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The Position and Velocity Solution SIR09P01 of the IGS Regional Network Associate Analysis Centre for SIRGAS (IGS RNAAC SIR)

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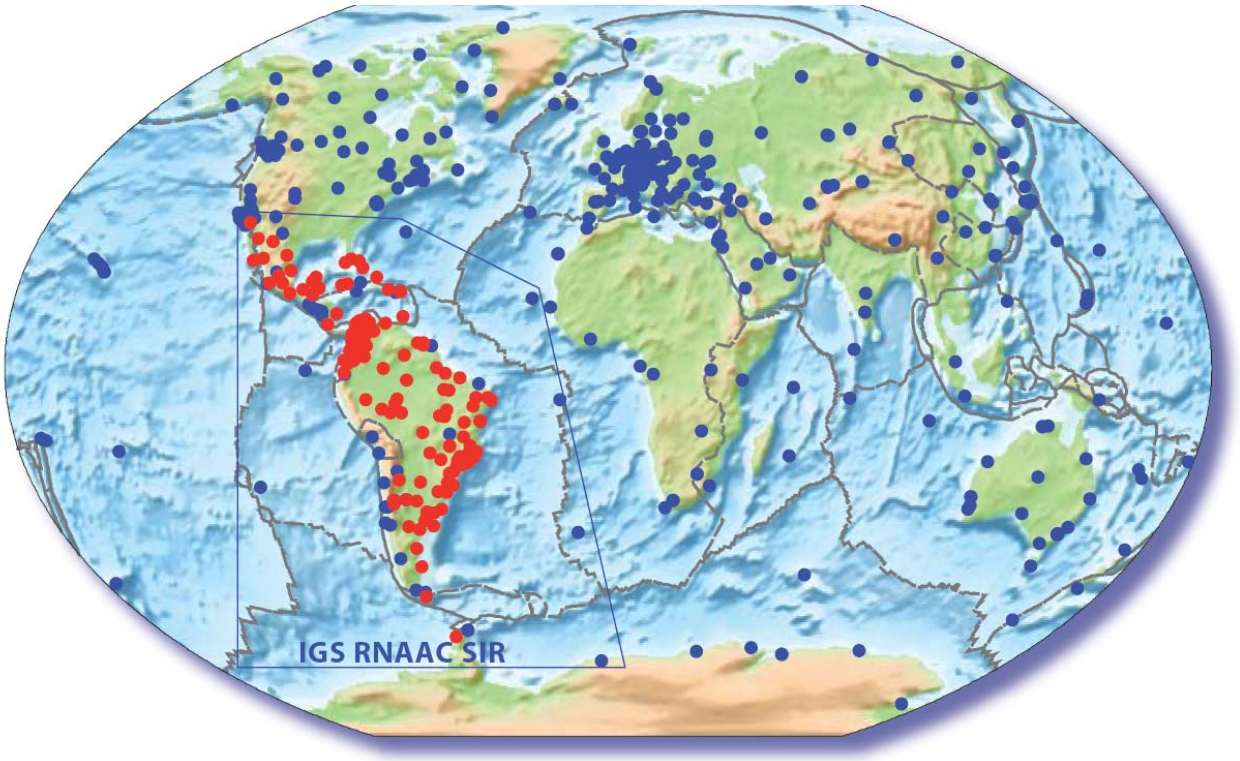

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1 Introduction

DGFI is in charge of the IGS Regional Network Associate Analysis Centre for SIRGAS (IGS RNAAC SIR, Seemüller and Drewes 2008). Its main responsibility is to deliver loosely constrained weekly coordinate solutions of the regional network SIRGAS-CON (SIRGAS Continuously Operating Network) in SINEX format to the IGS (International GNSS Service). These solutions are combined with the results from the other IGS Global and Regional Analysis Centres to form the IGS polyhedron. The processing of the SIRGAS-CON network includes also the generation of weekly coordinate solutions aligned to the current ITRF realization for applications in Latin America, as well as cumulative (multi-annual) position and velocity solutions for estimating the kinematics of the network. These multi-annual solutions are updated yearly (e.g. Drewes et al. 2000, Seemüller et al. 2002, Seemüller et al. 2008, Seemüller 2009).

During the last years, the Latin American countries decided to qualify their national reference networks by installing continuously operating GNSS stations, which have to be integrated into the SIRGAS continental network to guarantee the consistency of the regional reference frame with the global reference frame in which the GNSS orbits are computed. As a consequence, the number of SIRGAS-CON stations is rapidly increasing (Figure 1) and the processing of the entire network in only one adjustment became impracticable. It was necessary to split the network into different blocks to be separately processed and then combined to a unified solution for the entire region. The basic concept is based on i) defining a core continental network as the direct densification of the ITRF in Latin America, and ii) improving the geographical density of this core network by means of densification sub-networks. Although, they appear as two different levels, both kinds of stations (core and densification) match requirements, characteristics, performance and quality of the ITRF stations. In this way, the SIRGAS-CON network at present comprises (Brunini and Sánchez 2008):

1. One core network (SIRGAS-CON-C) with continental coverage and stabile site locations to ensure the long-term stability of the reference frame;

2. Three densification sub-networks (SIRGAS-CON-D): a northern, a middle, and a southern one, to provide accessibility to the reference frame at national and local levels.

Annex 1 shows the station distribution into the different sub-networks.

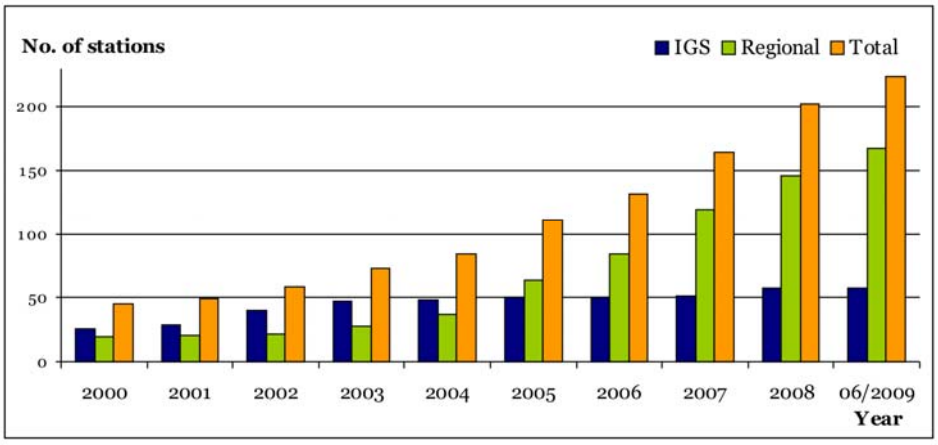

Figure 1. *Number of SIRGAS-CON stations since 2000.*

According to the new structure of the SIRGAS-CON network, DGFI as IGS RNAAC SIR is now responsible for processing the SIRGAS-CON-C core network, for combining this core network with the densification sub-networks, and for making available the official SIRGAS products, i.e. loosely constrained weekly solutions for the IGS polyhedron, weekly solutions aligned to the ITRF for the users in Latin America, and multi-annual solutions (coordinates + velocities) for applications requiring time-dependent coordinates.

The present report describes the computation of the latest multi-annual solution of the SIRGAS-CON network. Identified as SIR09P01, it was released in June 2009 and encompasses all the weekly solutions provided by the SIRGAS analysis centres from January 2, 2000 (GPS week 1043) to January 3, 2009 (GPS week 1512). It is referred to IGS05 at the epoch 2005.0 and provides coordinates and velocities for 128 SIRGAS-CON stations (all those operating more than two years). Its precision was estimated to be better than ±0.5 mm (horizontal), ±0.9 mm (vertical) for the coordinates at the reference epoch, and ±0.8 mm/a for the linear velocities.

2 Input data

The input data for the generation of the multi-year solution SIR09P01 are the loosely constrained weekly solutions of the SIRGAS-CON network (Figure 2) between January 2, 2000 and January 3, 2009.

As already mentioned, these weekly solutions were computed by DGFI in only one adjustment for the entire network until 31 August 2008 (GPS week 1495). Afterwards, the

SIRGAS-CON network was divided into four sub-networks: one core network covering homogeneously Latin America and the Caribbean, and three densification networks distributed on the northern, the middle, and the southern parts of the region (Annex 1).

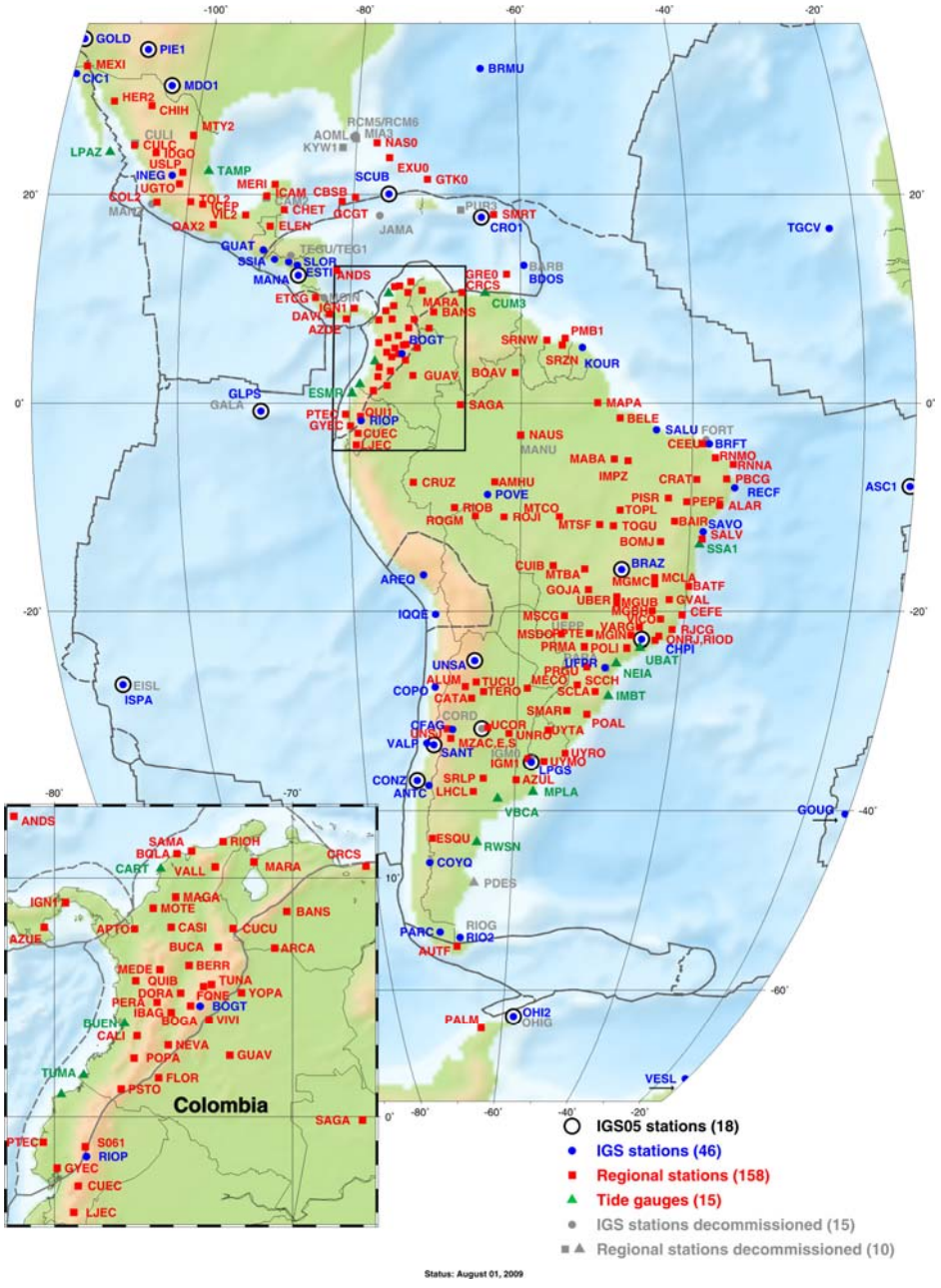

Figure 2. *SIRGAS-CON network.*

These four sub-networks are individually calculated by four SIRGAS Processing Centres, who generate loosely constrained weekly solutions to be combined in a unified solution for the complete network (Sánchez et al. 2008). According to this, the loosely constrained weekly solutions after GPS week 1495 included in the multi-year solution SIR09P01 are the combination of the four SIRGAS-CON sub-networks. Annex 2 (Seemüller and Sánchez

2009) and Annex 3 (Sánchez et al. 2009) summarize the corresponding processing and combination strategies.

Weekly solutions from January 2000 (GPS week 1043) to November 2006 (1399) formerly computed with relative antenna phase centre corrections and referring to previous ITRF solutions have been reprocessed including absolute phase centre corrections provided by the IGS and the IGS05 as reference frame (See Annex 2). This reprocessing provides homogeneously computed weekly solutions for the complete time span covered by the SIR09P01 solution and allows to improve reliability and accuracy of station positions and velocities. Figure 3 shows timetable and infrastructure used for processing and reprocessing the loosely constrained weekly solutions included in SIR09P01. Reprocessed solutions are identified with the name SI1*wwww* to be distinguished from the old weekly solutions.

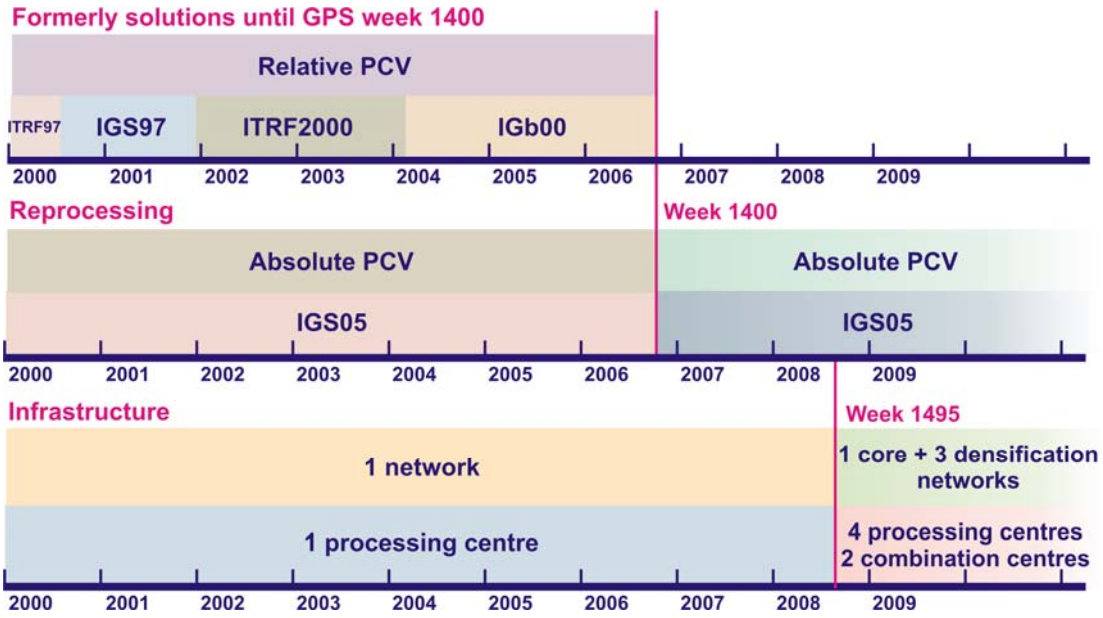

Figure 3. *Timetable and infrastructure used to generate the loosely constrained weekly solutions included in the multi-annual solution SIR09P01.*

3 Processing strategy

The processing strategy for the SIRGAS reference frame SIR09P01 is given as a flow chart in Figure 4. It is realized using the Bernese GPS Software V5.0 (Dach et al. 2007).

