IVS Memorandum 2008-006v01

02 July 2008

"Temperature Considerations for the VLBI2010 Station Requirements"

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In this memo, the actual temperature at 36 selected existing IVS and GPS stations located in different geographical regions is presented (Figs. 2 and 3). The meteodata with 6-hour temporal resolution used in this plots is extracted from the VMF1 files provided by the Institute of Geodesy and Geophysics IVS Analysis Center, Vienna University of Technology. The primary goal of this memo is to provide reliable data for developing of the VLBI2010 antenna specifications related to the temperature range, including the extreme values which cannot be obtained from a model. Hopefully, the time span covered by the VMF1 files is representative enough to give an accurate impression of the weather condition at the existing and planned IVS stations.

IVS and GPS stations included in the IVS2010 network proposed by the author in November 2006 and aimed at the occupation of all main tectonic plates keeping reasonably uniform global coverage (Fig.1). Also included in this study several supplement stations from the Arthur Niell's simulation network (IVS Memorandum 2007-001v01) and other stations in interesting locations.

In this plots, among others, four stations with the extreme temperatures are shown. At the coldest stations YAKT in Siberia and AMUN near South Pole temperature may fall below 50 °C. At the hottest stations YIBL in Oman, Arabia and DHLG in California, USA temperature just under 50 °C was observed. For the great majority of space geodesy stations the temperature range about –40...+40 °C could be accepted.

Finally we can conclude that a universal VLBI2010 antenna should operate in the at least –60...+50 °C temperature range. However, such an antenna seems to be unreasonably expensive. More practical approach may be to have a standard antenna design operated in the –40...+40 °C temperature range, and optional solution for extremely high or low temperatures when the antenna is designed for specific location.

It seems to be very useful, for new IVS stations design, to collect and plot in similar way the information on the wind speed at the existing and prospective station locations.

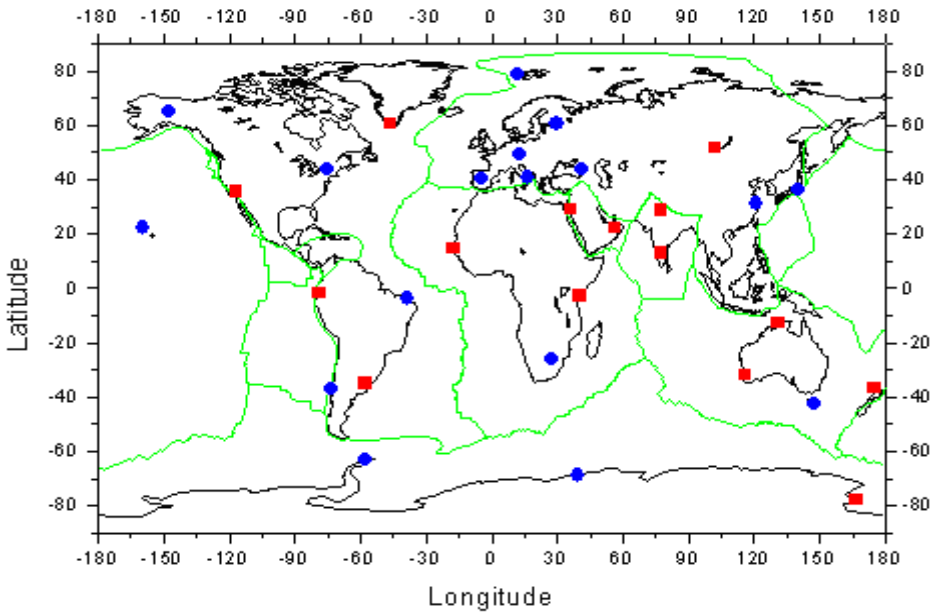
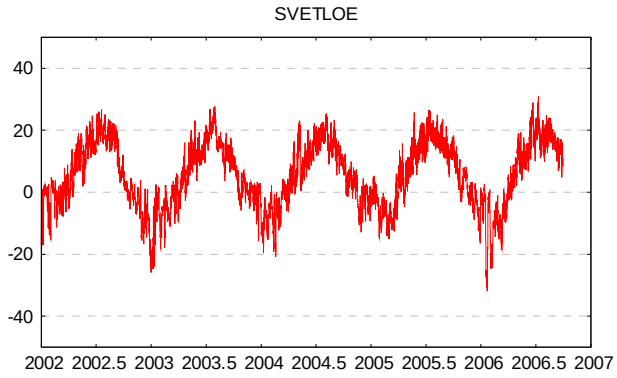
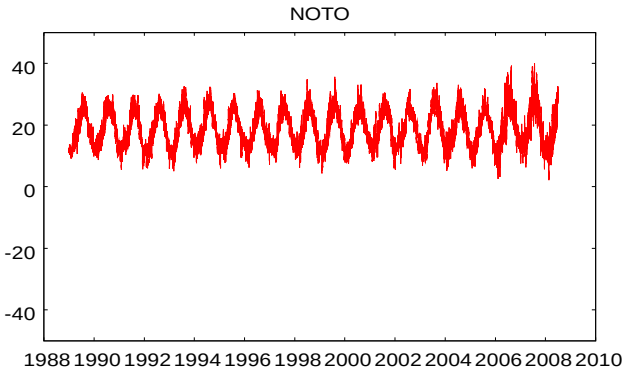
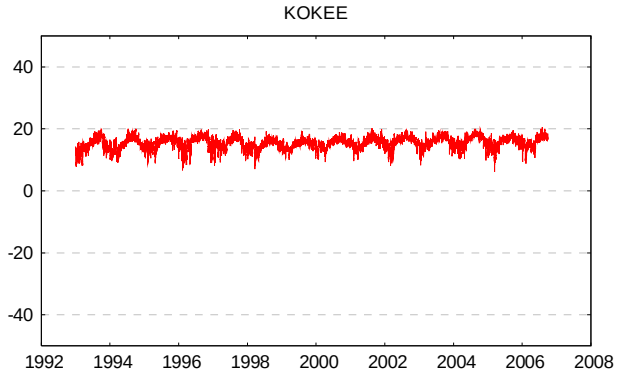
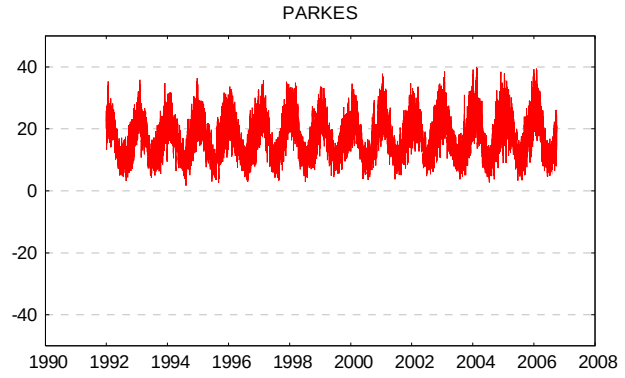


