Precipitation isoscape of high reliefs: interpolation scheme designed and tested for monthly resolved precipitation oxygen isotope records of an Alpine domain

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Table S1. Basic geographical information of the stations.

Name	**lon (deg)**	**lat (deg)**	**z (m a.s.l.)**	**First available data**	**Last available data**	**completeness % (full[1]/1995-2000)**	**Reference**
Basel	7.582	47.541	319	Jan 1985	Dec 2010	66.7/100	Network of the Division of Climate and Environmental Physics, University of Bern
Burgdorf	7.634	47.062	556	Jan 1984	Dec 2010	70.2/100	
Visp	7.881	46.286	664	Feb 1983	Dec 2010	69.3/97.2	
St. Gallen	9.417	47.429	805	Feb 1982	Dec 2010	72.6/98.6	
Grindelwald	8.042	46.624	1048	Jan 1980	Jan 2005	65.4/98.6	
St. Niklaus - Grächen	7.800	46.171	1450	Jan 1987	Dec 2010	59.6/98.6	
Kl. Scheidegg	7.963	46.585	2065	Jan 1980	Dec 2010	75.9/94.4	
Säntis	9.344	47.250	2470	Feb 1982	Dec 2010	73.7/97.2	
Jungfraujoch	7.985	46.548	3570	Jan 1983	Dec 2010	71.1/100	
Suhr	8.079	47.367	397	Jul 1994	Nov 2010	42.8/98.6	Swiss National Network for
Nyon Changins	6.230	46.380	436	Jul 1992	Dec 2010	48.0/97.2	

Vaduz	9.523	47.127	460	Jul 1992	Dec 2010	47.4/98.6	Isotopes in the Water Cycle (Schürch et al. 2003)
Sion	7.341	46.220	482	Jul 1994	Dec 2010	37.7/97.2	
LaBrevine	6.609	46.982	1042	Jan 1994	Dec 2010	44.5/100	
Pontresina	9.901	46.492	1742	Jul 1994	Dec 2010	52.4/98.6	
Locarno*	8.787	46.172	379	Jan 1973	Dec 2010	92.8/90.3	
Bern*	7.439	46.951	567	Jan 1971	Dec 2010	100/100	
Meiringen*	8.178	46.727	632	Jan 1971	Dec 2010	99.8/98.6	
Guttanen*	8.292	46.656	1055	Jan 1971	Dec 2010	99.6/98.6	
Grimsel*	8.332	46.571	1950	Jan 1971	Dec 2010	100/100	
Weil am Rhein	7.601	47.602	249	Jan 1988	Dec 2005	46.1/94.4	IAEA-GNIP network (IAEA 2010)
Konstanz	9.179	47.691	447	Jan 1978	Dec 2005	72.8/100	
Garmisch-Partenkirchen	11.070	47.480	720	Jan 1978	Dec 2005	73.5/100	
Hohenpeissenberg	11.009	47.801	977	Jan 1974	Mar 1999	62.1/43.1	
Feldberg-Schwarzwald	8.006	47.873	1493	Jan 1918	Aug 1985	11.0/0.0	
Thonon les Bains	6.473	46.373	385	Jun 1963	Dec 2002	77.9/100	
Bregenz	9.742	47.491	430	Jan 1973	Dec 2010	89.0/100	Austrian Network of Isotopes in Precipitation (Kralik et al. 2003)
Innsbruck	11.354	47.259	580	Jan 1988	Dec 2010	48.2/95.8	
Haiming	10.883	47.247	695	Jan 1973	Dec 2002	61.0/98.6	
Schoppernau	10.002	47.316	835	Jan 1973	Dec 2010	89.3/100	
Reutte	10.750	47.494	870	Jan 1973	Dec 2010	65.6/83.8	
Scharnitz	11.250	47.383	964	Jan 1973	Nov 2002	78.7/100	
Langenfeld	10.970	47.069	1180	Jan 1973	Dec 2010	89.3/98.6	
Obergurgl	11.026	46.867	1940	Jan 1973	Dec 2010	88.4/97.2	
Patscherkofel	11.460	47.208	2245	Jan 1973	Dec 2010	87.3/100	
Bellinzago	8.644	45.570	190	Jan 1995	Dec 1996	5.0/31.9	Longinelli and Selmo, 2003
Sarnico	9.958	45.668	197	Jan 1994	Dec 1996	7.7/31.9	
Pallanza	8.551	45.923	208	Jan 1995	Dec 1996	5.3/33.3	
Boario-Darfo	10.182	45.880	208	Feb 1992	Jan 1997	12.5/33.3	