The main parts of the analysis are:

1. Computation of time series and time series analysis to identify outliers and discontinuities in station positions (see grey arrows in Figure 4);

2. Combination of weekly normal equations (NEQ) to compute the SIRGAS reference frame (see blue arrows in Figure 4).

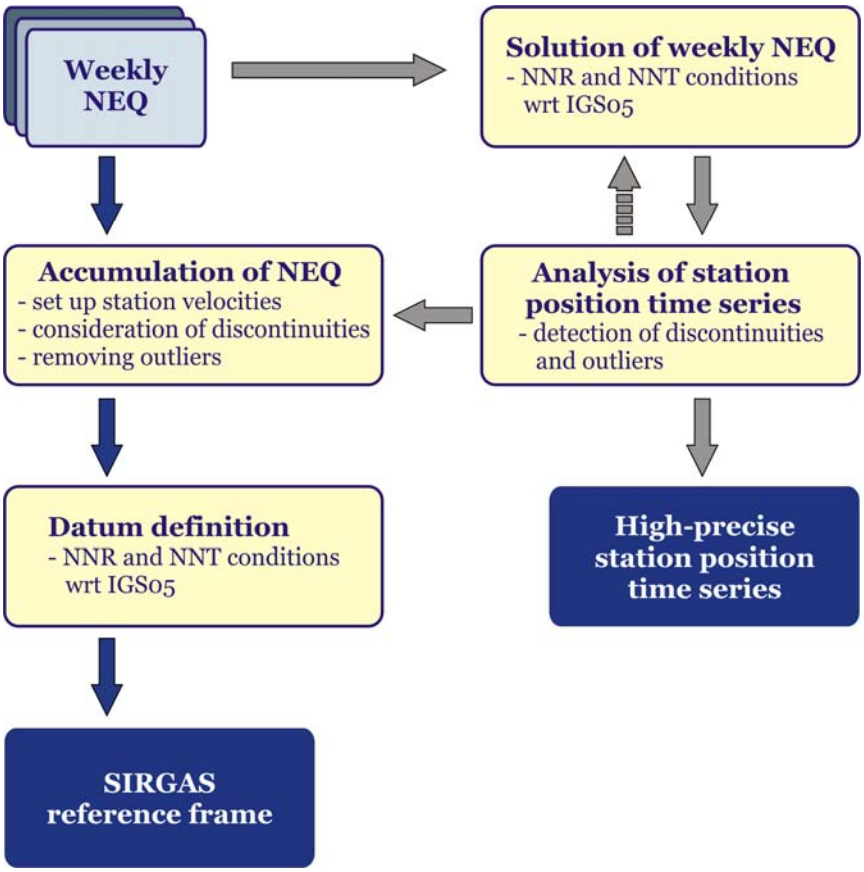

Figure 4. *Processing strategy for the computation of the SIRGAS reference frame.*

Before starting with the computation preparative steps are necessary. Unconstrained (free) normal equations are reconstructed from the weekly solutions stored in SINEX format. Thereby, the station information, e.g. antenna and receiver types, is compared to the log files and corrected if necessary in order to guarantee consistency of the station information. So, the input data for computation are unconstrained (free, non-deformed) normal equations and correct station information.

3.1 Computation of time series and time series analysis

The weekly normal equations are solved separately applying no-net-rotation (NNR) and no-net-translation (NNT) conditions with respect to IGS05. To generate residual position time series, the weekly solutions are transformed to an a priori SIRGAS reference frame (i.e. the actual SIRGAS reference frame SIR08P01, Seemüller et al. 2008) by a 7-parameter similarity

transformation. The residual time series of station positions (Annex 4) are analysed and the detected discontinuities and outliers are taken into account for the computation of the SIRGAS reference frame (see section 3.2).

The chosen thresholds for outliers are: 15 mm for north and east and 30 mm in height (about fourfold the mean RMS). If outliers appear sporadically (without pattern), the station is reduced from the normal equation for the corresponding week. If outliers correspond to a discontinuity, a new position is set up for the station. According to these criteria, discontinuities were identified for 11 stations and the following time spans are valid for the corresponding station solutions in SIR09P01:

Table 1. *Discontinuities identified in the computation of SIR09P01.*

Station	from	to	Id in SINEX files
AREQ 42202M005	2003-06-29	2006-04-08	A2
AREQ 42202M005	2006-04-09	2009-01-03	A3
BOGA 41901M002	2000-02-01	2005-04-24	A1
BOGA 41901M002	2005-04-25	2009-01-03	A2
BRMU 42501S004	2000-01-02	2006-09-30	A1
BRMU 42501S004	2006-10-01	2009-01-03	A2
CONZ 41719M002	2002-05-16	2005-01-29	A1
CONZ 41719M002	2005-01-30	2009-01-03	A2
COPO 41714S001	2002-01-01	2005-11-19	A1
COPO 41714S001	2005-11-20	2009-01-03	A2
CRAT 41619M001	2000-05-09	2005-07-30	A1
CRAT 41619M001	2005-07-31	2008-02-16	A2
GUAT 40901S001	2000-07-29	2005-01-22	A1
GUAT 40901S001	2005-01-23	2009-01-03	A2
INEG 40507M001	2000-01-02	2003-01-04	A1
INEG 40507M001	2003-01-05	2009-01-03	A2
MANA 41201S001	2000-05-13	2004-10-08	A1
MANA 41201S001	2004-10-09	2009-01-03	A2
PALM 66005M002	2000-01-02	2006-11-04	A1
PALM 66005M002	2006-11-05	2009-01-03	A2
PUR3 82001S003	2000-01-02	2005-02-19	A1
PUR3 82001S003	2005-02-20	2009-01-03	A2

3.2 Combination of weekly normal equations

According to Figure 4, the weekly normal equations are combined to a multi-year solution setting up station velocities. Seasonal (e.g. loading) signals are not considered up to now. So, stations with observation time spans of less than 2 years of data are excluded (reduced) as the velocity estimation would be affected strongly by eventual seasonal variations.

The geodetic datum is realized by applying no-net-rotation and no-net-translation conditions with respect to IGS05 using a set of reliable stations for datum realization. The selected sites

are: ASC1, BRAZ, CHPI, CRO1, GOLD, LPGS, MDO1, PIE1, SANT, SCUB, UNSA. The chosen reference epoch of the SIRGAS reference frame is 2005-01-01.

After solving the first SIRGAS reference frame, step (1) and (2) are iterated: new station position residual time series are generated by transforming the weekly solutions to the computed SIRGAS reference frame. Discontinuity and outlier detection are repeated and the new information is introduced into the computation of a refined reference frame.

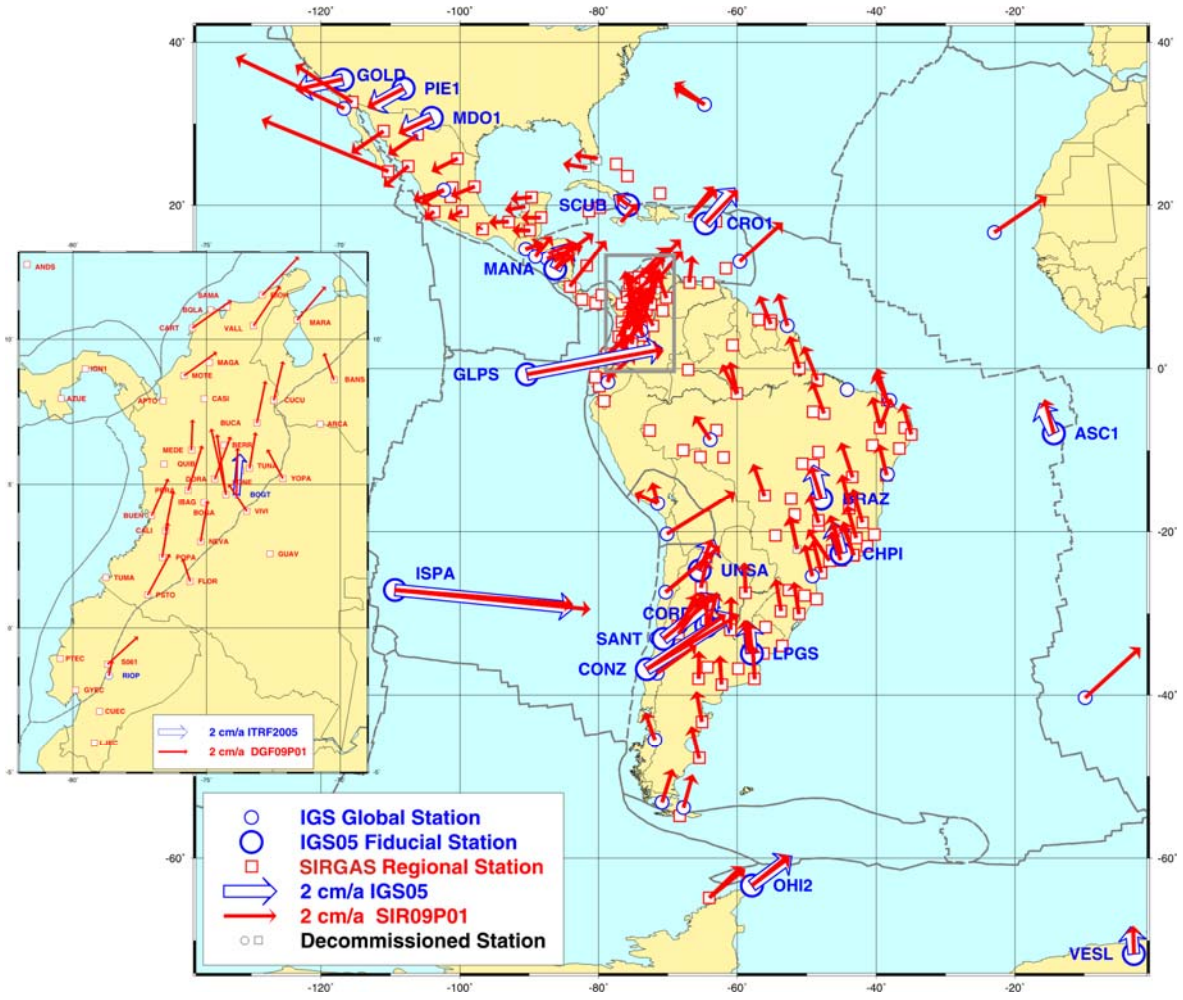

Figure 5. *Horizontal velocities of the SIR09P01 solution.*

4 Results

The final coordinates and velocities (Tables 2 and 3, Figures 5 and 6) contained in the multi-year solution SIR09P01 refer to the IGS05, epoch 2005.0. It includes 128 stations. It is well known, that the formal errors (included in the SINEX file) estimated in the GPS observation analysis are too small because physical correlations between the GPS observations are not well known and thus not fully considered. Therefore, standard deviations for station positions

and velocities are derived from the residual position time series. According to this, the precision of coordinates at reference epoch is estimated to be ± 0,5 mm in the horizontal component and ± 0,9 mm in the height. The precision of velocities is about ± 0,8 mm/year. Figures 7 and 8 compares the obtained velocities with those of ITRF2005 for the IGS global stations included in SIRGAS-CON.

The SIR09P01 solution (coordinates, velocities and SINEX file) is available at www.sirgas.org or ftp://ftp.dgfi.badw-muenchen.de/pub/gps/SIRGAS/. Please note that the reference epoch in the SINEX file is 2000-01-02 – the epoch of the first included GPS observation. Additionally, as mentioned above, the standard deviations included in the SINEX file are not reliable. Realistic precision estimations are included together with the coordinates in Tables 2 and 3, as well as in the SIRGAS web site.