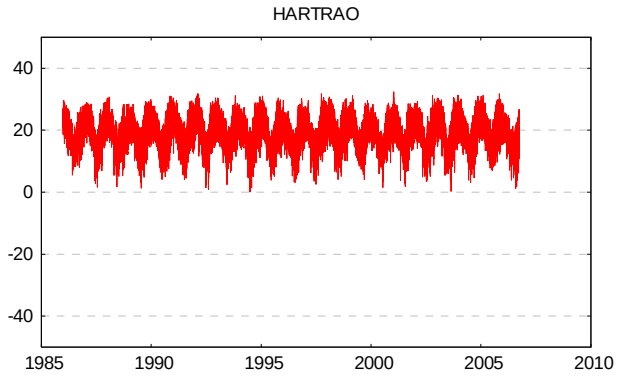
Fig. 1. A proposal for IVS2010 network, version of November 2006.


SVETLOE
40
20
0
-20
-40
2002 2002.5 2003 2003.5 2004 2004.5 2005 2005.5 2006 2006.5 2007


NOTO
40
20
0
-20
-40
1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010


KOKEE
40
20
0
-20
-40
1992 1994 1996 1998 2000 2002 2004 2006 2008


PARKES
40
20
0
-20
-40
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008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40
20
0
-20
-40
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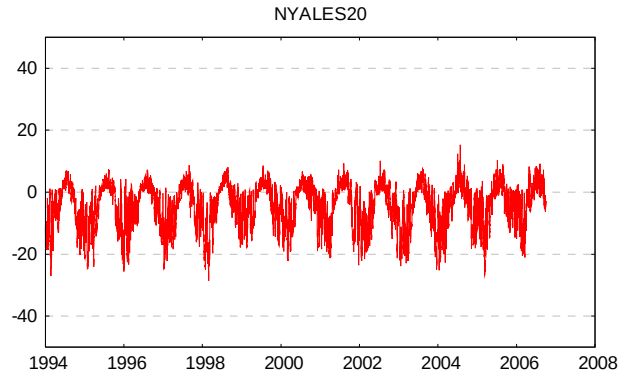
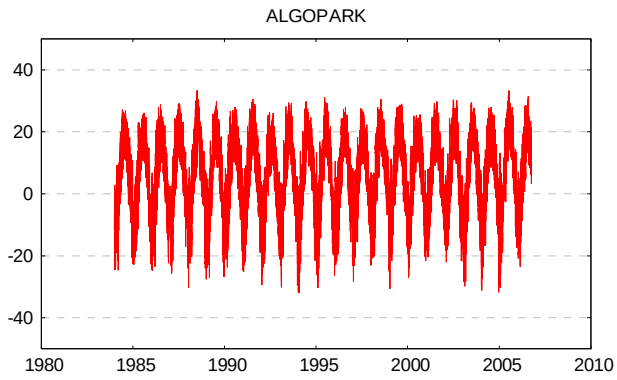
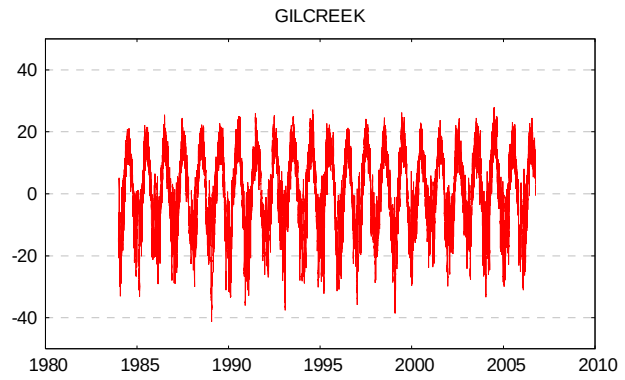