Graniga	8.199	46.131	1100	Jan 1995	Dec 1996	5.3/33.3	
Presolana	10.099	45.929	1290	Feb 1992	Dec 1996	12.3/31.9	
Aosta	7.355	45.742	563	Jan 2003	Dec 2004	4.8/0.0	Longinelli and Selmo, 2006
Introd	7.183	45.695	880	Jan 2003	Dec 2004	4.4/0.0	

[1]full means 1973-2010; * stations belong also to the GNIP global network

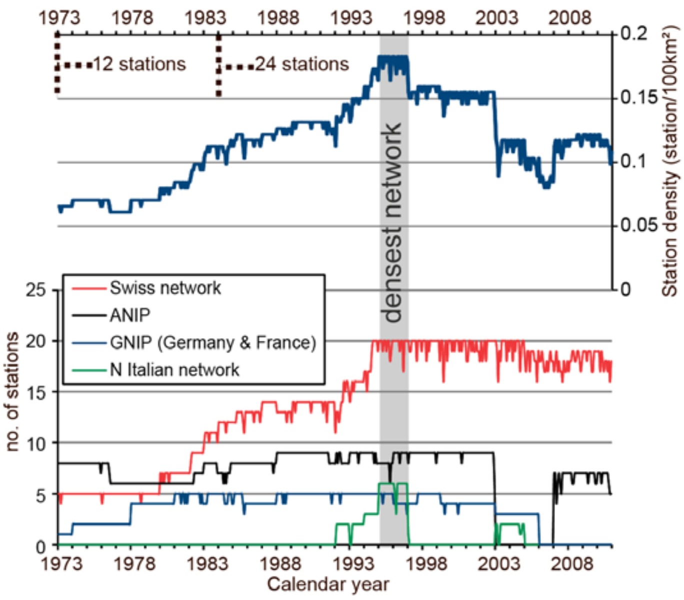
Schürch, M., Kozel, R., Schotterer, U., Tripet, J.P., 2003. Observation of isotopes in the water cycle – the Swiss National Network (NISOT). Environ. Geol. 45, 1–11.

IAEA, 2010. Global Network of Isotopes in Precipitation. The GNIP Database. www.isohis.iaea.org.

Kralik, M., Papesch, W., Stichler, W., 2003. Austrian Network of Isotopes in Precipitation (ANIP): Quality assurance and climatological phenomenon in one of the oldest and densest networks in the world. Isot. Hydrol. and Integr. Water Resour. Manag, C&S Paper series. 23, 146–149.

Longinelli, A., Selmo E., 2003. Isotopic composition of precipitation in Italy: a first overall map. J. Hydrol. 270, 75–88.

Longinelli, A., Selmo E., 2006. Isotopic composition of precipitation in Northern Italy: Reverse effects of anomalous climatic events. J. Hydrol. 329, 471–476.