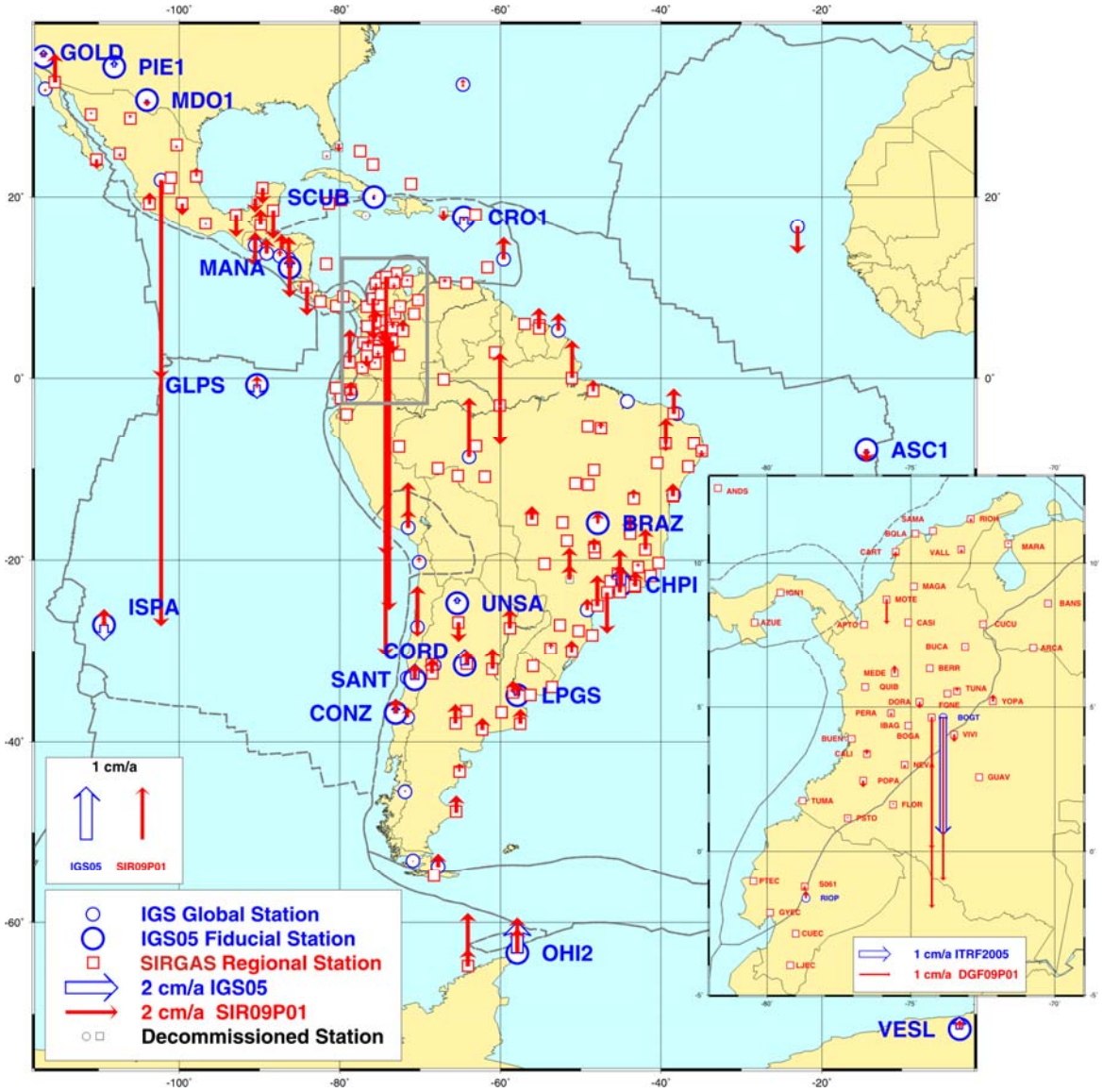

Figure 6. *Vertical velocities of the SIR09P01 solution.*

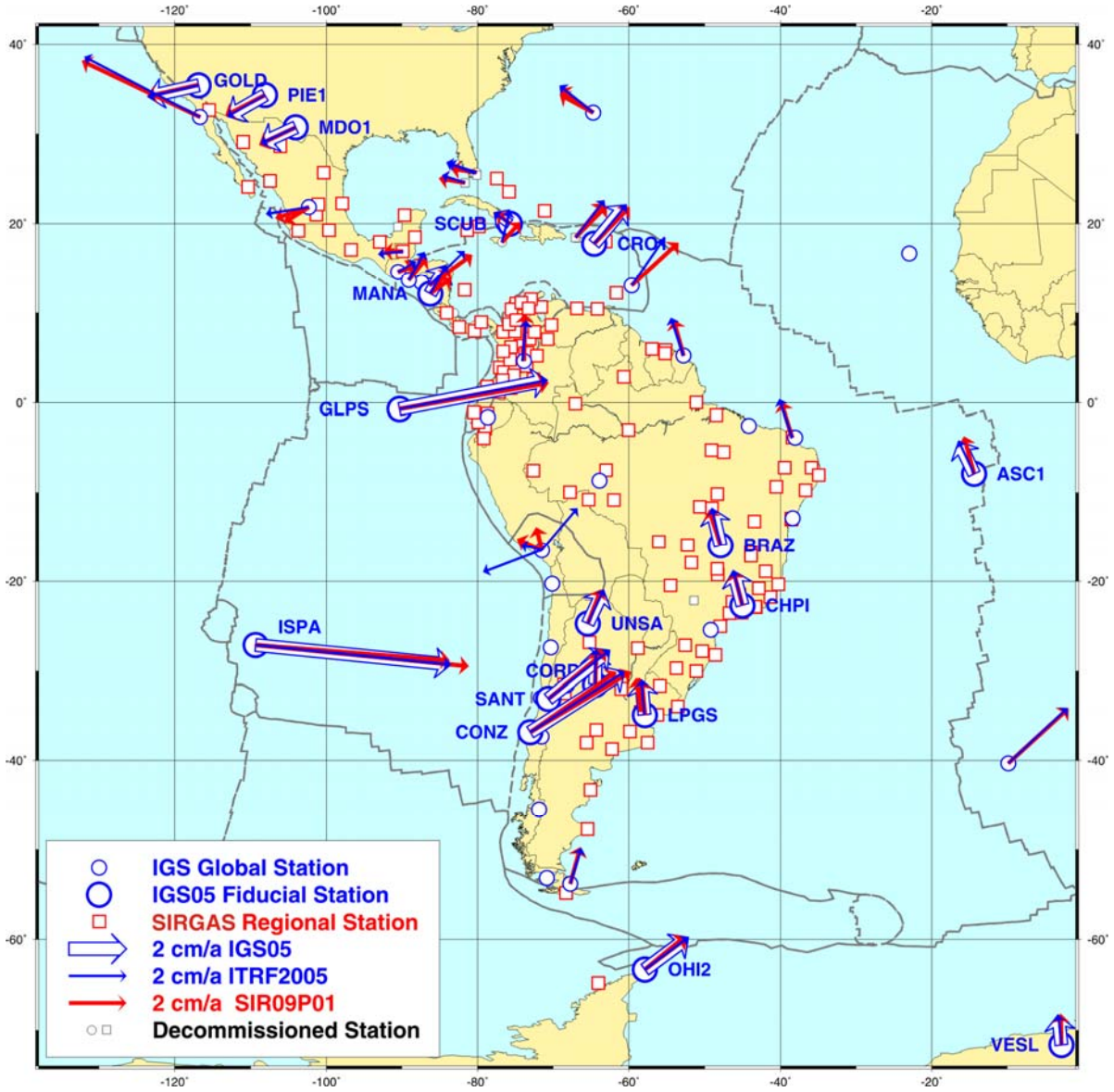

Figure 7. *Comparison of the horizontal velocities of the SIR09P01 solution with the ITRF2005 velocities.*

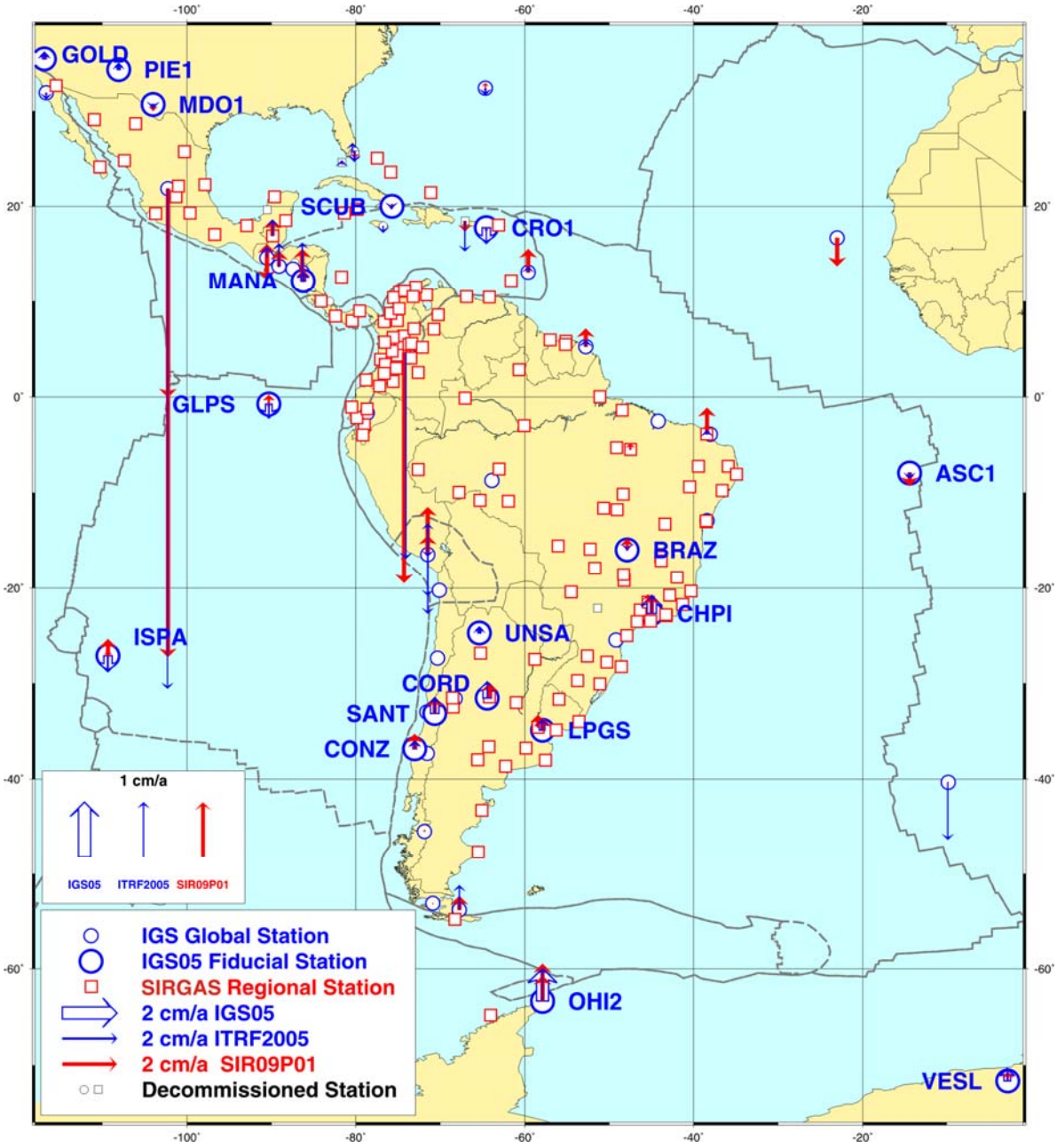

Figure 8. *Comparison of the vertical velocities of the SIR09P01 solution with the ITRF2005 velocities.*

***Table 2**. Geocentric coordinates [X, Y, Z] and velocities [Vx, Vy, Vz] of solution SIR09P01. Epoch 2005.0.*

Station	Domes No.	Location	X [m] VX [m/y]	Y [m] VY [m/y]	Z [m] VZ [m/y]
ANTC	41713S001	Los Angeles, Chile	1608539,5716 ± 0,0003 m 0,0165 ± 0,0000 m/y	-4816369,7180 ± 0,0003 m -0,0029 ± 0,0001 m/y	-3847798,5433 ± 0,0002 m 0,0073 ± 0,0001 m/y
AOML	49914S001	Key Biscayne, USA	982296,7233 ± 0,0002 m -0,0089 ± 0,0001 m/y	-5664607,2227 ± 0,0002 m 0,0002 ± 0,0002 m/y	2752614,4955 ± 0,0002 m 0,0006 ± 0,0001 m/y
AREQ	42202M005 A2	Arequipa, Peru	1942826,2134 ± 0,0004 m -0,0068 ± 0,0002 m/y	-5804070,3223 ± 0,0005 m -0,0069 ± 0,0005 m/y	-1796894,2678 ± 0,0000 m 0,0027 ± 0,0002 m/y
AREQ	42202M005 A3	Arequipa, Peru	1942826,2050 ± 0,0003 m 0,0014 ± 0,0001 m/y	-5804070,3063 ± 0,0004 m -0,0106 ± 0,0003 m/y	-1796894,2678 ± 0,0000 m 0,0052 ± 0,0001 m/y
ASC1	30602M001	Ascension, UK	6118526,0494 ± 0,0005 m -0,0015 ± 0,0001 m/y	-1572344,7349 ± 0,0002 m -0,0032 ± 0,0000 m/y	-876451,0644 ± 0,0002 m 0,0131 ± 0,0000 m/y
BANS	42403M001	Barinas, Venezuela	2132376,3734 ± 0,0003 m -0,0037 ± 0,0002 m/y	-5935471,3325 ± 0,0003 m 0,0003 ± 0,0005 m/y	948857,2280 ± 0,0002 m 0,0091 ± 0,0001 m/y
BDOS	43401M001	Barbados, Barbados	3143382,2009 ± 0,0005 m 0,0143 ± 0,0001 m/y	-5359714,8239 ± 0,0003 m 0,0076 ± 0,0002 m/y	1434875,7817 ± 0,0003 m 0,0155 ± 0,0001 m/y
BELE	41622M001	Belem, Brazil	4228139,0394 ± 0,0004 m -0,0023 ± 0,0001 m/y	-4772752,0937 ± 0,0001 m -0,0052 ± 0,0001 m/y	-155761,3126 ± 0,0002 m 0,0129 ± 0,0000 m/y
BOGA	41901M002 A1	Bogota, Colombia	1744517,3882 ± 0,0002 m -0,0149 ± 0,0000 m/y	-6116051,6033 ± 0,0001 m 0,0409 ± 0,0001 m/y	512580,8927 ± 0,0001 m 0,0174 ± 0,0000 m/y
BOGA	41901M002 A2	Bogota, Colombia	1744517,3936 ± 0,0002 m -0,0221 ± 0,0001 m/y	-6116051,6091 ± 0,0002 m 0,0590 ± 0,0003 m/y	512580,8926 ± 0,0001 m 0,0176 ± 0,0000 m/y
BOGT	41901M001	Bogota, Colombia	1744399,0367 ± 0,0003 m -0,0143 ± 0,0001 m/y	-6116037,5399 ± 0,0002 m 0,0516 ± 0,0002 m/y	512731,7190 ± 0,0001 m 0,0119 ± 0,0000 m/y
BOMJ	41612M001	Bom Jesus da Lapa, Brazil	4510195,8270 ± 0,0002 m 0,0004 ± 0,0001 m/y	-4268322,3398 ± 0,0001 m -0,0064 ± 0,0001 m/y	-1453035,2319 ± 0,0000 m 0,0124 ± 0,0000 m/y
BRAZ	41606M001	Brasilia, Brazil	4115014,0806 ± 0,0002 m 0,0007 ± 0,0000 m/y	-4550641,5664 ± 0,0001 m -0,0065 ± 0,0000 m/y	-1741443,9606 ± 0,0000 m 0,0114 ± 0,0000 m/y
BRFT	41602M002	Eusebio, Brazil	4985393,5410 ± 0,0005 m -0,0021 ± 0,0002 m/y	-3954993,4227 ± 0,0001 m -0,0046 ± 0,0002 m/y	-428426,7034 ± 0,0002 m 0,0101 ± 0,0000 m/y
BRMU	42501S004 A1	Bermuda, UK	2304703,4774 ± 0,0002 m -0,0116 ± 0,0001 m/y	-4874817,1914 ± 0,0001 m -0,0027 ± 0,0001 m/y	3395186,9557 ± 0,0002 m 0,0058 ± 0,0001 m/y
BRMU	42501S004 A2	Bermuda, UK	2304703,4790 ± 0,0003 m -0,0123 ± 0,0002 m/y	-4874817,1884 ± 0,0001 m -0,0005 ± 0,0003 m/y	3395186,9524 ± 0,0004 m 0,0068 ± 0,0002 m/y
BUCA	41911S001	Bucaramanga, Colombia	1838191,2930 ± 0,0002 m 0,0023 ± 0,0001 m/y	-6057527,6817 ± 0,0002 m 0,0029 ± 0,0002 m/y	785312,1980 ± 0,0002 m 0,0144 ± 0,0001 m/y
BUEN	41912S001	Buenaventura, Colombia	1430383,8484 ± 0,0002 m 0,0055 ± 0,0001 m/y	-6200818,1805 ± 0,0002 m 0,0019 ± 0,0002 m/y	428933,9699 ± 0,0001 m 0,0129 ± 0,0000 m/y
CALI	41903S001	Cali, Colombia	1483099,9380 ± 0,0001 m 0,0028 ± 0,0000 m/y	-6193060,1977 ± 0,0001 m 0,0001 ± 0,0001 m/y	373124,0429 ± 0,0001 m 0,0140 ± 0,0000 m/y
CAM2	40514M001	Campeche, Mexico	-56581,3334 ± 0,0001 m -0,0077 ± 0,0001 m/y	-6001449,5819 ± 0,0002 m 0,0021 ± 0,0002 m/y	2151509,1573 ± 0,0002 m -0,0023 ± 0,0001 m/y
CART	41902M001	Cartagena, Colombia	1567348,5975 ± 0,0001 m 0,0123 ± 0,0000 m/y	-6075293,5287 ± 0,0001 m 0,0064 ± 0,0001 m/y	1142850,8101 ± 0,0001 m 0,0091 ± 0,0000 m/y
CFAG	41517S001	Caucete, Argentina	2016584,8754 ± 0,0001 m 0,0081 ± 0,0000 m/y	-5050165,6394 ± 0,0000 m -0,0044 ± 0,0000 m/y	-3323308,7677 ± 0,0000 m 0,0098 ± 0,0000 m/y
CHET	40526M001	Chetumal, Mexico	179584,7809 ± 0,0001 m -0,0075 ± 0,0001 m/y	-6048080,6859 ± 0,0003 m 0,0050 ± 0,0002 m/y	2010447,3555 ± 0,0002 m -0,0017 ± 0,0001 m/y
CHIH	40525M001	Chihuahua, Mexico	-1552307,7958 ± 0,0001 m -0,0118 ± 0,0001 m/y	-5382771,9621 ± 0,0002 m -0,0010 ± 0,0002 m/y	3041779,7910 ± 0,0002 m -0,0063 ± 0,0001 m/y
CHPI	41609M003	Cachoeira, Brazil	4164613,8804 ± 0,0002 m 0,0032 ± 0,0001 m/y	-4162456,8814 ± 0,0001 m -0,0076 ± 0,0001 m/y	-2445028,8066 ± 0,0000 m 0,0097 ± 0,0001 m/y
CIC1	40508M002	Ensenada, Mexico	-2433177,0958 ± 0,0000 m -0,0318 ± 0,0000 m/y	-4845044,8914 ± 0,0001 m 0,0280 ± 0,0001 m/y	3348295,8700 ± 0,0001 m 0,0163 ± 0,0000 m/y
COL2	40524M001	Colima, Mexico	-1427005,6249 ± 0,0001 m -0,0041 ± 0,0001 m/y	-5852976,0424 ± 0,0002 m -0,0022 ± 0,0002 m/y	2089088,9615 ± 0,0001 m -0,0023 ± 0,0001 m/y
CONZ	41719M002 A1	Concepcion, Chile	1492007,5830 ± 0,0004 m 0,0329 ± 0,0001 m/y	-4887910,7302 ± 0,0003 m -0,0053 ± 0,0003 m/y	-3803639,9434 ± 0,0001 m 0,0150 ± 0,0002 m/y
CONZ	41719M002 A2	Concepcion, Chile	1492007,5773 ± 0,0002 m 0,0371 ± 0,0001 m/y	-4887910,7255 ± 0,0002 m -0,0019 ± 0,0001 m/y	-3803639,9419 ± 0,0001 m 0,0165 ± 0,0001 m/y
COPO	41714S001 A1	Copiapo, Chile	1907040,7623 ± 0,0004 m 0,0217 ± 0,0002 m/y	-5337379,0197 ± 0,0002 m -0,0070 ± 0,0004 m/y	-2916334,8490 ± 0,0000 m 0,0097 ± 0,0002 m/y
COPO	41714S001 A2	Copiapo, Chile	1907040,7479 ± 0,0004 m 0,0217 ± 0,0002 m/y	-5337379,0299 ± 0,0002 m 0,0008 ± 0,0004 m/y	-2916334,8431 ± 0,0000 m 0,0165 ± 0,0002 m/y
CORD	41511M001	Cordoba, Argentina	2345503,8815 ± 0,0003 m 0,0032 ± 0,0001 m/y	-4910842,8368 ± 0,0002 m -0,0056 ± 0,0002 m/y	-3316365,3609 ± 0,0001 m 0,0098 ± 0,0001 m/y
COYQ	41715S001	Coyhaique, Chile	1391587,1958 ± 0,0003 m -0,0011 ± 0,0000 m/y	-4255574,4784 ± 0,0003 m -0,0086 ± 0,0001 m/y	-4527925,9555 ± 0,0002 m 0,0072 ± 0,0001 m/y
CRAT	41619M001 A1	Crato, Brazil	4888826,0171 ± 0,0005 m -0,0018 ± 0,0003 m/y	-4017957,4517 ± 0,0001 m -0,0024 ± 0,0002 m/y	-798308,9490 ± 0,0001 m 0,0118 ± 0,0001 m/y
CRAT	41619M001 A2	Crato, Brazil	4888826,0218 ± 0,0010 m 0,0075 ± 0,0006 m/y	-4017957,4542 ± 0,0003 m -0,0009 ± 0,0005 m/y	-798308,9492 ± 0,0002 m 0,0105 ± 0,0001 m/y
CRCS	42401M001	Caracas, Venezuela	2459721,8617 ± 0,0003 m 0,0006 ± 0,0002 m/y	-5770508,8907 ± 0,0003 m 0,0014 ± 0,0004 m/y	1155112,0298 ± 0,0002 m 0,0100 ± 0,0001 m/y
CRO1	43201M001	Saint Croix, USA	2607771,2165 ± 0,0001 m 0,0091 ± 0,0000 m/y	-5488076,7075 ± 0,0001 m 0,0093 ± 0,0001 m/y	1932767,7884 ± 0,0001 m 0,0118 ± 0,0000 m/y

