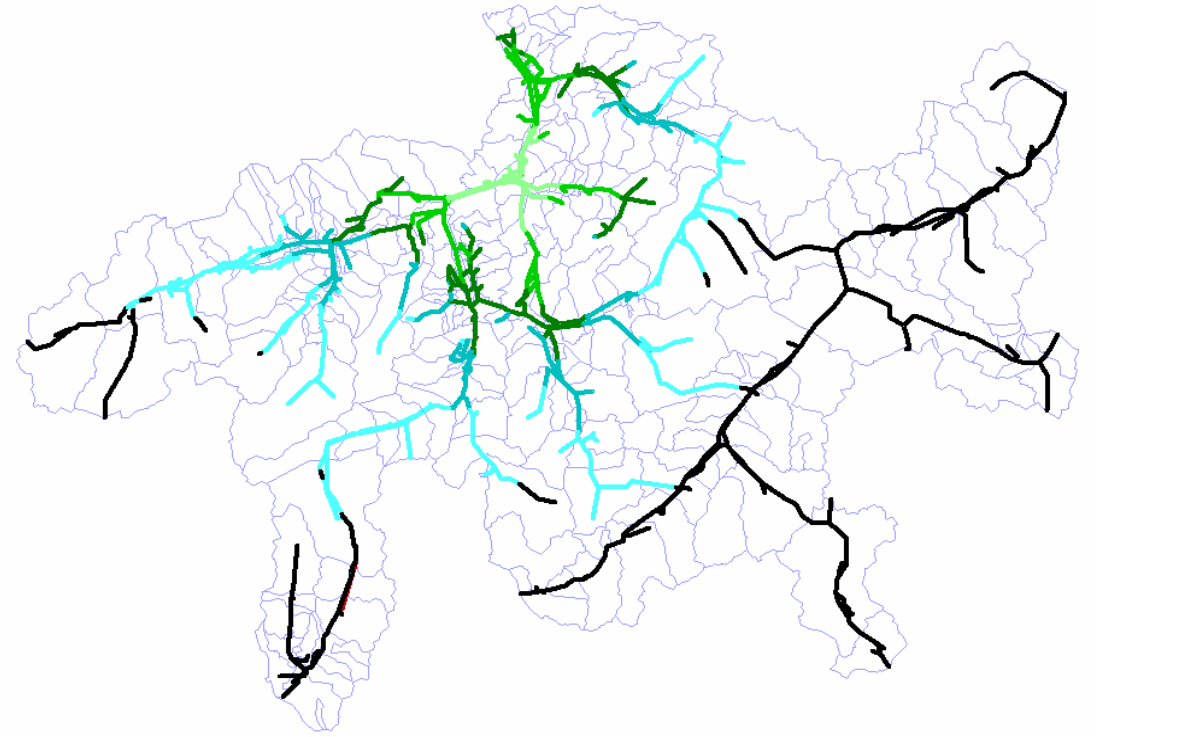


Appendix 13. Isocrhones from Chur

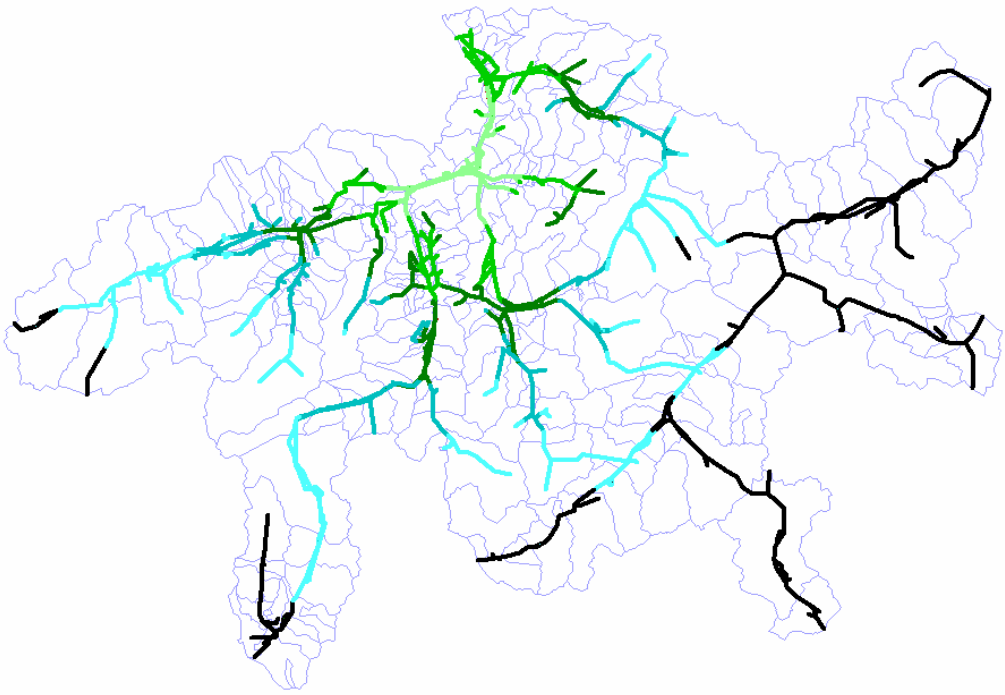
1960



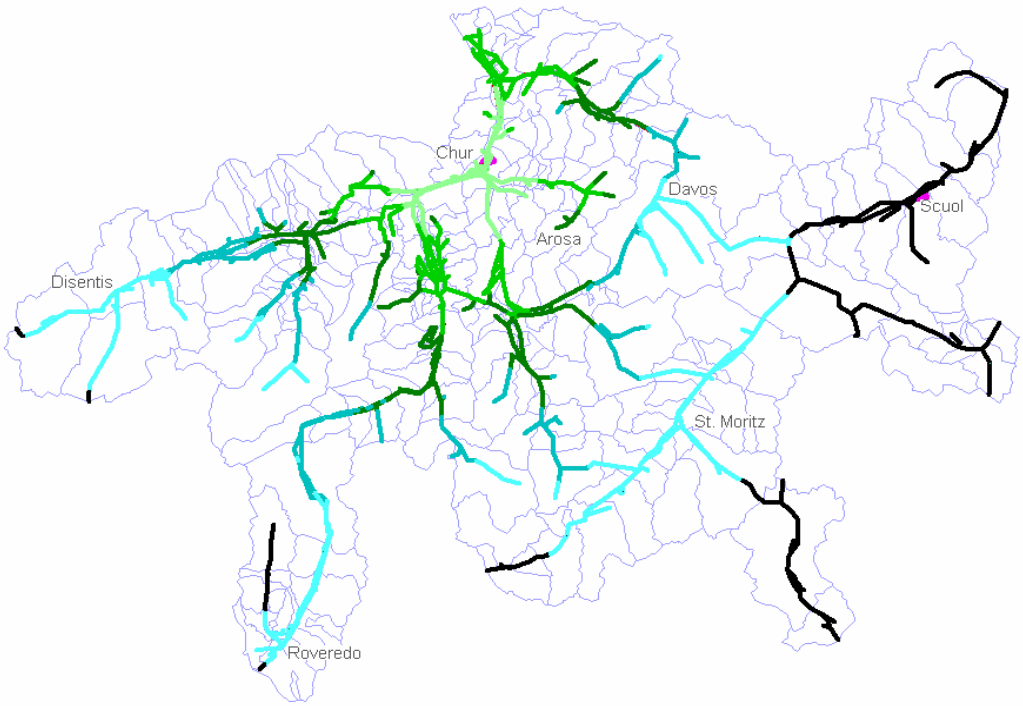
1970



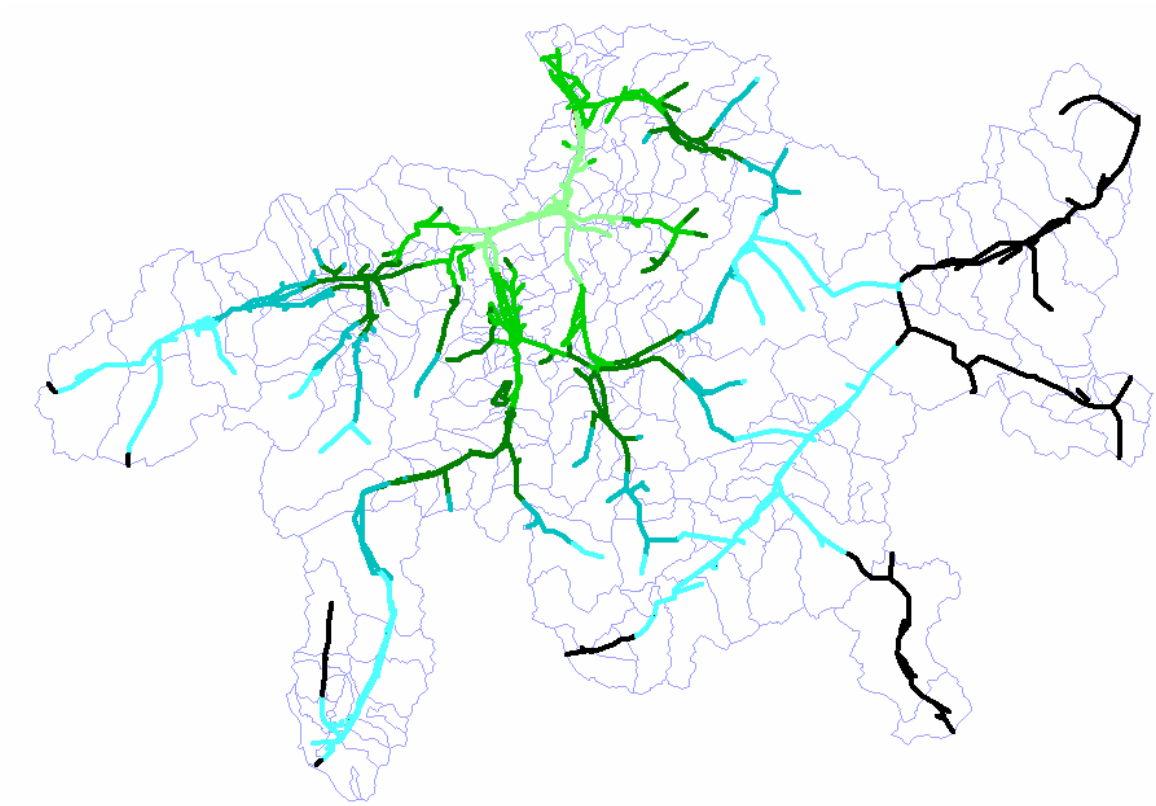