NYALES20
40
20
0
-20
-40
1994 1996 1998 2000 2002 2004 2006 2008


ALGOPARK
40
20
0
-20
-40
1980 1985 1990 1995 2000 2005 2010


GILCREEK
40
20
0
-20
-40
1980 1985 1990 1995 2000 2005 2010

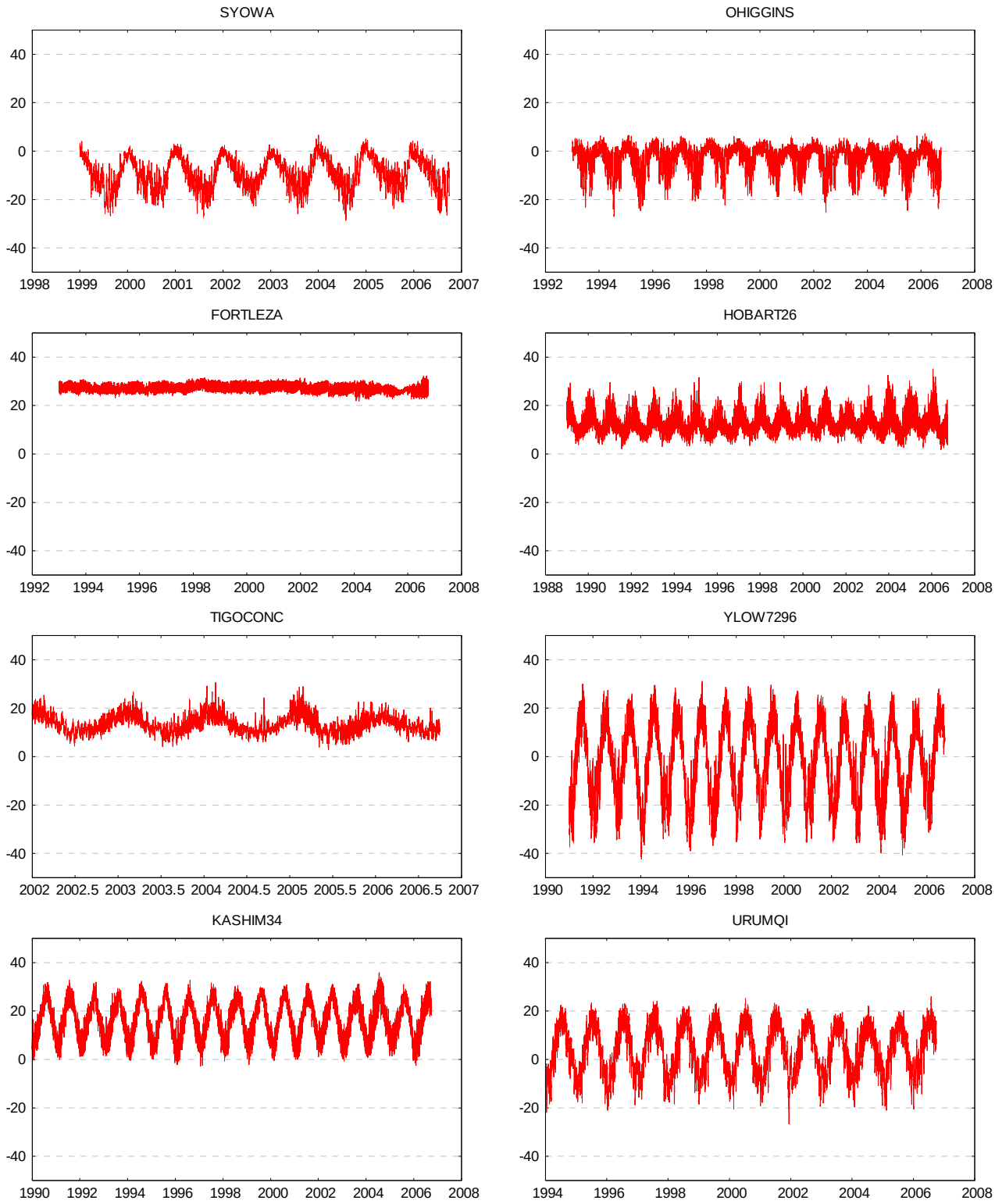
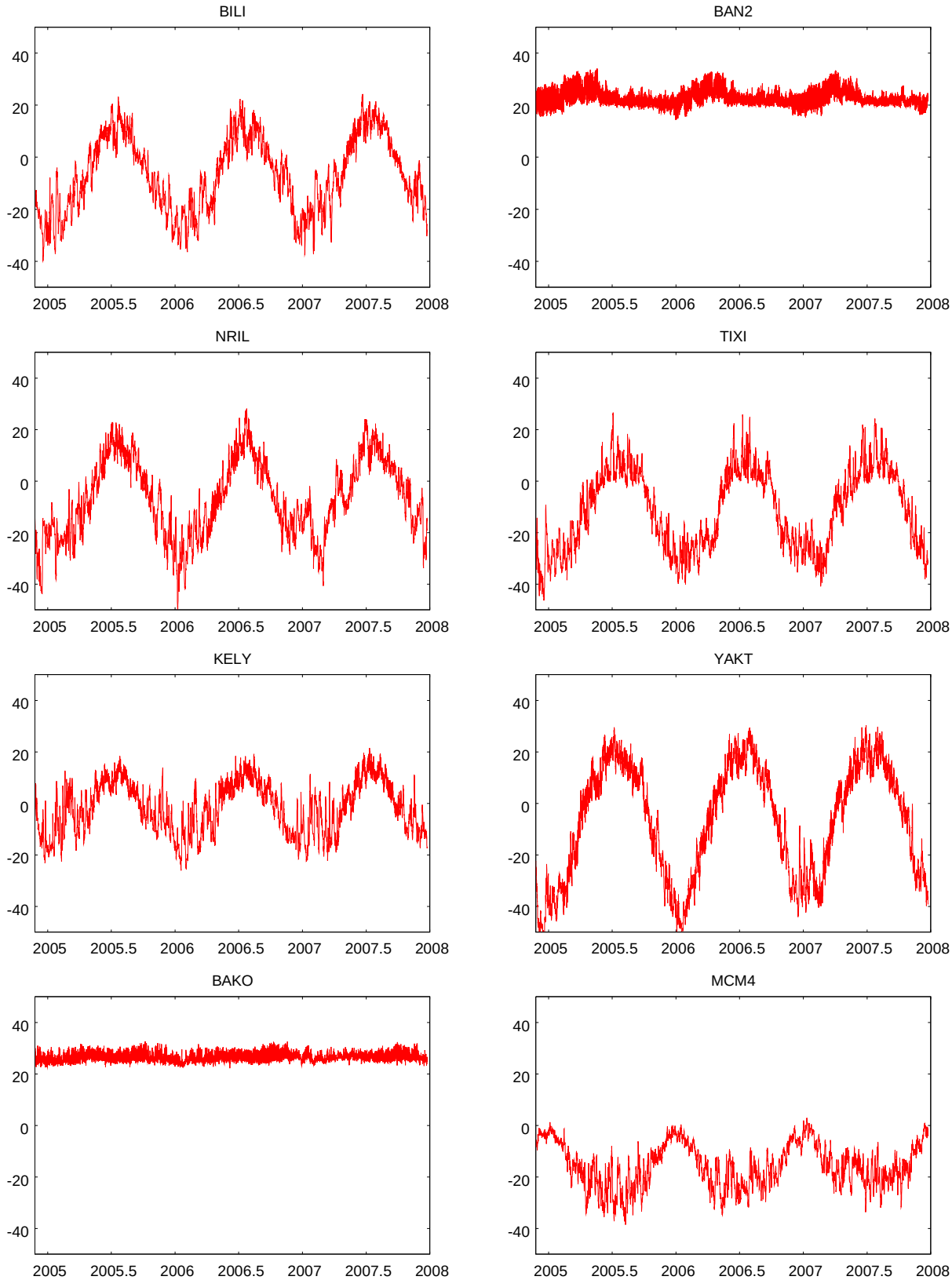
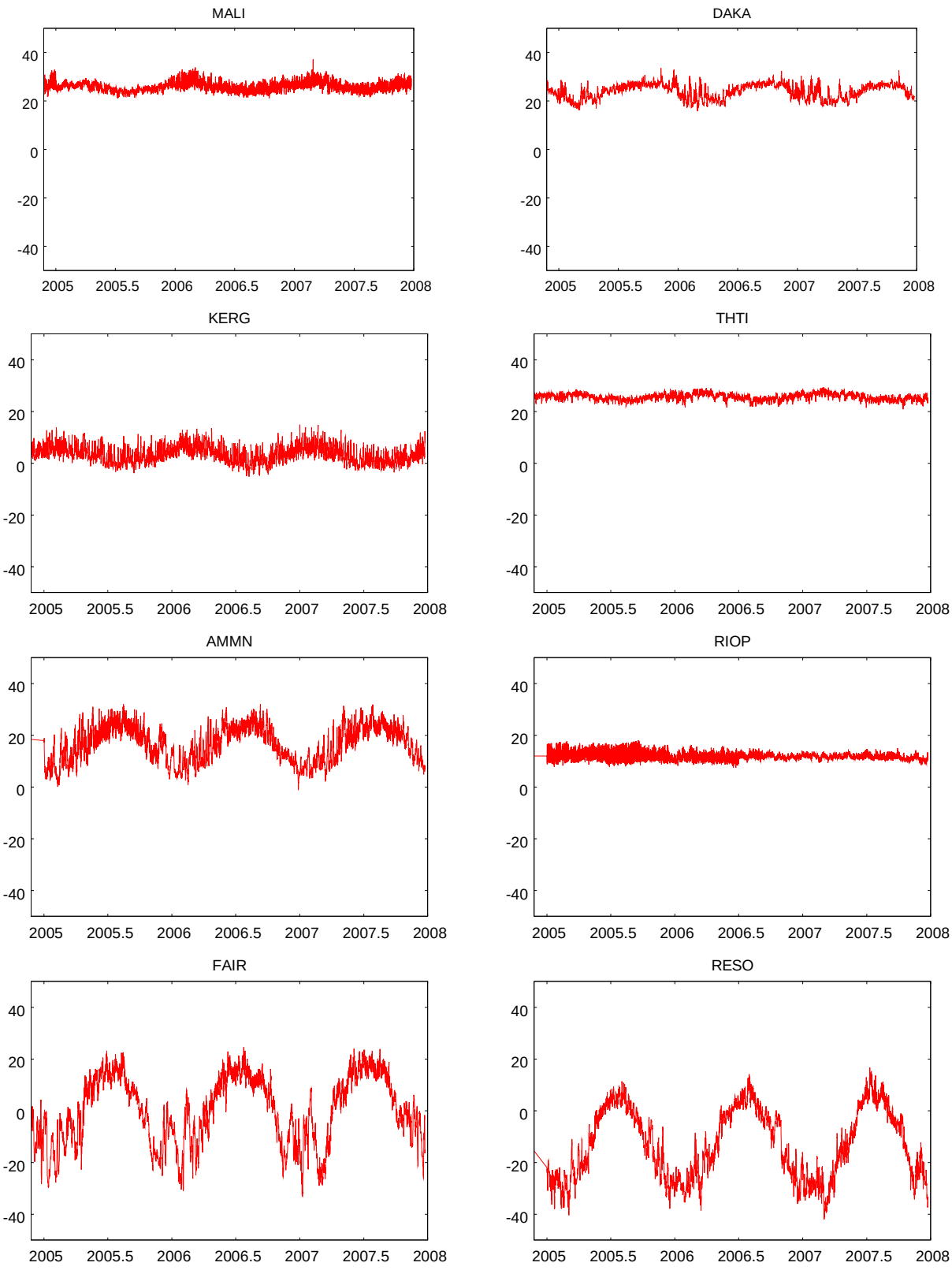