***Table 2**. Geocentric coordinates [X, Y, Z] and velocities [Vx, Vy, Vz] of solution SIR09P01 (continuation).*

Station	Domes No.	Location	X [m] VX [m/y]	Y [m] VY [m/y]	Z [m] VZ [m/y]
CUCU	41904S001	Cucuta, Colombia	1901228,7065 ± 0,0002 m 0,0025 ± 0,0001 m/y	-6025504,3095 ± 0,0002 m 0,0026 ± 0,0001 m/y	870700,4649 ± 0,0001 m 0,0133 ± 0,0000 m/y
CUIB	41603M001	Cuiaba, Brazil	3430711,3995 ± 0,0001 m -0,0004 ± 0,0000 m/y	-5099641,5812 ± 0,0001 m -0,0071 ± 0,0000 m/y	-1699432,8744 ± 0,0000 m 0,0110 ± 0,0000 m/y
CULI	40523M001	Culiacan, Mexico	-1730936,7073 ± 0,0001 m -0,0096 ± 0,0002 m/y	-5528855,2591 ± 0,0003 m 0,0002 ± 0,0004 m/y	2658865,6243 ± 0,0002 m -0,0074 ± 0,0002 m/y
DORA	41915S001	La Dorada, Colombia	1679425,2160 ± 0,0003 m 0,0044 ± 0,0002 m/y	-6123536,8838 ± 0,0004 m 0,0047 ± 0,0005 m/y	602182,2368 ± 0,0002 m 0,0144 ± 0,0001 m/y
EISL	41703M003	Easter Island, Chile	-1884951,2119 ± 0,0002 m 0,0708 ± 0,0003 m/y	-5357596,0368 ± 0,0008 m -0,0223 ± 0,0007 m/y	-2892890,5582 ± 0,0001 m -0,0070 ± 0,0004 m/y
ELEN	40902S001	Santa Elena, Guatemala	14103,7792 ± 0,0001 m -0,0068 ± 0,0000 m/y	-6103995,0237 ± 0,0003 m -0,0028 ± 0,0001 m/y	1843981,7359 ± 0,0002 m 0,0010 ± 0,0000 m/y
ESTI	41202S001	Esteli, Nicaragua	394283,5421 ± 0,0002 m 0,0150 ± 0,0001 m/y	-6201541,4194 ± 0,0003 m -0,0007 ± 0,0003 m/y	1436325,8423 ± 0,0003 m 0,0114 ± 0,0001 m/y
ETCG	40602M001	Heredia, Costa Rica	645208,2388 ± 0,0002 m 0,0127 ± 0,0001 m/y	-6249842,2156 ± 0,0003 m 0,0097 ± 0,0003 m/y	1100399,4268 ± 0,0002 m 0,0163 ± 0,0001 m/y
FLOR	41916S001	Florencia, Colombia	1585141,1005 ± 0,0003 m -0,0024 ± 0,0002 m/y	-6175731,4544 ± 0,0004 m -0,0008 ± 0,0004 m/y	179144,8429 ± 0,0002 m 0,0079 ± 0,0001 m/y
FORT	41602M001	Fortaleza, Brazil	4985386,5971 ± 0,0003 m 0,0021 ± 0,0002 m/y	-3954998,6075 ± 0,0001 m -0,0065 ± 0,0002 m/y	-428426,3795 ± 0,0001 m 0,0118 ± 0,0000 m/y
GALA	42005M001	Galapagos, Ecuador	-33795,7032 ± 0,0003 m 0,0518 ± 0,0001 m/y	-6377522,6384 ± 0,0004 m 0,0002 ± 0,0003 m/y	-82120,8127 ± 0,0001 m 0,0090 ± 0,0001 m/y
GLPS	42005M002	Puerto Ayora, Ecuador	-33801,6561 ± 0,0001 m 0,0513 ± 0,0000 m/y	-6377516,5291 ± 0,0002 m -0,0020 ± 0,0001 m/y	-82154,3922 ± 0,0001 m 0,0095 ± 0,0000 m/y
GOLD	40405S031	Goldstone, USA	-2353614,3210 ± 0,0001 m -0,0172 ± 0,0000 m/y	-4641385,3347 ± 0,0001 m 0,0054 ± 0,0000 m/y	3676976,4291 ± 0,0002 m -0,0028 ± 0,0000 m/y
GOUG	30608M001	Gough, UK	4795578,6634 ± 0,0003 m 0,0159 ± 0,0002 m/y	-835299,3904 ± 0,0001 m 0,0184 ± 0,0001 m/y	-4107633,9472 ± 0,0001 m 0,0145 ± 0,0002 m/y
GUAT	40901S001 A1	Guatemala, Guatemala	-56063,5819 ± 0,0002 m 0,0065 ± 0,0000 m/y	-6174978,6823 ± 0,0001 m -0,0019 ± 0,0002 m/y	1596665,2654 ± 0,0001 m 0,0029 ± 0,0001 m/y
GUAT	40901S001 A2	Guatemala, Guatemala	-56063,5845 ± 0,0001 m 0,0060 ± 0,0001 m/y	-6174978,6906 ± 0,0002 m 0,0044 ± 0,0002 m/y	1596665,2682 ± 0,0002 m 0,0011 ± 0,0001 m/y
GVAL	41623M001	Gov. Valadares, Brazil	4490200,7957 ± 0,0004 m 0,0034 ± 0,0001 m/y	-4036984,9480 ± 0,0002 m -0,0080 ± 0,0001 m/y	-2048288,3381 ± 0,0000 m 0,0108 ± 0,0001 m/y
HER2	40522M001	Hermosillo, Mexico	-1996003,9576 ± 0,0001 m -0,0129 ± 0,0001 m/y	-5208674,5226 ± 0,0001 m 0,0002 ± 0,0002 m/y	3082959,5782 ± 0,0002 m -0,0071 ± 0,0001 m/y
IGM0	41505M002	Buenos Aires, Argentina	2751801,0648 ± 0,0003 m 0,0020 ± 0,0001 m/y	-4479882,7049 ± 0,0002 m -0,0063 ± 0,0002 m/y	-3598917,2231 ± 0,0000 m 0,0097 ± 0,0001 m/y
IGM1	41505M003	Buenos Aires, Argentina	2751804,0378 ± 0,0002 m 0,0038 ± 0,0001 m/y	-4479879,2978 ± 0,0001 m -0,0076 ± 0,0001 m/y	-3598922,5266 ± 0,0000 m 0,0084 ± 0,0001 m/y
IMPZ	41615M001	Imperatriz, Brazil	4289656,4310 ± 0,0002 m -0,0016 ± 0,0000 m/y	-4680884,9504 ± 0,0001 m -0,0047 ± 0,0001 m/y	-606347,2685 ± 0,0000 m 0,0117 ± 0,0000 m/y
INEG	40507M001 A1	Aguascalientes, Mexico	-1260435,6583 ± 0,0002 m 0,0053 ± 0,0002 m/y	-5788547,2070 ± 0,0005 m 0,0787 ± 0,0007 m/y	2360340,0744 ± 0,0004 m -0,0355 ± 0,0003 m/y
INEG	40507M001 A2	Aguascalientes, Mexico	-1260435,6819 ± 0,0000 m -0,0011 ± 0,0001 m/y	-5788547,2764 ± 0,0002 m 0,0345 ± 0,0002 m/y	2360340,0916 ± 0,0001 m -0,0190 ± 0,0001 m/y
IQQE	41708S002	Iquique, Chile	2034208,5031 ± 0,0006 m 0,0265 ± 0,0002 m/y	-5629172,2732 ± 0,0006 m 0,0027 ± 0,0005 m/y	-2196141,8551 ± 0,0001 m 0,0145 ± 0,0002 m/y
ISPA	41703M007	EasterIsland, Chile	-1881703,6592 ± 0,0002 m 0,0636 ± 0,0001 m/y	-5359979,7253 ± 0,0006 m -0,0227 ± 0,0001 m/y	-2890599,2456 ± 0,0000 m -0,0063 ± 0,0001 m/y
JAMA	42601S001	Kingston, Jamaica	1388059,8373 ± 0,0003 m 0,0056 ± 0,0000 m/y	-5909149,0465 ± 0,0003 m 0,0037 ± 0,0001 m/y	1951963,8707 ± 0,0003 m 0,0065 ± 0,0000 m/y
KOUR	97301M210	Kourou, France	3839591,3892 ± 0,0002 m -0,0014 ± 0,0000 m/y	-5059567,5686 ± 0,0001 m -0,0038 ± 0,0000 m/y	579957,0401 ± 0,0001 m 0,0125 ± 0,0000 m/y
KYW1	49852S001	Key West, USA	842464,4292 ± 0,0001 m -0,0090 ± 0,0000 m/y	-5741929,0127 ± 0,0002 m -0,0003 ± 0,0001 m/y	2637061,5156 ± 0,0002 m 0,0012 ± 0,0000 m/y
LHCL	41518S001	Lihuel Calel, Argentina	2079355,6133 ± 0,0005 m 0,0039 ± 0,0002 m/y	-4582903,4631 ± 0,0003 m -0,0084 ± 0,0004 m/y	-3905925,6727 ± 0,0002 m 0,0061 ± 0,0003 m/y
LPAZ	40521M001	La Paz, Mexico	-2022283,3337 ± 0,0000 m -0,0416 ± 0,0001 m/y	-5461274,2516 ± 0,0002 m 0,0257 ± 0,0002 m/y	2592317,0884 ± 0,0002 m 0,0172 ± 0,0001 m/y
LPGS	41510M001	La Plata, Argentina	2780102,9993 ± 0,0001 m 0,0037 ± 0,0000 m/y	-4437418,9232 ± 0,0001 m -0,0080 ± 0,0000 m/y	-3629404,5173 ± 0,0000 m 0,0084 ± 0,0000 m/y
MANA	41201S001 A1	Managua, Nicaragua	407981,8435 ± 0,0001 m 0,0068 ± 0,0000 m/y	-6222925,7183 ± 0,0002 m 0,0003 ± 0,0002 m/y	1333528,9802 ± 0,0001 m 0,0088 ± 0,0001 m/y
MANA	41201S001 A2	Managua, Nicaragua	407981,8366 ± 0,0001 m 0,0068 ± 0,0000 m/y	-6222925,7315 ± 0,0003 m 0,0071 ± 0,0002 m/y	1333528,9672 ± 0,0002 m 0,0040 ± 0,0001 m/y
MANU	41614M001	Manaus, Brazil	3179009,3283 ± 0,0018 m -0,0082 ± 0,0003 m/y	-5518662,0977 ± 0,0014 m 0,0031 ± 0,0005 m/y	-344401,7641 ± 0,0002 m 0,0116 ± 0,0001 m/y
MAPA	41629M001	Macapa, Brazil	4005461,1365 ± 0,0004 m 0,0016 ± 0,0002 m/y	-4963550,3093 ± 0,0002 m -0,0079 ± 0,0003 m/y	5162,2945 ± 0,0002 m 0,0122 ± 0,0000 m/y
MARA	42402M001	Maracaibo, Venezuela	1976117,1492 ± 0,0001 m 0,0088 ± 0,0000 m/y	-5948895,1610 ± 0,0001 m 0,0046 ± 0,0001 m/y	1173592,2267 ± 0,0001 m 0,0114 ± 0,0000 m/y