FigS1: Station density and temporal coverage of the merged networks between 1973 and 2010. Before 1973 practically only Thonon-les-Bains (France) and Bern (Switzerland) provided values to the record. (Data sources: NISOT (Schürch et al., 2003), ANIP (Kralik et al 2003), GNIP (IAEA, 2010), N-Italy (Longinelli and Selmo, 2003, 2006) and the private network run by the Division of Climate and Environmental Physics, Physics Institute, University of Bern)

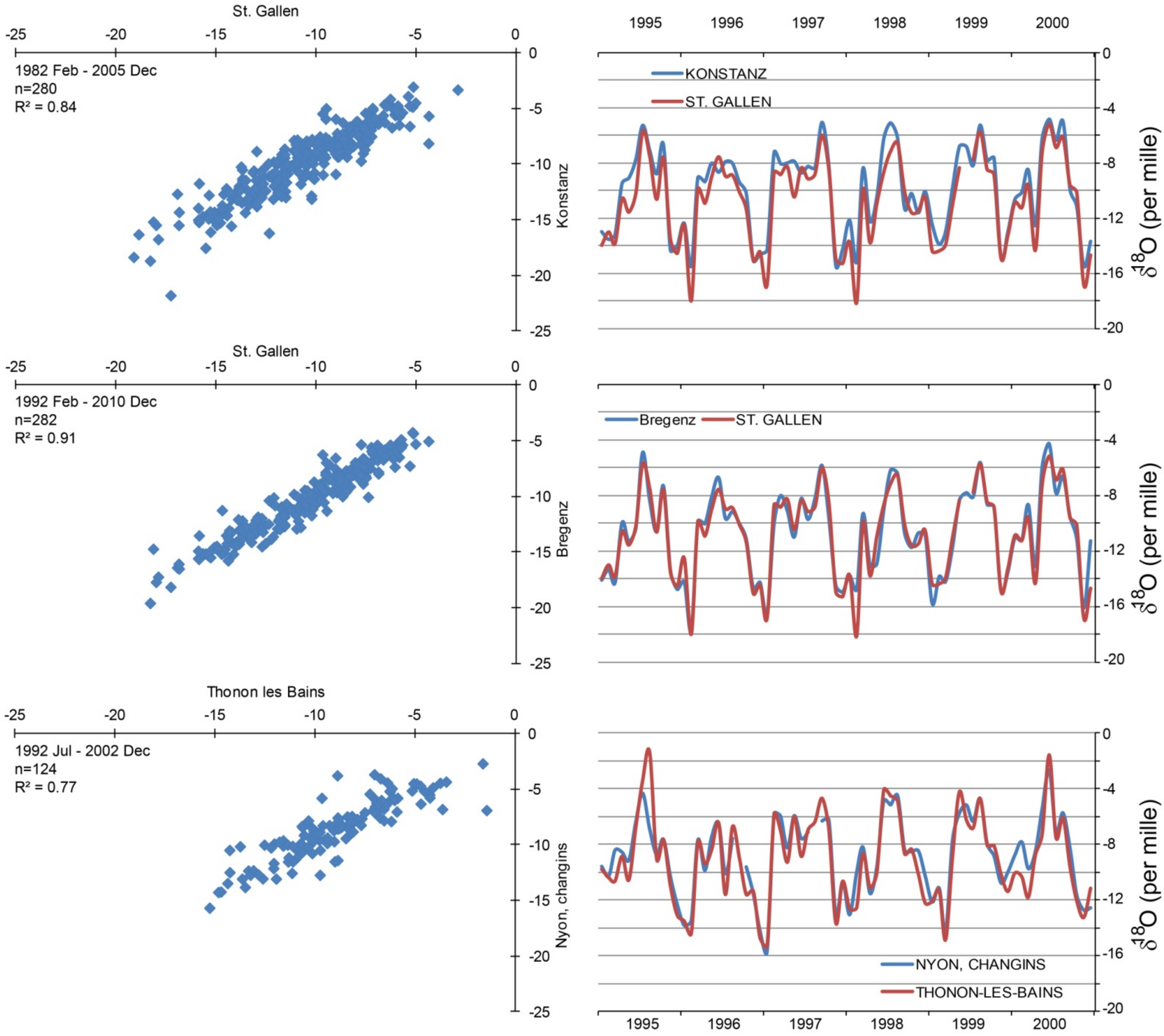


Fig. S2. Data consistency graph between nearby stations of different measuring networks. Three station comparisons are shown between the German (IAEA) and Swiss (KUP) networks (Konstanz – St. Gallen), Austrian (ANIP) and Swiss (KUP) networks (Bregenz – St. Gallen) and the French (IAEA) and Swiss (ISOT) networks (Thonon-les-Bains – Nyon Changins). The left cross plot show the correlation for the full overlapping period. The beginning and end month of overlap, the number of available pairs, and the R^2 are indicated at the upper left corner of each panel. The right plot demonstrates the similarity between the station records over the 1995-2000 period, studied in the paper.