1980



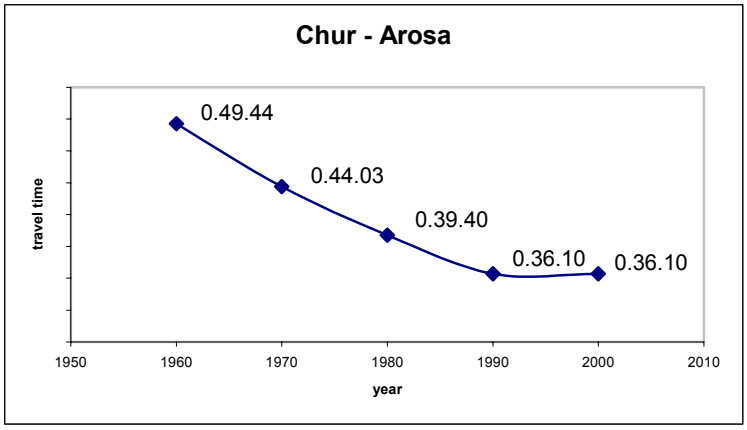
1990

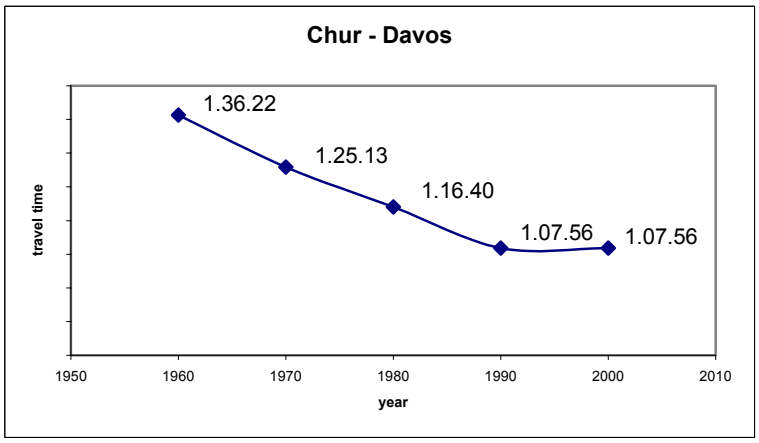


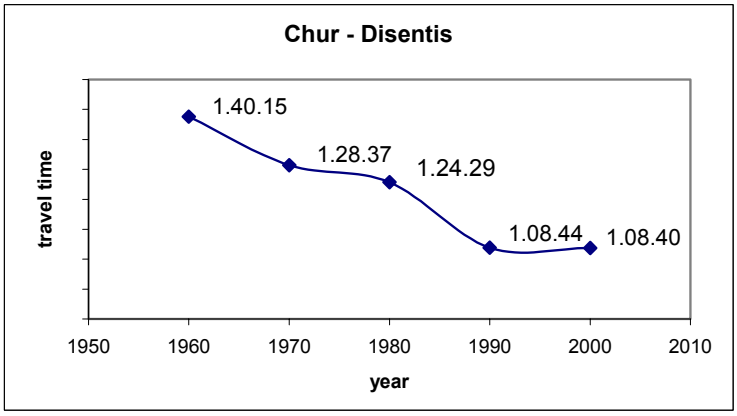
2000

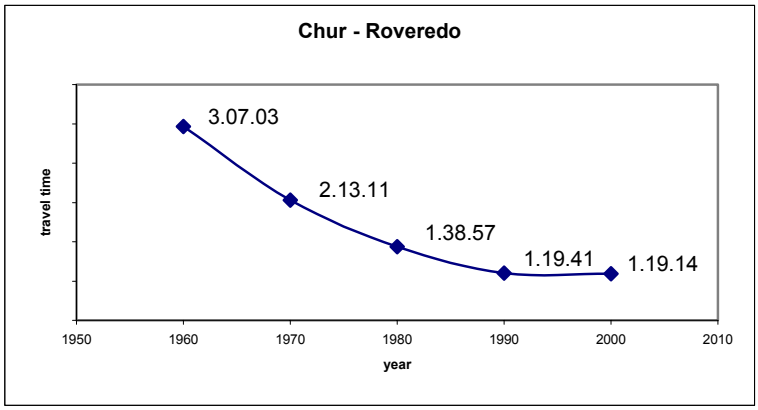


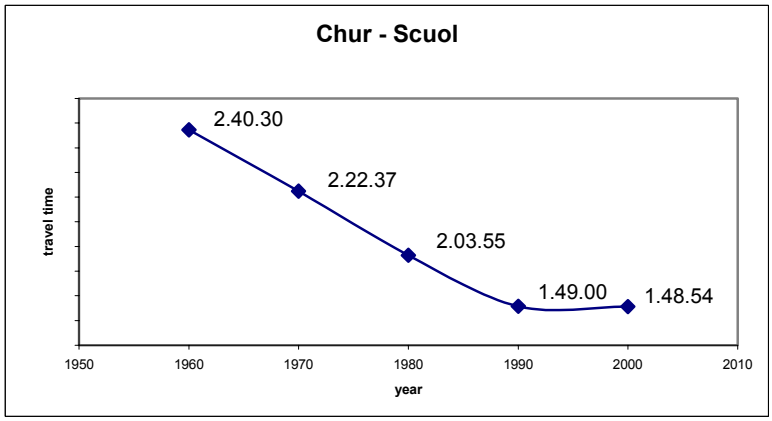