***Table 2**. Geocentric coordinates [X, Y, Z] and velocities [Vx, Vy, Vz] of solution SIR09P01 (continuation).*

Station	Domes No.	Location	X [m] VX [m/y]	Y [m] VY [m/y]	Z [m] VZ [m/y]
MCLA	41624M001	Montes Claros, Brazil	4404519,5853 ± 0,0003 m 0,0020 ± 0,0001 m/y	-4235798,4134 ± 0,0001 m -0,0060 ± 0,0001 m/y	-1823409,1122 ± 0,0000 m 0,0104 ± 0,0001 m/y
MDO1	40442M012	Fort Davis, USA	-1329998,7761 ± 0,0001 m -0,0126 ± 0,0000 m/y	-5328393,3767 ± 0,0001 m 0,0011 ± 0,0000 m/y	3236504,1582 ± 0,0002 m -0,0057 ± 0,0000 m/y
MECO	41526M001	Mercedes, Argentina	2946968,5638 ± 0,0003 m 0,0042 ± 0,0002 m/y	-4730056,9701 ± 0,0002 m -0,0077 ± 0,0004 m/y	-3091865,0195 ± 0,0001 m 0,0082 ± 0,0002 m/y
MEDE	41921S001	Medellin, Colombia	1579608,4381 ± 0,0003 m 0,0007 ± 0,0001 m/y	-6142783,8448 ± 0,0002 m -0,0011 ± 0,0003 m/y	684352,2935 ± 0,0002 m 0,0108 ± 0,0001 m/y
MERI	40520M001	Merida, Mexico	39480,7850 ± 0,0001 m -0,0082 ± 0,0001 m/y	-5957733,1127 ± 0,0002 m 0,0025 ± 0,0002 m/y	2269335,1236 ± 0,0002 m -0,0017 ± 0,0001 m/y
MEXI	40519M001	Mexicali, Mexico	-2312590,9118 ± 0,0001 m -0,0180 ± 0,0001 m/y	-4853743,6648 ± 0,0002 m 0,0119 ± 0,0002 m/y	3419740,4466 ± 0,0003 m 0,0149 ± 0,0001 m/y
MOTE	41922S001	Monteria, Colombia	1539876,9155 ± 0,0004 m 0,0088 ± 0,0003 m/y	-6112744,6379 ± 0,0005 m 0,0114 ± 0,0008 m/y	968435,2629 ± 0,0004 m 0,0068 ± 0,0002 m/y
MPLA	41521M001	Mar del Plata, Argentina	2700316,8336 ± 0,0002 m 0,0048 ± 0,0001 m/y	-4243736,7214 ± 0,0002 m -0,0089 ± 0,0001 m/y	-3908569,7436 ± 0,0001 m 0,0082 ± 0,0001 m/y
MTY2	40518M001	Monterrey, Mexico	-1029483,4559 ± 0,0001 m -0,0099 ± 0,0001 m/y	-5657637,2375 ± 0,0001 m 0,0002 ± 0,0002 m/y	2750926,1154 ± 0,0001 m -0,0046 ± 0,0001 m/y
MZAC	41503M001	Mendoza, Argentina	1932262,6786 ± 0,0002 m 0,0122 ± 0,0001 m/y	-5001226,5272 ± 0,0002 m -0,0052 ± 0,0002 m/y	-3444667,8512 ± 0,0001 m 0,0093 ± 0,0001 m/y
NAUS	41614M002	Manaus, Brazil	3179409,3614 ± 0,0008 m 0,0029 ± 0,0002 m/y	-5519130,6549 ± 0,0011 m -0,0108 ± 0,0002 m/y	-334110,1063 ± 0,0002 m 0,0113 ± 0,0000 m/y
NEIA	41620M002	Cananeia, Brazil	3875254,9805 ± 0,0003 m 0,0047 ± 0,0002 m/y	-4292588,7179 ± 0,0002 m -0,0099 ± 0,0003 m/y	-2681108,7181 ± 0,0000 m 0,0087 ± 0,0002 m/y
NEVA	41923S001	Neiva, Colombia	1617259,9672 ± 0,0002 m 0,0020 ± 0,0001 m/y	-6161575,1570 ± 0,0002 m 0,0022 ± 0,0002 m/y	324674,6495 ± 0,0001 m 0,0141 ± 0,0000 m/y
OAX2	40517M001	Oaxaca, Mexico	-713483,0384 ± 0,0001 m -0,0023 ± 0,0001 m/y	-6058316,0925 ± 0,0002 m 0,0009 ± 0,0002 m/y	1861594,6946 ± 0,0002 m 0,0009 ± 0,0001 m/y
OHI2	66008M005	O'Higgins, Antartica	1525811,8722 ± 0,0003 m 0,0184 ± 0,0000 m/y	-2432478,2214 ± 0,0002 m -0,0022 ± 0,0000 m/y	-5676165,5950 ± 0,0003 m 0,0007 ± 0,0001 m/y
OHIG	66008M001	O'Higgins, Antartica	1525872,6312 ± 0,0007 m 0,0188 ± 0,0002 m/y	-2432481,3260 ± 0,0004 m -0,0038 ± 0,0003 m/y	-5676146,0939 ± 0,0007 m -0,0010 ± 0,0006 m/y
ONRJ	41635M001	Rio de Janeiro, Brazil	4283638,3590 ± 0,0004 m 0,0023 ± 0,0004 m/y	-4026028,8392 ± 0,0002 m -0,0080 ± 0,0003 m/y	-2466096,7762 ± 0,0001 m 0,0094 ± 0,0002 m/y
PALM	66005M002 A1	Palmer, Antartica	1192671,9123 ± 0,0002 m 0,0170 ± 0,0000 m/y	-2450887,6129 ± 0,0001 m -0,0041 ± 0,0000 m/y	-5747096,0316 ± 0,0001 m 0,0017 ± 0,0001 m/y
PALM	66005M002 A2	Palmer, Antartica	1192671,9080 ± 0,0004 m 0,0175 ± 0,0001 m/y	-2450887,6098 ± 0,0003 m -0,0082 ± 0,0002 m/y	-5747096,0278 ± 0,0005 m -0,0042 ± 0,0003 m/y
PARA	41610M001	Curitiba, Brazil	3763751,6539 ± 0,0001 m 0,0023 ± 0,0001 m/y	-4365113,8244 ± 0,0000 m -0,0072 ± 0,0001 m/y	-2724404,6419 ± 0,0000 m 0,0099 ± 0,0000 m/y
PARC	41716S001	Punta Arenas, Chile	1255992,4459 ± 0,0001 m 0,0071 ± 0,0000 m/y	-3622975,1256 ± 0,0001 m -0,0081 ± 0,0000 m/y	-5079719,2725 ± 0,0001 m 0,0077 ± 0,0000 m/y
PDES	41524M001	Puerto Deseado, Argentina	1753203,6635 ± 0,0005 m 0,0019 ± 0,0003 m/y	-3922031,1104 ± 0,0004 m -0,0116 ± 0,0004 m/y	-4698513,5175 ± 0,0004 m 0,0059 ± 0,0005 m/y
PERA	41905S001	Pereira, Colombia	1571418,6732 ± 0,0002 m 0,0041 ± 0,0001 m/y	-6160208,4304 ± 0,0002 m 0,0033 ± 0,0003 m/y	529446,3956 ± 0,0001 m 0,0153 ± 0,0001 m/y
PIE1	40456M001	Pie Town, USA	-1640916,9045 ± 0,0001 m -0,0142 ± 0,0000 m/y	-5014781,2067 ± 0,0001 m 0,0005 ± 0,0000 m/y	3575447,0986 ± 0,0002 m -0,0059 ± 0,0000 m/y
POAL	41616M001	Porto Alegre, Brazil	3467519,4118 ± 0,0001 m 0,0036 ± 0,0000 m/y	-4300378,5553 ± 0,0001 m -0,0075 ± 0,0000 m/y	-3177517,6796 ± 0,0000 m 0,0095 ± 0,0000 m/y
POPA	41924S001	Popayan, Colombia	1477067,4466 ± 0,0002 m 0,0014 ± 0,0001 m/y	-6200659,1191 ± 0,0002 m 0,0029 ± 0,0004 m/y	270141,2780 ± 0,0001 m 0,0119 ± 0,0001 m/y
POVE	41628M001	Porto Velho, Brazil	2774265,6189 ± 0,0005 m 0,0002 ± 0,0001 m/y	-5662060,1119 ± 0,0007 m -0,0140 ± 0,0003 m/y	-959415,9192 ± 0,0000 m 0,0072 ± 0,0001 m/y
PPTE	41611M002	Presidente Prudente, Brazil	3687624,3562 ± 0,0003 m 0,0043 ± 0,0002 m/y	-4620818,6816 ± 0,0002 m -0,0094 ± 0,0002 m/y	-2386880,3104 ± 0,0000 m 0,0089 ± 0,0001 m/y
PSTO	41925S001	Pasto, Colombia	1404951,7250 ± 0,0004 m 0,0074 ± 0,0001 m/y	-6222655,1005 ± 0,0003 m 0,0017 ± 0,0003 m/y	134028,5885 ± 0,0002 m 0,0142 ± 0,0000 m/y
PUR3	82001S003 A1	Puerto Rico	2358177,9097 ± 0,0002 m 0,0072 ± 0,0001 m/y	-5573619,6482 ± 0,0001 m 0,0075 ± 0,0002 m/y	2007083,9471 ± 0,0001 m 0,0111 ± 0,0001 m/y
PUR3	82001S003 A2	Puerto Rico	2358177,9128 ± 0,0005 m 0,0078 ± 0,0004 m/y	-5573619,6640 ± 0,0003 m 0,0090 ± 0,0007 m/y	2007083,9519 ± 0,0003 m 0,0096 ± 0,0003 m/y
RECF	41617M001	Recife, Brazil	5176588,6288 ± 0,0002 m -0,0015 ± 0,0001 m/y	-3618162,1629 ± 0,0000 m -0,0029 ± 0,0000 m/y	-887363,8556 ± 0,0000 m 0,0118 ± 0,0000 m/y
RIOD	41608M001	Rio de Janeiro, Brazil	4280294,8833 ± 0,0001 m 0,0015 ± 0,0001 m/y	-4034431,2477 ± 0,0000 m -0,0066 ± 0,0001 m/y	-2458141,3250 ± 0,0000 m 0,0113 ± 0,0000 m/y
RIOG	41507M004	Rio Grande, Argentina	1429907,7969 ± 0,0001 m 0,0076 ± 0,0000 m/y	-3495354,8181 ± 0,0001 m -0,0094 ± 0,0000 m/y	-5122698,6489 ± 0,0001 m 0,0055 ± 0,0001 m/y
RIOH	41927S001	Riohacha, Colombia	1841101,0006 ± 0,0003 m 0,0109 ± 0,0001 m/y	-5973351,3620 ± 0,0003 m 0,0071 ± 0,0003 m/y	1264686,5365 ± 0,0002 m 0,0128 ± 0,0001 m/y
RIOP	42006M001	Riobamba, Ecuador	1255144,9639 ± 0,0004 m 0,0015 ± 0,0000 m/y	-6253609,4508 ± 0,0005 m -0,0021 ± 0,0001 m/y	-182569,8400 ± 0,0002 m 0,0053 ± 0,0000 m/y

***Table 2**. Geocentric coordinates [X, Y, Z] and velocities [Vx, Vy, Vz] of solution SIR09P01 (continuation).*

Station	Domes No.	Location	X [m] VX [m/y]	Y [m] VY [m/y]	Z [m] VZ [m/y]
RWSN	41513M001	Rawson, Argentina	1956973,4330 ± 0,0001 m 0,0019 ± 0,0000 m/y	-4217335,3066 ± 0,0001 m -0,0091 ± 0,0000 m/y	-4351745,4969 ± 0,0000 m 0,0074 ± 0,0000 m/y
S061	42003S003	Quito, Ecuador	1272867,3123 ± 0,0002 m 0,0099 ± 0,0001 m/y	-6252772,1405 ± 0,0004 m 0,0033 ± 0,0003 m/y	-23801,7679 ± 0,0001 m 0,0095 ± 0,0000 m/y
SALV	41618M001	Salvador, Brazil	4863495,7212 ± 0,0002 m 0,0021 ± 0,0001 m/y	-3870312,3653 ± 0,0000 m -0,0052 ± 0,0001 m/y	-1426347,7545 ± 0,0000 m 0,0109 ± 0,0000 m/y
SANT	41705M003	Santiago de Chile, Chile	1769693,5228 ± 0,0001 m 0,0229 ± 0,0000 m/y	-5044574,1687 ± 0,0001 m -0,0043 ± 0,0000 m/y	-3468320,9464 ± 0,0000 m 0,0125 ± 0,0000 m/y
SCUB	40701M001	Santiago de Cuba, Cuba	1474538,0915 ± 0,0001 m -0,0044 ± 0,0000 m/y	-5811243,2796 ± 0,0001 m -0,0003 ± 0,0001 m/y	2168958,8210 ± 0,0001 m 0,0036 ± 0,0000 m/y
SLOR	41102S001	San Lorenzo, Honduras	277528,9877 ± 0,0003 m 0,0135 ± 0,0001 m/y	-6198801,8086 ± 0,0004 m 0,0007 ± 0,0007 m/y	1471065,6117 ± 0,0003 m 0,0051 ± 0,0002 m/y
SMAR	41621M001	Santa Maria, Brazil	3280748,4129 ± 0,0002 m 0,0025 ± 0,0001 m/y	-4468909,7641 ± 0,0001 m -0,0068 ± 0,0001 m/y	-3143408,6389 ± 0,0000 m 0,0101 ± 0,0001 m/y
SRZN	43701S005	Paramatibo, Suriname	3623419,9913 ± 0,0006 m -0,0018 ± 0,0004 m/y	-5214015,4438 ± 0,0004 m -0,0049 ± 0,0006 m/y	602359,1905 ± 0,0003 m 0,0109 ± 0,0001 m/y
SSIA	41401S001	San Salvador, El Salvador	95566,9980 ± 0,0001 m 0,0062 ± 0,0000 m/y	-6197785,5906 ± 0,0002 m -0,0008 ± 0,0001 m/y	1500590,5292 ± 0,0001 m 0,0082 ± 0,0000 m/y
TAMP	40516M001	Tampico, Mexico	-807922,6354 ± 0,0001 m -0,0093 ± 0,0001 m/y	-5849358,2529 ± 0,0002 m -0,0016 ± 0,0002 m/y	2402967,6803 ± 0,0002 m -0,0028 ± 0,0001 m/y
TEG1	41101S001	Tegucigalpa, Honduras	301692,7047 ± 0,0003 m 0,0103 ± 0,0001 m/y	-6181037,6643 ± 0,0005 m -0,0014 ± 0,0009 m/y	1542881,1684 ± 0,0004 m 0,0048 ± 0,0003 m/y
TGCV	39601S001	Palmeira, Cape Verde	5624175,6275 ± 0,0012 m -0,0004 ± 0,0007 m/y	-2385323,5972 ± 0,0006 m 0,0218 ± 0,0005 m/y	1826873,7653 ± 0,0006 m 0,0115 ± 0,0003 m/y
TOL2	40515M001	Toluca, Mexico	-1009229,1653 ± 0,0000 m -0,0051 ± 0,0001 m/y	-5939511,4389 ± 0,0002 m 0,0020 ± 0,0002 m/y	2094889,2320 ± 0,0002 m -0,0036 ± 0,0001 m/y
TUCU	41520S001	Tucuman, Argentina	2386117,1882 ± 0,0003 m 0,0028 ± 0,0001 m/y	-5171223,3064 ± 0,0002 m -0,0005 ± 0,0001 m/y	-2862949,1262 ± 0,0001 m 0,0113 ± 0,0001 m/y
TUNA	41930S001	Tunja, Colombia	1818373,1659 ± 0,0002 m 0,0020 ± 0,0001 m/y	-6085596,9168 ± 0,0002 m 0,0006 ± 0,0002 m/y	610964,9824 ± 0,0001 m 0,0125 ± 0,0000 m/y
UBAT	41627M001	Ubatuba, Brazil	4129567,6783 ± 0,0005 m 0,0058 ± 0,0009 m/y	-4146742,9540 ± 0,0003 m -0,0110 ± 0,0009 m/y	-2527616,4342 ± 0,0001 m 0,0069 ± 0,0005 m/y
UBER	41625M001	Uberlandia, Brazil	4014997,2228 ± 0,0003 m 0,0011 ± 0,0001 m/y	-4509022,4448 ± 0,0002 m -0,0064 ± 0,0001 m/y	-2052040,6451 ± 0,0000 m 0,0095 ± 0,0001 m/y
UCOR	41502M001	Cordoba, Argentina	2371430,0319 ± 0,0004 m 0,0068 ± 0,0002 m/y	-4904119,9757 ± 0,0002 m -0,0064 ± 0,0003 m/y	-3307377,4642 ± 0,0001 m 0,0093 ± 0,0002 m/y
UEPP	41611M001	Presidente Prudente, Brazil	3687624,3190 ± 0,0002 m 0,0023 ± 0,0001 m/y	-4620818,6264 ± 0,0001 m -0,0074 ± 0,0001 m/y	-2386880,2876 ± 0,0000 m 0,0106 ± 0,0001 m/y
UNRO	41525M001	Rosario, Argentina	2627448,1888 ± 0,0003 m 0,0052 ± 0,0001 m/y	-4668383,1726 ± 0,0002 m -0,0087 ± 0,0002 m/y	-3450213,5020 ± 0,0000 m 0,0084 ± 0,0001 m/y
UNSA	41514M001	Salta, Argentina	2412830,4315 ± 0,0001 m 0,0062 ± 0,0000 m/y	-5271936,7303 ± 0,0001 m -0,0026 ± 0,0000 m/y	-2652209,0408 ± 0,0000 m 0,0109 ± 0,0000 m/y
UNSJ	41527M001	San Juan, Argentina	1987485,0122 ± 0,0003 m 0,0116 ± 0,0002 m/y	-5065493,3527 ± 0,0002 m -0,0020 ± 0,0005 m/y	-3317557,5093 ± 0,0001 m 0,0110 ± 0,0003 m/y
VALL	41906S001	Valledupar, Colombia	1807579,7277 ± 0,0002 m 0,0078 ± 0,0001 m/y	-6006678,3599 ± 0,0002 m 0,0058 ± 0,0001 m/y	1151876,7852 ± 0,0001 m 0,0133 ± 0,0000 m/y
VARG	41626M001	Varginha, Brazil	4165518,2809 ± 0,0003 m 0,0014 ± 0,0002 m/y	-4229235,7950 ± 0,0002 m -0,0061 ± 0,0002 m/y	-2327739,5933 ± 0,0000 m 0,0099 ± 0,0001 m/y
VBCA	41512M001	Bahia Blanca, Argentina	2319240,8170 ± 0,0001 m 0,0034 ± 0,0000 m/y	-4411743,9340 ± 0,0001 m -0,0079 ± 0,0001 m/y	-3966484,1218 ± 0,0000 m 0,0071 ± 0,0001 m/y
VESL	66009M001	Sanae. Veslesk., Antartica	2009329,7910 ± 0,0002 m 0,0106 ± 0,0000 m/y	-99741,4818 ± 0,0001 m -0,0008 ± 0,0000 m/y	-6033158,4361 ± 0,0002 m 0,0018 ± 0,0001 m/y
VICO	41613M001	Viscosa, Brazil	4373283,3128 ± 0,0001 m 0,0013 ± 0,0000 m/y	-4059639,0672 ± 0,0000 m -0,0060 ± 0,0000 m/y	-2246959,6700 ± 0,0000 m 0,0112 ± 0,0000 m/y
VIL2	40527M001	Villahermosa, Mexico	-310300,6380 ± 0,0001 m -0,0072 ± 0,0001 m/y	-6060324,0310 ± 0,0002 m 0,0043 ± 0,0002 m/y	1957383,6060 ± 0,0002 m -0,0016 ± 0,0001 m/y
VIVI	41931S001	Villavicencio, Colombia	1798110,7544 ± 0,0003 m -0,0069 ± 0,0002 m/y	-6103160,6854 ± 0,0003 m 0,0011 ± 0,0005 m/y	450209,5809 ± 0,0002 m 0,0093 ± 0,0001 m/y
YOPA	41932S001	Yopal, Colombia	1921562,4225 ± 0,0004 m -0,0048 ± 0,0003 m/y	-6053497,5439 ± 0,0005 m -0,0028 ± 0,0006 m/y	587652,0593 ± 0,0002 m 0,0102 ± 0,0001 m/y