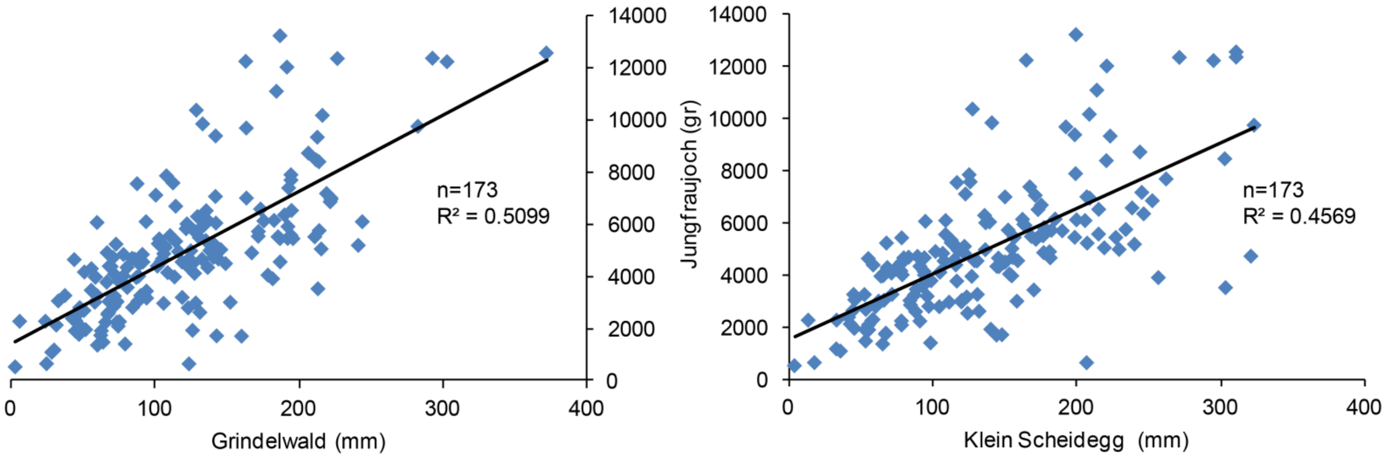


Fig. S3. Scatter plots of Grindelwald and Kleine Scheidegg gauge records against the available accumulated snow used for isotope analysis from Jungfraujoch between 1994 and 2010. As an official gauge is not operated at Jungfraujoch (JFJ) monthly amounts have been estimated for JFJ based on a bilinear regression using the best correlated nearby gauge records (Grindelwald and Kleine Scheidegg) as predictors.