Appendix 14. Travel times from Chur trough the time.

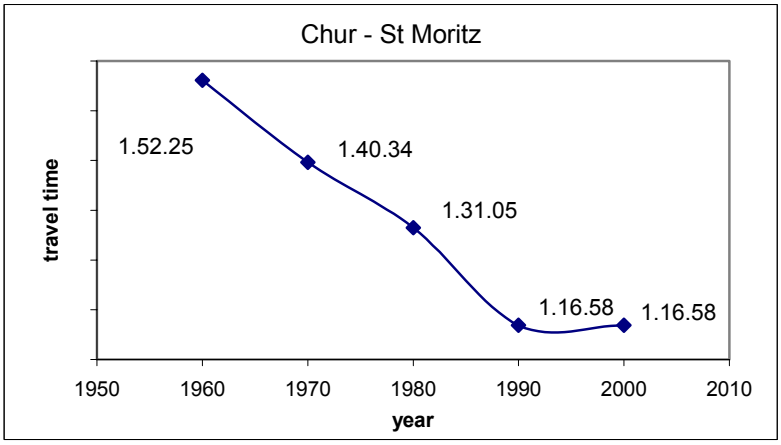







Chur - Roveredo
travel time
3.07.03
2.13.11
1.38.57
1.19.41
1.19.14
1950
1960
1970
1980
1990
2000
2010
year


Chur - Scuol
travel time
2.40.30
2.22.37
2.03.55
1.49.00
1.48.54
1950
1960
1970
1980
1990
2000
2010
year


Chur - St Moritz
travel time
1.52.25
1.40.34
1.31.05
1.16.58
1.16.58
1950
1960
1970
1980
1990
2000
2010
year