Fig. 2. Temperature at IVS stations located in different geographical regions.


BILI
BAN2
NRIL
TIXI
KELY
YAKT
BAKO
MCM4
40
20
0
-20
-40
2005
2005.5
2006
2006.5
2007
2007.5
2008


MALI
DAKA
KERG
THTI
AMMN
RIOP
FAIR
RESO
40
20
0
-20
-40
2005
2005.5
2006
2006.5
2007
2007.5
2008

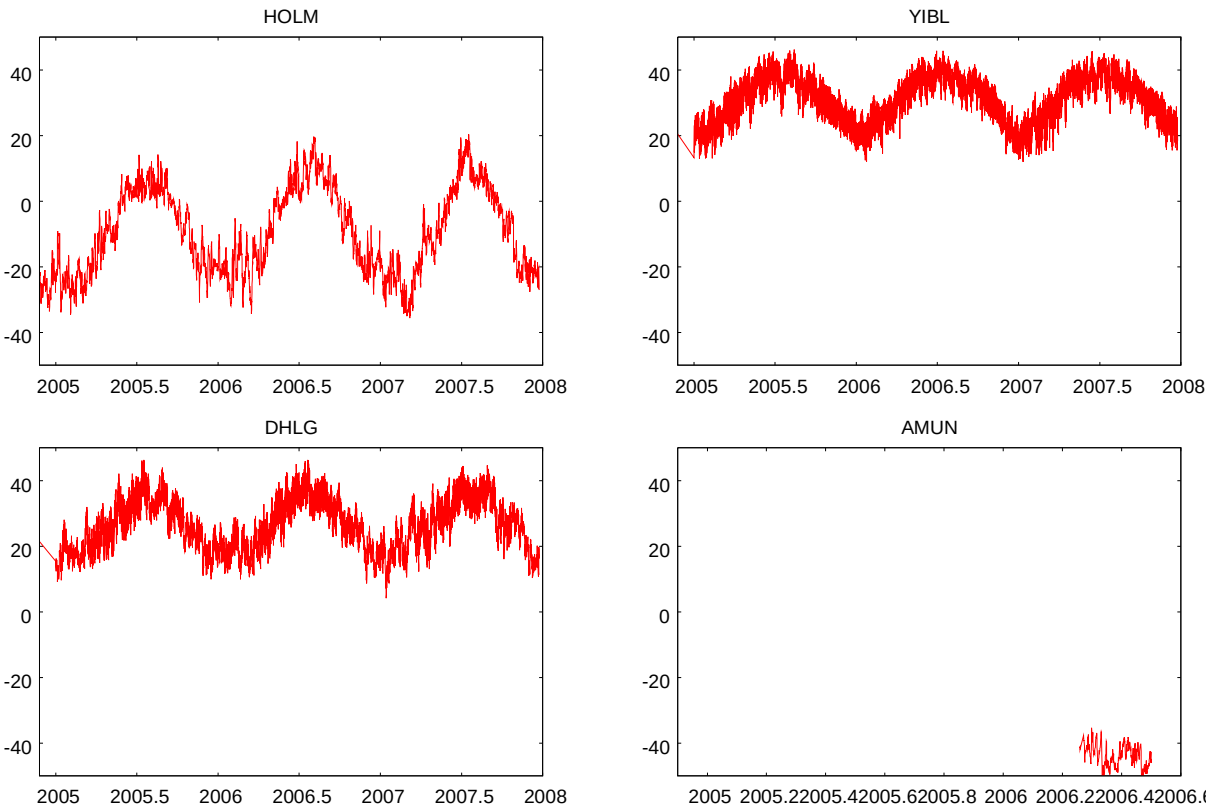


Fig. 3. Temperature at GPS stations located in different geographical regions.