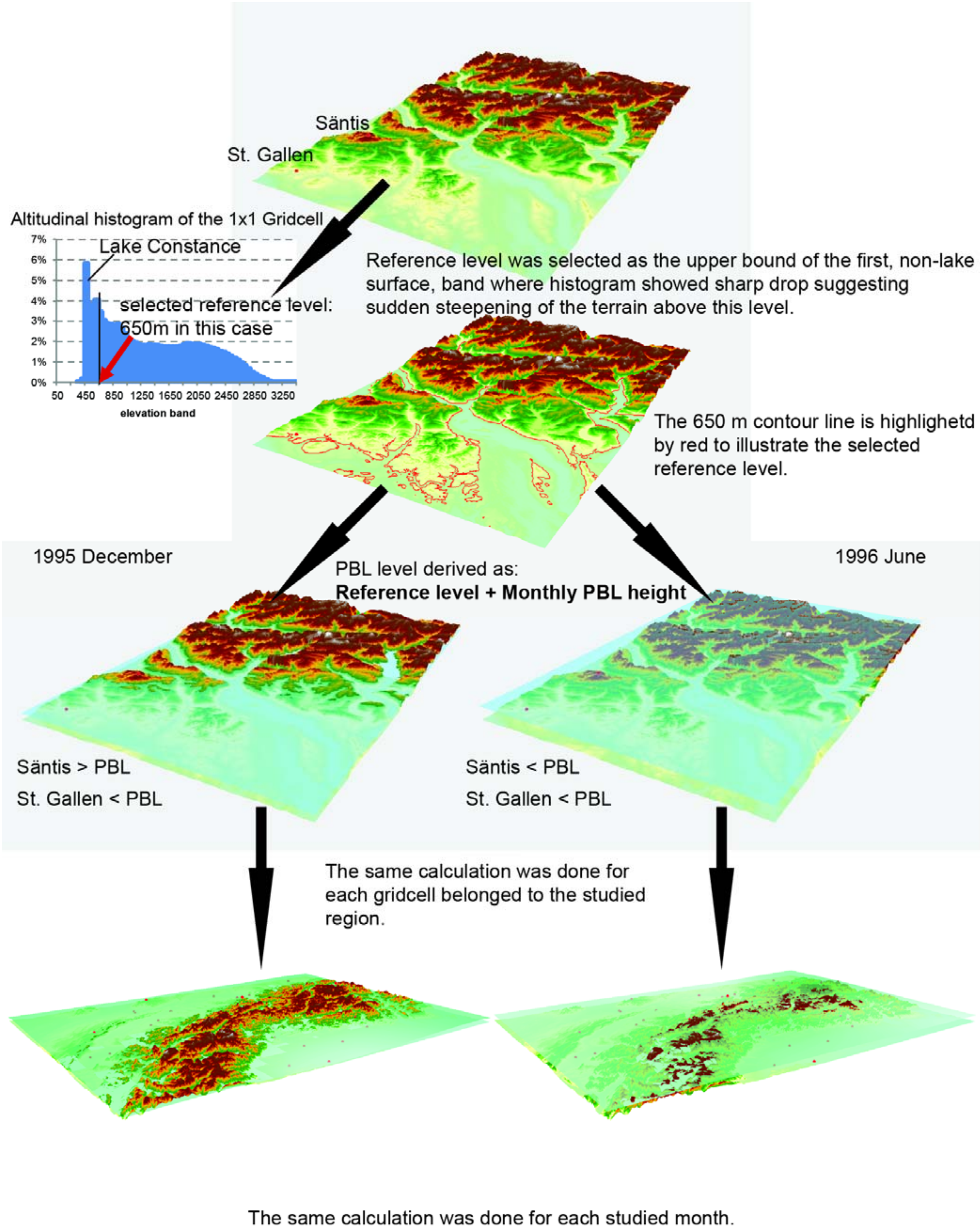


Fig. S4. Graphical illustration of the PBL derivation. For illustration purpose a winter (1995 Dec) and a summer (1996 June) month is selected.