***Table 3**. Ellipsoidal coordinates [φ, λ, h] and velocities [Vφ, Vλ, Vh] of solution SIR09P01 (Epoch 2005.0, Ellipsoid GRS80).*

Station	Domes No.	Location	Latitude [° ' "] VLatitude [m/y]	Longitude [° ' "] VLongitude [m/y]	h [m] Vh [m/y]
ANTC	41713S001	Los Angeles, Chile	37° 20' 19,329946" S ± 0,0001 m 0,0106 ± 0,0000 m/y	71° 31' 55,378404" W ± 0,0002 m 0,0148 ± 0,0001 m/y	745,4016 ± 0,0004 m 0,0019 ± 0,0001 m/y
AOML	49914S001	Key Biscayne, USA	25° 44' 4,889811" N ± 0,0001 m 0,0013 ± 0,0002 m/y	80° 9' 43,917063" W ± 0,0001 m -0,0088 ± 0,0001 m/y	0,095 ± 0,0003 m -0,0013 ± 0,0001 m/y
AREQ	42202M005 A2	Arequipa, Peru	16° 27' 55,861250" S ± 0,0001 m 0,0039 ± 0,0001 m/y	71° 29' 34,067234" W ± 0,0002 m -0,0086 ± 0,0004 m/y	2488,9214 ± 0,0006 m 0,0035 ± 0,0004 m/y
AREQ	42202M005 A3	Arequipa, Peru	16° 27' 55,861414" S ± 0,0001 m 0,0080 ± 0,0000 m/y	71° 29' 34,067330" W ± 0,0002 m -0,0020 ± 0,0002 m/y	2488,9044 ± 0,0004 m 0,0086 ± 0,0003 m/y
ASC1	30602M001	Ascension, UK	7° 57' 4,368679" S ± 0,0003 m 0,0129 ± 0,0000 m/y	14° 24' 43,460647" W ± 0,0003 m -0,0035 ± 0,0001 m/y	105,1105 ± 0,0004 m -0,0024 ± 0,0001 m/y
BANS	42403M001	Barinas, Venezuela	8° 36' 45,546386" N ± 0,0001 m 0,0092 ± 0,0002 m/y	70° 14' 19,233427" W ± 0,0002 m -0,0034 ± 0,0004 m/y	204,9908 ± 0,0004 m -0,0001 ± 0,0004 m/y
BDOS	43401M001	Barbados, Barbados	13° 5' 16,633223" N ± 0,0002 m 0,0149 ± 0,0001 m/y	59° 36' 32,749864" W ± 0,0003 m 0,0162 ± 0,0002 m/y	-38,6168 ± 0,0005 m 0,0042 ± 0,0001 m/y
BELE	41622M001	Belem, Brazil	1° 24' 31,661458" S ± 0,0002 m 0,0129 ± 0,0000 m/y	48° 27' 45,179013" W ± 0,0002 m -0,0052 ± 0,0002 m/y	9,0771 ± 0,0003 m 0,0021 ± 0,0000 m/y
BOGA	41901M002 A1	Bogota, Colombia	4° 38' 19,248960" N ± 0,0001 m 0,0208 ± 0,0000 m/y	74° 4' 47,816285" W ± 0,0001 m -0,0031 ± 0,0001 m/y	2610,3939 ± 0,0002 m -0,0419 ± 0,0001 m/y
BOGA	41901M002 A2	Bogota, Colombia	4° 38' 19,248940" N ± 0,0001 m 0,0227 ± 0,0001 m/y	74° 4' 47,816168" W ± 0,0002 m -0,0051 ± 0,0002 m/y	2610,4009 ± 0,0002 m -0,0612 ± 0,0002 m/y
BOGT	41901M001	Bogota, Colombia	4° 38' 24,262089" N ± 0,0001 m 0,0162 ± 0,0000 m/y	74° 4' 51,382320" W ± 0,0002 m 0,0004 ± 0,0001 m/y	2576,7575 ± 0,0003 m -0,0524 ± 0,0002 m/y
BOMJ	41612M001	Bom Jesus da Lapa, Brazil	13° 15' 20,008100" S ± 0,0001 m 0,0132 ± 0,0000 m/y	43° 25' 18,247348" W ± 0,0001 m -0,0044 ± 0,0001 m/y	419,3895 ± 0,0001 m 0,0017 ± 0,0000 m/y
BRAZ	41606M001	Brasilia, Brazil	15° 56' 50,909316" S ± 0,0000 m 0,0124 ± 0,0000 m/y	47° 52' 40,328835" W ± 0,0001 m -0,0039 ± 0,0000 m/y	1106,0139 ± 0,0002 m 0,0020 ± 0,0000 m/y
BRFT	41602M002	Eusebio, Brazil	3° 52' 38,808295" S ± 0,0002 m 0,0101 ± 0,0000 m/y	38° 25' 31,934033" W ± 0,0002 m -0,0049 ± 0,0002 m/y	21,6841 ± 0,0005 m 0,0005 ± 0,0000 m/y
BRMU	42501S004 A1	Bermuda, UK	32° 22' 13,435363" N ± 0,0001 m 0,0063 ± 0,0001 m/y	64° 41' 46,583389" W ± 0,0001 m -0,0116 ± 0,0001 m/y	-11,6062 ± 0,0002 m 0,0009 ± 0,0000 m/y
BRMU	42501S004 A2	Bermuda, UK	32° 22' 13,435307" N ± 0,0002 m 0,0083 ± 0,0003 m/y	64° 41' 46,583284" W ± 0,0002 m -0,0113 ± 0,0003 m/y	-11,6097 ± 0,0004 m -0,0005 ± 0,0001 m/y
BUCA	41911S001	Bucaramanga, Colombia	7° 7' 8,163735" N ± 0,0001 m 0,0145 ± 0,0001 m/y	73° 7' 9,409495" W ± 0,0001 m 0,0030 ± 0,0002 m/y	1005,5587 ± 0,0003 m -0,0003 ± 0,0002 m/y
BUEN	41912S001	Buenaventura, Colombia	3° 52' 55,280947" N ± 0,0001 m 0,0129 ± 0,0000 m/y	77° 0' 37,514223" W ± 0,0001 m 0,0057 ± 0,0001 m/y	57,7574 ± 0,0002 m 0,0002 ± 0,0002 m/y
CALI	41903S001	Cali, Colombia	3° 22' 32,831034" N ± 0,0001 m 0,0139 ± 0,0000 m/y	76° 31' 57,232992" W ± 0,0001 m 0,0027 ± 0,0001 m/y	1027,5002 ± 0,0002 m 0,0014 ± 0,0001 m/y
CAM2	40514M001	Campeche, Mexico	19° 50' 39,937630" N ± 0,0001 m -0,0014 ± 0,0002 m/y	90° 32' 24,595525" W ± 0,0001 m -0,0077 ± 0,0001 m/y	12,1986 ± 0,0003 m -0,0027 ± 0,0002 m/y
CART	41902M001	Cartagena, Colombia	10° 23' 28,803466" N ± 0,0001 m 0,0095 ± 0,0000 m/y	75° 32' 1,873283" W ± 0,0001 m 0,0135 ± 0,0000 m/y	4,0744 ± 0,0002 m -0,0014 ± 0,0001 m/y
CFAG	41517S001	Caucete, Argentina	31° 36' 7,802231" S ± 0,0000 m 0,0121 ± 0,0000 m/y	68° 13' 57,533111" W ± 0,0001 m 0,0059 ± 0,0000 m/y	702,5522 ± 0,0001 m 0,0009 ± 0,0000 m/y
CHET	40526M001	Chetumal, Mexico	18° 29' 42,996073" N ± 0,0001 m 0,0000 ± 0,0002 m/y	88° 17' 57,208079" W ± 0,0001 m -0,0074 ± 0,0001 m/y	2,9793 ± 0,0003 m -0,0055 ± 0,0002 m/y
CHIH	40525M001	Chihuahua, Mexico	28° 39' 43,894144" N ± 0,0001 m -0,0075 ± 0,0002 m/y	106° 5' 12,261640" W ± 0,0001 m -0,0110 ± 0,0000 m/y	1413,1854 ± 0,0002 m 0,0007 ± 0,0001 m/y
CHPI	41609M003	Cachoeira, Brazil	22° 41' 13,724751" S ± 0,0001 m 0,0119 ± 0,0001 m/y	44° 59' 6,570291" W ± 0,0001 m -0,0031 ± 0,0002 m/y	617,4107 ± 0,0002 m 0,0033 ± 0,0000 m/y
CIC1	40508M002	Ensenada, Mexico	31° 52' 14,440963" N ± 0,0001 m 0,0195 ± 0,0001 m/y	116° 39' 56,739496" W ± 0,0001 m -0,0410 ± 0,0000 m/y	64,3388 ± 0,0001 m -0,0005 ± 0,0000 m/y
COL2	40524M001	Colima, Mexico	19° 14' 39,994764" N ± 0,0001 m -0,0032 ± 0,0001 m/y	103° 42' 6,781344" W ± 0,0001 m -0,0035 ± 0,0000 m/y	528,7678 ± 0,0002 m 0,0022 ± 0,0002 m/y
CONZ	41719M002 A1	Concepcion, Chile	36° 50' 37,540370" S ± 0,0002 m 0,0208 ± 0,0000 m/y	73° 1' 31,733308" W ± 0,0003 m 0,0299 ± 0,0002 m/y	180,712 ± 0,0004 m 0,0027 ± 0,0004 m/y
CONZ	41719M002 A2	Concepcion, Chile	36° 50' 37,540452" S ± 0,0001 m 0,0208 ± 0,0000 m/y	73° 1' 31,733473" W ± 0,0001 m 0,0349 ± 0,0001 m/y	180,7062 ± 0,0003 m 0,0002 ± 0,0001 m/y
COPO	41714S001 A1	Copiapo, Chile	27° 23' 4,297009" S ± 0,0001 m 0,0150 ± 0,0001 m/y	70° 20' 17,651588" W ± 0,0003 m 0,0180 ± 0,0003 m/y	479,1013 ± 0,0003 m 0,0079 ± 0,0004 m/y
COPO	41714S001 A2	Copiapo, Chile	27° 23' 4,296768" S ± 0,0001 m 0,0176 ± 0,0001 m/y	70° 20' 17,652210" W ± 0,0003 m 0,0207 ± 0,0003 m/y	479,1029 ± 0,0003 m -0,0018 ± 0,0004 m/y
CORD	41511M001	Cordoba, Argentina	31° 31' 42,365338" S ± 0,0001 m 0,0117 ± 0,0000 m/y	64° 28' 12,173890" W ± 0,0002 m 0,0004 ± 0,0002 m/y	746,8496 ± 0,0003 m 0,0003 ± 0,0002 m/y
COYQ	41715S001	Coyhaique, Chile	45° 30' 51,627925" S ± 0,0001 m 0,0106 ± 0,0000 m/y	71° 53' 31,490959" W ± 0,0002 m -0,0037 ± 0,0001 m/y	476,1781 ± 0,0004 m 0,0003 ± 0,0002 m/y
CRAT	41619M001 A1	Crato, Brazil	7° 14' 16,865207" S ± 0,0001 m 0,0117 ± 0,0001 m/y	39° 24' 56,180143" W ± 0,0002 m -0,0030 ± 0,0004 m/y	436,0264 ± 0,0005 m -0,0014 ± 0,0001 m/y
CRAT	41619M001 A2	Crato, Brazil	7° 14' 16,865193" S ± 0,0003 m 0,0112 ± 0,0002 m/y	39° 24' 56,180108" W ± 0,0004 m 0,0041 ± 0,0008 m/y	436,0317 ± 0,0009 m 0,0050 ± 0,0001 m/y
CRCS	42401M001	Caracas, Venezuela	10° 30' 9,106949" N ± 0,0001 m 0,0101 ± 0,0002 m/y	66° 54' 48,657923" W ± 0,0001 m 0,0011 ± 0,0003 m/y	913,0392 ± 0,0004 m 0,0008 ± 0,0003 m/y
CRO1	43201M001	Saint Croix, USA	17° 45' 24,833447" N ± 0,0000 m 0,0126 ± 0,0000 m/y	64° 35' 3,551370" W ± 0,0001 m 0,0122 ± 0,0001 m/y	-31,9427 ± 0,0002 m -0,0007 ± 0,0000 m/y

***Table 3**. Ellipsoidal coordinates [φ, λ, h] and velocities [Vφ, Vλ, Vh] of solution SIR09P01 (Epoch 2005.0, Ellipsoid GRS80) (continuation).*