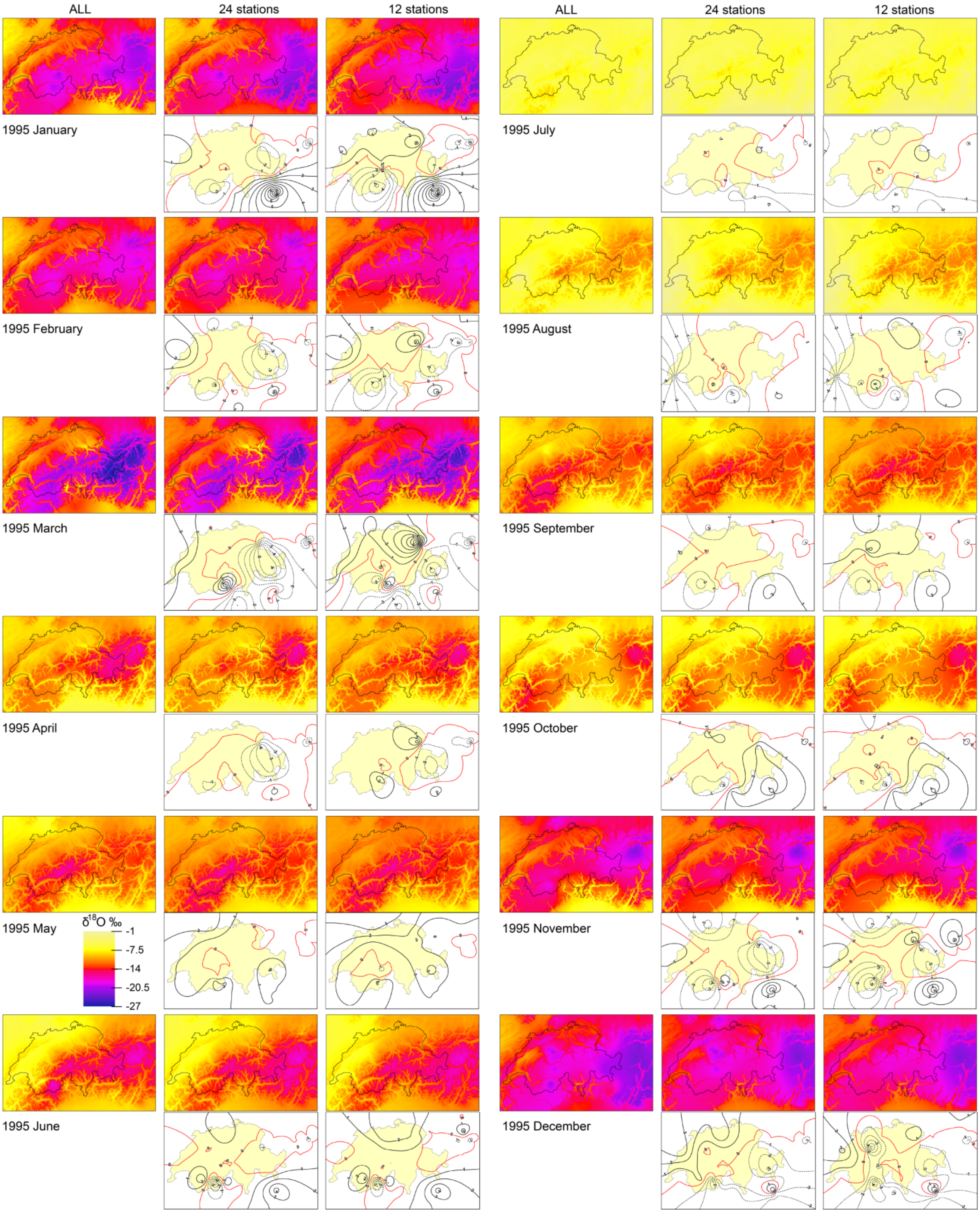


Fig. S5. Precipitation oxygen isoscapes for Switzerland derived for 1995. Left map shows the isoscape obtained using all available stations for each monthly set of maps. The longest 24 and 12 station records have been used for the middle and right maps, respectively. The difference maps, obtained after the grid computed with the reduced datasets was subtracted from the full one, are shown below the corresponding subset derived maps. Isolines for positive values are shown by bold lines; while for negative values are shown by dashed lines. The zero isoline is red.

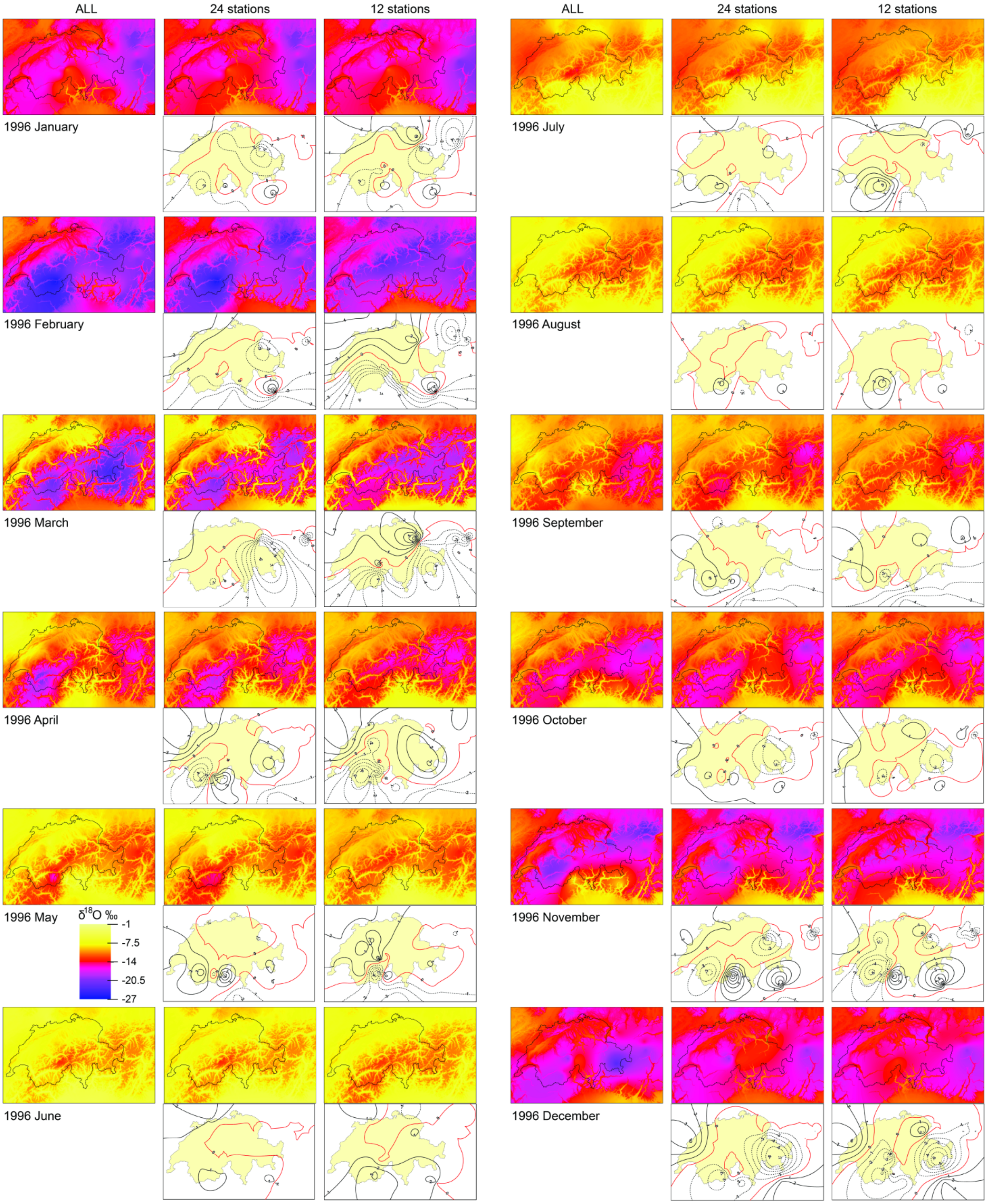


Fig. S6. Precipitation oxygen isoscapes for Switzerland derived for 1996. Left map shows the isoscape obtained using all available stations for each monthly set of maps. The longest 24 and 12 station records have been used for the middle and right maps, respectively. The difference maps, obtained after the grid computed with the reduced datasets was subtracted from the full one, are shown below the corresponding subset derived maps. Isolines for positive values are shown by bold lines; while for negative values are shown by dashed lines. The zero isoline is red.