Station	Domes No.	Location	Latitude [° ' "] VLatitude [m/y]	Longitude [° ' "] VLongitude [m/y]	h [m] Vh [m/y]
CUCU	41904S001	Cucuta, Colombia	7° 53' 54,447985" N ± 0,0001 m 0,0134 ± 0,0000 m/y	72° 29' 16,583086" W ± 0,0001 m 0,0032 ± 0,0001 m/y	311,1788 ± 0,0002 m 0,0001 ± 0,0001 m/y
CUIB	41603M001	Cuiaba, Brazil	15° 33' 18,944918" S ± 0,0000 m 0,0121 ± 0,0000 m/y	56° 4' 11,520058" W ± 0,0001 m -0,0043 ± 0,0001 m/y	237,4388 ± 0,0002 m 0,0025 ± 0,0000 m/y
CULI	40523M001	Culiacan, Mexico	24° 47' 54,788402" N ± 0,0001 m -0,0078 ± 0,0003 m/y	107° 23' 2,193480" W ± 0,0002 m -0,0093 ± 0,0000 m/y	75,408 ± 0,0003 m -0,0007 ± 0,0003 m/y
DORA	41915S001	La Dorada, Colombia	5° 27' 13,838713" N ± 0,0002 m 0,0147 ± 0,0001 m/y	74° 39' 47,928313" W ± 0,0002 m 0,0055 ± 0,0003 m/y	204,5 ± 0,0005 m -0,0020 ± 0,0004 m/y
EISL	41703M003	Easter Island, Chile	27° 8' 53,553946" S ± 0,0003 m -0,0074 ± 0,0000 m/y	109° 22' 59,841366" W ± 0,0005 m 0,0742 ± 0,0000 m/y	114,5421 ± 0,0006 m 0,0010 ± 0,0008 m/y
ELEN	40902S001	Santa Elena, Guatemala	16° 54' 57,801472" N ± 0,0001 m 0,0001 ± 0,0001 m/y	89° 52' 3,409160" W ± 0,0001 m -0,0068 ± 0,0000 m/y	118,1282 ± 0,0004 m 0,0030 ± 0,0001 m/y
ESTI	41202S001	Esteli, Nicaragua	13° 5' 58,329888" N ± 0,0002 m 0,0107 ± 0,0002 m/y	86° 21' 43,658605" W ± 0,0002 m 0,0149 ± 0,0001 m/y	852,6802 ± 0,0004 m 0,0042 ± 0,0003 m/y
ETCG	40602M001	Heredia, Costa Rica	9° 59' 58,136522" N ± 0,0001 m 0,0175 ± 0,0001 m/y	84° 6' 21,229784" W ± 0,0002 m 0,0137 ± 0,0001 m/y	1193,6442 ± 0,0004 m -0,0054 ± 0,0003 m/y
FLOR	41916S001	Florencia, Colombia	1° 37' 12,945104" N ± 0,0002 m 0,0079 ± 0,0001 m/y	75° 36' 16,207024" W ± 0,0002 m -0,0026 ± 0,0003 m/y	314,2587 ± 0,0004 m 0,0004 ± 0,0004 m/y
FORT	41602M001	Fortaleza, Brazil	3° 52' 38,802656" S ± 0,0001 m 0,0122 ± 0,0000 m/y	38° 25' 32,205571" W ± 0,0001 m -0,0038 ± 0,0003 m/y	19,4496 ± 0,0003 m 0,0048 ± 0,0001 m/y
GALA	42005M001	Galapagos, Ecuador	0° 44' 33,702266" N ± 0,0001 m 0,0090 ± 0,0001 m/y	90° 18' 13,026134" W ± 0,0003 m 0,0518 ± 0,0001 m/y	7,4348 ± 0,0004 m -0,0006 ± 0,0003 m/y
GLPS	42005M002	Puerto Ayora, Ecuador	0° 44' 34,797994" N ± 0,0001 m 0,0095 ± 0,0000 m/y	90° 18' 13,219707" W ± 0,0001 m 0,0513 ± 0,0000 m/y	1,793 ± 0,0002 m 0,0017 ± 0,0001 m/y
GOLD	40405S031	Goldstone, USA	35° 25' 30,561616" N ± 0,0001 m -0,0040 ± 0,0001 m/y	116° 53' 21,300319" W ± 0,0001 m -0,0178 ± 0,0000 m/y	986,6641 ± 0,0002 m 0,0008 ± 0,0000 m/y
GOUG	30608M001	Gough, UK	40° 20' 55,798474" S ± 0,0001 m 0,0191 ± 0,0002 m/y	9° 52' 50,579319" W ± 0,0002 m 0,0209 ± 0,0001 m/y	81,2614 ± 0,0003 m 0,0001 ± 0,0000 m/y
GUAT	40901S001 A1	Guatemala, Guatemala	14° 35' 25,454673" N ± 0,0001 m 0,0023 ± 0,0001 m/y	90° 31' 12,658471" W ± 0,0002 m 0,0065 ± 0,0000 m/y	1519,885 ± 0,0002 m 0,0025 ± 0,0001 m/y
GUAT	40901S001 A2	Guatemala, Guatemala	14° 35' 25,454694" N ± 0,0001 m 0,0022 ± 0,0001 m/y	90° 31' 12,658555" W ± 0,0001 m 0,0060 ± 0,0001 m/y	1519,8937 ± 0,0003 m -0,0040 ± 0,0002 m/y
GVAL	41623M001	Gov. Valadares, Brazil	18° 51' 20,183094" S ± 0,0001 m 0,0128 ± 0,0001 m/y	41° 57' 27,429553" W ± 0,0001 m -0,0037 ± 0,0002 m/y	178,6424 ± 0,0004 m 0,0039 ± 0,0000 m/y
HER2	40522M001	Hermosillo, Mexico	29° 5' 33,169528" N ± 0,0001 m -0,0083 ± 0,0002 m/y	110° 58' 1,973842" W ± 0,0001 m -0,0121 ± 0,0000 m/y	186,9524 ± 0,0002 m 0,0004 ± 0,0001 m/y
IGM0	41505M002	Buenos Aires, Argentina	34° 34' 19,911458" S ± 0,0001 m 0,0116 ± 0,0001 m/y	58° 26' 21,718897" W ± 0,0001 m -0,0016 ± 0,0002 m/y	48,7923 ± 0,0003 m -0,0002 ± 0,0001 m/y
IGM1	41505M003	Buenos Aires, Argentina	34° 34' 20,077979" S ± 0,0001 m 0,0117 ± 0,0000 m/y	58° 26' 21,549549" W ± 0,0001 m -0,0007 ± 0,0001 m/y	50,6926 ± 0,0002 m 0,0022 ± 0,0001 m/y
IMPZ	41615M001	Imperatriz, Brazil	5° 29' 30,356436" S ± 0,0001 m 0,0119 ± 0,0000 m/y	47° 29' 50,044902" W ± 0,0001 m -0,0044 ± 0,0001 m/y	104,9997 ± 0,0002 m 0,0012 ± 0,0000 m/y
INEG	40507M001 A1	Aguascalientes, Mexico	21° 51' 22,153571" N ± 0,0002 m -0,0039 ± 0,0005 m/y	102° 17' 3,130437" W ± 0,0003 m -0,0115 ± 0,0000 m/y	1887,9232 ± 0,0006 m -0,0856 ± 0,0005 m/y
INEG	40507M001 A2	Aguascalientes, Mexico	21° 51' 22,153208" N ± 0,0001 m -0,0052 ± 0,0001 m/y	102° 17' 3,130725" W ± 0,0001 m -0,0084 ± 0,0000 m/y	1887,9971 ± 0,0002 m -0,0381 ± 0,0001 m/y
IQQE	41708S002	Iquique, Chile	20° 16' 24,748970" S ± 0,0002 m 0,0159 ± 0,0001 m/y	70° 7' 54,170257" W ± 0,0004 m 0,0258 ± 0,0004 m/y	38,9476 ± 0,0008 m 0,0010 ± 0,0004 m/y
ISPA	41703M007	EasterIsland, Chile	27° 7' 29,938167" S ± 0,0002 m -0,0054 ± 0,0000 m/y	109° 20' 39,881702" W ± 0,0004 m 0,0675 ± 0,0000 m/y	112,4944 ± 0,0005 m 0,0031 ± 0,0002 m/y
JAMA	42601S001	Kingston, Jamaica	17° 56' 20,483851" N ± 0,0002 m 0,0069 ± 0,0001 m/y	76° 46' 51,139116" W ± 0,0002 m 0,0063 ± 0,0001 m/y	-2,9382 ± 0,0005 m -0,0002 ± 0,0001 m/y
KOUR	97301M210	Kourou, France	5° 15' 7,852497" N ± 0,0001 m 0,0123 ± 0,0000 m/y	52° 48' 21,454853" W ± 0,0001 m -0,0034 ± 0,0001 m/y	-25,7572 ± 0,0002 m 0,0033 ± 0,0000 m/y
KYW1	49852S001	Key West, USA	24° 34' 56,181028" N ± 0,0001 m 0,0015 ± 0,0001 m/y	81° 39' 10,918666" W ± 0,0001 m -0,0090 ± 0,0000 m/y	-13,7862 ± 0,0002 m -0,0004 ± 0,0001 m/y
LHCL	41518S001	Lihuel Calel, Argentina	38° 0' 9,574856" S ± 0,0001 m 0,0105 ± 0,0001 m/y	65° 35' 42,889983" W ± 0,0003 m 0,0001 ± 0,0003 m/y	404,5419 ± 0,0005 m 0,0036 ± 0,0004 m/y
LPAZ	40521M001	La Paz, Mexico	24° 8' 19,671711" N ± 0,0001 m 0,0197 ± 0,0001 m/y	110° 19' 9,647364" W ± 0,0001 m -0,0479 ± 0,0000 m/y	-6,834 ± 0,0002 m -0,0018 ± 0,0001 m/y
LPGS	41510M001	La Plata, Argentina	34° 54' 24,283059" S ± 0,0000 m 0,0119 ± 0,0000 m/y	57° 55' 56,278234" W ± 0,0000 m -0,0011 ± 0,0000 m/y	29,873 ± 0,0001 m 0,0023 ± 0,0000 m/y
MANA	41201S001 A1	Managua, Nicaragua	12° 8' 56,178641" N ± 0,0001 m 0,0086 ± 0,0001 m/y	86° 14' 56,378026" W ± 0,0001 m 0,0068 ± 0,0001 m/y	71,0501 ± 0,0002 m 0,0020 ± 0,0002 m/y
MANA	41201S001 A2	Managua, Nicaragua	12° 8' 56,178140" N ± 0,0001 m 0,0053 ± 0,0001 m/y	86° 14' 56,378280" W ± 0,0001 m 0,0073 ± 0,0001 m/y	71,0599 ± 0,0003 m -0,0057 ± 0,0002 m/y
MANU	41614M001	Manaus, Brazil	3° 6' 58,139652" S ± 0,0003 m 0,0112 ± 0,0001 m/y	60° 3' 21,711343" W ± 0,0009 m -0,0055 ± 0,0005 m/y	40,139 ± 0,0021 m -0,0074 ± 0,0003 m/y
MAPA	41629M001	Macapa, Brazil	0° 2' 48,070508" N ± 0,0002 m 0,0122 ± 0,0000 m/y	51° 5' 50,412761" W ± 0,0002 m -0,0037 ± 0,0003 m/y	-4,2468 ± 0,0004 m 0,0071 ± 0,0001 m/y
MARA	42402M001	Maracaibo, Venezuela	10° 40' 26,323314" N ± 0,0001 m 0,0115 ± 0,0000 m/y	71° 37' 27,950355" W ± 0,0001 m 0,0098 ± 0,0001 m/y	28,3892 ± 0,0001 m 0,0005 ± 0,0001 m/y

***Table 3**. Ellipsoidal coordinates [φ, λ, h] and velocities [Vφ, Vλ, Vh] of solution SIR09P01 (Epoch 2005.0, Ellipsoid GRS80) (continuation).*

Station	Domes No.	Location	Latitude [° ' "] VLatitude [m/y]	Longitude [° ' "] VLongitude [m/y]	h [m] Vh [m/y]
MCLA	41624M001	Montes Claros, Brazil	16° 43' 13,420470" S ± 0,0001 m 0,0116 ± 0,0001 m/y	43° 52' 52,738794" W ± 0,0001 m -0,0029 ± 0,0002 m/y	656,543 ± 0,0003 m 0,0024 ± 0,0000 m/y
MDO1	40442M012	Fort Davis, USA	30° 40' 49,840201" N ± 0,0001 m -0,0059 ± 0,0001 m/y	104° 0' 53,974955" W ± 0,0001 m -0,0125 ± 0,0000 m/y	2004,4969 ± 0,0002 m -0,0012 ± 0,0000 m/y
MECO	41526M001	Mercedes, Argentina	29° 11' 5,594332" S ± 0,0001 m 0,0115 ± 0,0001 m/y	58° 4' 33,043200" W ± 0,0001 m -0,0005 ± 0,0004 m/y	116,5119 ± 0,0003 m 0,0036 ± 0,0003 m/y
MEDE	41921S001	Medellin, Colombia	6° 11' 57,853944" N ± 0,0002 m 0,0106 ± 0,0001 m/y	75° 34' 44,100233" W ± 0,0003 m 0,0004 ± 0,0002 m/y	1553,4182 ± 0,0003 m 0,0024 ± 0,0002 m/y
MERI	40520M001	Merida, Mexico	20° 58' 48,163183" N ± 0,0001 m -0,0007 ± 0,0001 m/y	89° 37' 13,141649" W ± 0,0001 m -0,0081 ± 0,0001 m/y	7,875 ± 0,0002 m -0,0030 ± 0,0002 m/y
MEXI	40519M001	Mexicali, Mexico	32° 37' 58,768629" N ± 0,0002 m 0,0142 ± 0,0002 m/y	115° 28' 32,530634" W ± 0,0002 m -0,0214 ± 0,0000 m/y	-22,4529 ± 0,0003 m 0,0055 ± 0,0001 m/y
MOTE	41922S001	Monteria, Colombia	8° 47' 31,073436" N ± 0,0003 m 0,0081 ± 0,0003 m/y	75° 51' 38,410080" W ± 0,0003 m 0,0113 ± 0,0005 m/y	33,2312 ± 0,0007 m -0,0078 ± 0,0006 m/y
MPLA	41521M001	Mar del Plata, Argentina	38° 2' 8,173264" S ± 0,0001 m 0,0127 ± 0,0000 m/y	57° 31' 52,111030" W ± 0,0001 m -0,0007 ± 0,0001 m/y	20,1172 ± 0,0003 m 0,0028 ± 0,0001 m/y
MTY2	40518M001	Monterrey, Mexico	25° 42' 55,824121" N ± 0,0001 m -0,0049 ± 0,0002 m/y	100° 18' 46,460784" W ± 0,0001 m -0,0098 ± 0,0000 m/y	521,7438 ± 0,0002 m -0,0006 ± 0,0001 m/y
MZAC	41503M001	Mendoza, Argentina	32° 53' 42,550645" S ± 0,0001 m 0,0128 ± 0,0000 m/y	68° 52' 32,065716" W ± 0,0001 m 0,0095 ± 0,0002 m/y	859,8402 ± 0,0002 m 0,0027 ± 0,0002 m/y
NAUS	41614M002	Manaus, Brazil	3° 1' 22,509010" S ± 0,0003 m 0,0119 ± 0,0000 m/y	60° 3' 18,060004" W ± 0,0001 m -0,0028 ± 0,0003 m/y	93,8639 ± 0,0014 m 0,0102 ± 0,0001 m/y
NEIA	41620M002	Cananeia, Brazil	25° 1' 12,859653" S ± 0,0001 m 0,0123 ± 0,0001 m/y	47° 55' 29,886813" W ± 0,0001 m -0,0032 ± 0,0003 m/y	6,0525 ± 0,0003 m 0,0058 ± 0,0001 m/y
NEVA	41923S001	Neiva, Colombia	2° 56' 14,279959" N ± 0,0001 m 0,0142 ± 0,0001 m/y	75° 17' 34,913661" W ± 0,0001 m 0,0024 ± 0,0002 m/y	472,7409 ± 0,0002 m -0,0009 ± 0,0002 m/y
OAX2	40517M001	Oaxaca, Mexico	17° 4' 42,023098" N ± 0,0002 m 0,0010 ± 0,0001 m/y	96° 43' 0,261607" W ± 0,0001 m -0,0024 ± 0,0000 m/y	1607,2556 ± 0,0002 m -0,0003 ± 0,0002 m/y
OHI2	66008M005	O'Higgins, Antartica	63° 19' 15,892283" S ± 0,0001 m 0,0107 ± 0,0000 m/y	57° 54' 4,797536" W ± 0,0001 m 0,0144 ± 0,0000 m/y	32,4703 ± 0,0004 m 0,0046 ± 0,0001 m/y
OHIG	66008M001	O'Higgins, Antartica	63° 19' 14,601878" S ± 0,0003 m 0,0114 ± 0,0002 m/y	57° 54' 1,218733" W ± 0,0004 m 0,0139 ± 0,0003 m/y	30,7227 ± 0,0009 m 0,0068 ± 0,0006 m/y
ONRJ	41635M001	Rio de Janeiro, Brazil	22° 53' 44,520059" S ± 0,0002 m 0,0114 ± 0,0002 m/y	43° 13' 27,594171" W ± 0,0002 m -0,0043 ± 0,0005 m/y	35,6248 ± 0,0004 m 0,0029 ± 0,0001 m/y
PALM	66005M002 A1	Palmer, Antartica	64° 46' 30,324633" S ± 0,0001 m 0,0108 ± 0,0000 m/y	64° 3' 4,040865" W ± 0,0001 m 0,0135 ± 0,0000 m/y	31,0511 ± 0,0001 m 0,0032 ± 0,0001 m/y
PALM	66005M002 A2	Palmer, Antartica	64° 46' 30,324719" S ± 0,0002 m 0,0118 ± 0,0001 m/y	64° 3' 4,041052" W ± 0,0002 m 0,0122 ± 0,0002 m/y	31,0456 ± 0,0006 m 0,0102 ± 0,0004 m/y
PARA	41610M001	Curitiba, Brazil	25° 26' 54,125078" S ± 0,0001 m 0,0120 ± 0,0000 m/y	49° 13' 51,437753" W ± 0,0001 m -0,0029 ± 0,0001 m/y	925,7579 ± 0,0001 m 0,0021 ± 0,0000 m/y
PARC	41716S001	Punta Arenas, Chile	53° 8' 13,037595" S ± 0,0001 m 0,0126 ± 0,0000 m/y	70° 52' 47,575563" W ± 0,0001 m 0,0040 ± 0,0000 m/y	22,2947 ± 0,0002 m -0,0002 ± 0,0001 m/y
PDES	41524M001	Puerto Deseado, Argentina	47° 45' 12,938458" S ± 0,0002 m 0,0124 ± 0,0001 m/y	65° 54' 52,840100" W ± 0,0003 m -0,0030 ± 0,0004 m/y	18,0072 ± 0,0006 m 0,0033 ± 0,0005 m/y
PERA	41905S001	Pereira, Colombia	4° 47' 32,983101" N ± 0,0001 m 0,0154 ± 0,0001 m/y	75° 41' 22,234203" W ± 0,0001 m 0,0048 ± 0,0002 m/y	1496,7484 ± 0,0003 m -0,0009 ± 0,0003 m/y
PIE1	40456M001	Pie Town, USA	34° 18' 5,421283" N ± 0,0001 m -0,0071 ± 0,0001 m/y	108° 7' 8,137430" W ± 0,0001 m -0,0137 ± 0,0000 m/y	2347,7326 ± 0,0002 m -0,0001 ± 0,0000 m/y
POAL	41616M001	Porto Alegre, Brazil	30° 4' 26,550988" S ± 0,0001 m 0,0123 ± 0,0000 m/y	51° 7' 11,153444" W ± 0,0001 m -0,0019 ± 0,0001 m/y	76,7389 ± 0,0001 m 0,0022 ± 0,0000 m/y
POPA	41924S001	Popayan, Colombia	2° 26' 35,208988" N ± 0,0001 m 0,0120 ± 0,0001 m/y	76° 36' 4,341633" W ± 0,0001 m 0,0020 ± 0,0002 m/y	1782,2587 ± 0,0003 m -0,0020 ± 0,0003 m/y
POVE	41628M001	Porto Velho, Brazil	8° 42' 33,609653" S ± 0,0001 m 0,0090 ± 0,0000 m/y	63° 53' 46,750945" W ± 0,0002 m -0,0060 ± 0,0002 m/y	119,5634 ± 0,0009 m 0,0114 ± 0,0002 m/y
PPTE	41611M002	Presidente Prudente, Brazil	22° 7' 11,655052" S ± 0,0001 m 0,0121 ± 0,0001 m/y	51° 24' 30,722770" W ± 0,0001 m -0,0025 ± 0,0003 m/y	431,0157 ± 0,0003 m 0,0060 ± 0,0001 m/y
PSTO	41925S001	Pasto, Colombia	1° 12' 42,158963" N ± 0,0002 m 0,0142 ± 0,0001 m/y	77° 16' 37,490197" W ± 0,0003 m 0,0076 ± 0,0002 m/y	2569,1152 ± 0,0004 m 0,0003 ± 0,0002 m/y
PUR3	82001S003 A1	Puerto Rico	18° 27' 46,715878" N ± 0,0001 m 0,0119 ± 0,0001 m/y	67° 4' 1,046610" W ± 0,0001 m 0,0096 ± 0,0001 m/y	89,550 ± 0,0002 m -0,0004 ± 0,0001 m/y
PUR3	82001S003 A2	Puerto Rico	18° 27' 46,715863" N ± 0,0002 m 0,0108 ± 0,0004 m/y	67° 4' 1,046721" W ± 0,0003 m 0,0107 ± 0,0006 m/y	89,566 ± 0,0005 m -0,0019 ± 0,0003 m/y
RECF	41617M001	Recife, Brazil	8° 3' 3,467733" S ± 0,0001 m 0,0117 ± 0,0000 m/y	34° 57' 5,459556" W ± 0,0001 m -0,0032 ± 0,0001 m/y	20,151 ± 0,0002 m -0,0012 ± 0,0000 m/y
RIOD	41608M001	Rio de Janeiro, Brazil	22° 49' 4,238040" S ± 0,0001 m 0,0126 ± 0,0000 m/y	43° 18' 22,596243" W ± 0,0001 m -0,0037 ± 0,0001 m/y	8,6262 ± 0,0001 m 0,0008 ± 0,0000 m/y
RIOG	41507M004	Rio Grande, Argentina	53° 47' 7,699469" S ± 0,0001 m 0,0126 ± 0,0000 m/y	67° 45' 4,024553" W ± 0,0001 m 0,0035 ± 0,0000 m/y	32,0413 ± 0,0001 m 0,0025 ± 0,0001 m/y
RIOH	41927S001	Riohacha, Colombia	11° 30' 47,576428" N ± 0,0001 m 0,0132 ± 0,0001 m/y	72° 52' 10,928585" W ± 0,0002 m 0,0125 ± 0,0002 m/y	12,4785 ± 0,0004 m -0,0009 ± 0,0002 m/y
RIOP	42006M001	Riobamba, Ecuador	1° 39' 2,144715" S ± 0,0002 m 0,0053 ± 0,0000 m/y	78° 39' 3,985598" W ± 0,0003 m 0,0011 ± 0,0001 m/y	2817,1865 ± 0,0006 m 0,0022 ± 0,0001 m/y

***Table 3**. Ellipsoidal coordinates [φ, λ, h] and velocities [Vφ, Vλ, Vh] of solution SIR09P01 (Epoch 2005.0, Ellipsoid GRS80) (continuation).*

Station	Domes No.	Location	Latitude [° ' "] VLatitude [m/y]	Longitude [° ' "] VLongitude [m/y]	h [m] Vh [m/y]
RWSN	41513M001	Rawson, Argentina	43° 17' 55,971015" S ± 0,0000 m 0,0116 ± 0,0000 m/y	65° 6' 26,093854" W ± 0,0001 m -0,0021 ± 0,0000 m/y	27,3846 ± 0,0001 m 0,0015 ± 0,0000 m/y
S061	42003S003	Quito, Ecuador	0° 12' 54,565803" N ± 0,0001 m 0,0095 ± 0,0000 m/y	78° 29' 36,989325" W ± 0,0001 m 0,0104 ± 0,0002 m/y	2922,5497 ± 0,0004 m -0,0013 ± 0,0003 m/y
SALV	41618M001	Salvador, Brazil	13° 0' 31,209750" S ± 0,0001 m 0,0117 ± 0,0000 m/y	38° 30' 44,493426" W ± 0,0001 m -0,0028 ± 0,0001 m/y	35,745 ± 0,0001 m 0,0024 ± 0,0000 m/y
SANT	41705M003	Santiago de Chile, Chile	33° 9' 1,037815" S ± 0,0000 m 0,0168 ± 0,0000 m/y	70° 40' 6,794653" W ± 0,0001 m 0,0202 ± 0,0000 m/y	723,066 ± 0,0001 m 0,0029 ± 0,0000 m/y
SCUB	40701M001	Santiago de Cuba, Cuba	20° 0' 43,427874" N ± 0,0001 m 0,0037 ± 0,0000 m/y	75° 45' 44,338788" W ± 0,0001 m -0,0044 ± 0,0000 m/y	20,9214 ± 0,0002 m 0,0005 ± 0,0000 m/y
SLOR	41102S001	San Lorenzo, Honduras	13° 25' 26,106627" N ± 0,0002 m 0,0050 ± 0,0004 m/y	87° 26' 11,400319" W ± 0,0003 m 0,0135 ± 0,0002 m/y	12,0033 ± 0,0005 m 0,0011 ± 0,0006 m/y
SMAR	41621M001	Santa Maria, Brazil	29° 43' 8,124395" S ± 0,0001 m 0,0122 ± 0,0000 m/y	53° 42' 59,735713" W ± 0,0001 m -0,0020 ± 0,0001 m/y	113,1048 ± 0,0002 m 0,0010 ± 0,0000 m/y
SRZN	43701S005	Paramatibo, Suriname	5° 27' 20,314812" N ± 0,0002 m 0,0106 ± 0,0002 m/y	55° 12' 11,074206" W ± 0,0003 m -0,0043 ± 0,0007 m/y	-17,2599 ± 0,0007 m 0,0040 ± 0,0002 m/y
SSIA	41401S001	San Salvador, El Salvador	13° 41' 49,505343" N ± 0,0001 m 0,0078 ± 0,0000 m/y	89° 6' 59,743761" W ± 0,0001 m 0,0062 ± 0,0000 m/y	626,636 ± 0,0002 m 0,0028 ± 0,0001 m/y
TAMP	40516M001	Tampico, Mexico	22° 16' 41,955662" N ± 0,0001 m -0,0037 ± 0,0002 m/y	97° 51' 50,497041" W ± 0,0001 m -0,0090 ± 0,0000 m/y	21,0463 ± 0,0002 m 0,0016 ± 0,0002 m/y
TEG1	41101S001	Tegucigalpa, Honduras	14° 5' 24,263000" N ± 0,0003 m 0,0042 ± 0,0005 m/y	87° 12' 20,323247" W ± 0,0003 m 0,0102 ± 0,0002 m/y	951,3549 ± 0,0006 m 0,0030 ± 0,0008 m/y
TGCV	39601S001	Palmeira, Cape Verde	16° 45' 17,184161" N ± 0,0004 m 0,0136 ± 0,0001 m/y	22° 58' 57,924357" W ± 0,0010 m 0,0199 ± 0,0007 m/y	35,2017 ± 0,0010 m -0,0052 ± 0,0006 m/y
TOL2	40515M001	Toluca, Mexico	19° 17' 35,643550" N ± 0,0001 m -0,0030 ± 0,0001 m/y	99° 38' 36,499322" W ± 0,0001 m -0,0054 ± 0,0000 m/y	2651,733 ± 0,0002 m -0,0022 ± 0,0001 m/y
TUCU	41520S001	Tucuman, Argentina	26° 50' 35,718963" S ± 0,0001 m 0,0108 ± 0,0000 m/y	65° 13' 49,265783" W ± 0,0002 m 0,0023 ± 0,0001 m/y	485,0555 ± 0,0003 m -0,0037 ± 0,0001 m/y
TUNA	41930S001	Tunja, Colombia	5° 31' 52,782283" N ± 0,0001 m 0,0124 ± 0,0001 m/y	73° 21' 49,975559" W ± 0,0001 m 0,0021 ± 0,0002 m/y	2831,8603 ± 0,0002 m 0,0012 ± 0,0002 m/y
UBAT	41627M001	Ubatuba, Brazil	23° 30' 0,635534" S ± 0,0002 m 0,0110 ± 0,0005 m/y	45° 7' 8,046988" W ± 0,0002 m -0,0036 ± 0,0013 m/y	6,0474 ± 0,0006 m 0,0081 ± 0,0002 m/y
UBER	41625M001	Uberlandia, Brazil	18° 53' 22,326966" S ± 0,0001 m 0,0108 ± 0,0000 m/y	48° 19' 1,097765" W ± 0,0001 m -0,0034 ± 0,0001 m/y	791,791 ± 0,0003 m 0,0022 ± 0,0000 m/y
UCOR	41502M001	Cordoba, Argentina	31° 26' 5,856998" S ± 0,0001 m 0,0125 ± 0,0001 m/y	64° 11' 36,620547" W ± 0,0002 m 0,0034 ± 0,0003 m/y	462,7744 ± 0,0003 m 0,0026 ± 0,0003 m/y
UEPP	41611M001	Presidente Prudente, Brazil	22° 7' 11,655180" S ± 0,0001 m 0,0126 ± 0,0000 m/y	51° 24' 30,722585" W ± 0,0001 m -0,0028 ± 0,0001 m/y	430,9456 ± 0,0001 m 0,0027 ± 0,0000 m/y
UNRO	41525M001	Rosario, Argentina	32° 57' 33,671229" S ± 0,0001 m 0,0126 ± 0,0001 m/y	60° 37' 42,330767" W ± 0,0001 m 0,0003 ± 0,0002 m/y	66,8681 ± 0,0003 m 0,0039 ± 0,0002 m/y
UNSA	41514M001	Salta, Argentina	24° 43' 38,843433" S ± 0,0000 m 0,0119 ± 0,0000 m/y	65° 24' 27,516164" W ± 0,0001 m 0,0046 ± 0,0000 m/y	1257,8007 ± 0,0002 m -0,0001 ± 0,0000 m/y
UNSJ	41527M001	San Juan, Argentina	31° 32' 28,528800" S ± 0,0001 m 0,0126 ± 0,0001 m/y	68° 34' 37,419171" W ± 0,0002 m 0,0101 ± 0,0004 m/y	708,9207 ± 0,0003 m -0,0005 ± 0,0005 m/y
VALL	41906S001	Valledupar, Colombia	10° 28' 26,276117" N ± 0,0001 m 0,0137 ± 0,0001 m/y	73° 15' 7,093030" W ± 0,0001 m 0,0092 ± 0,0001 m/y	208,5006 ± 0,0002 m -0,0009 ± 0,0001 m/y
VARG	41626M001	Varginha, Brazil	21° 32' 33,662490" S ± 0,0001 m 0,0111 ± 0,0001 m/y	45° 26' 5,552511" W ± 0,0001 m -0,0033 ± 0,0002 m/y	958,6371 ± 0,0003 m 0,0014 ± 0,0000 m/y
VBCA	41512M001	Bahia Blanca, Argentina	38° 42' 2,766067" S ± 0,0000 m 0,0109 ± 0,0000 m/y	62° 16' 9,217627" W ± 0,0001 m -0,0007 ± 0,0001 m/y	59,4753 ± 0,0001 m 0,0023 ± 0,0001 m/y
VESL	66009M001	Sanae. Veslesk., Antartica	71° 40' 25,666644" S ± 0,0001 m 0,0106 ± 0,0001 m/y	2° 50' 30,418475" W ± 0,0001 m -0,0003 ± 0,0000 m/y	862,3651 ± 0,0002 m 0,0017 ± 0,0001 m/y
VICO	41613M001	Viscosa, Brazil	20° 45' 41,400070" S ± 0,0000 m 0,0123 ± 0,0000 m/y	42° 52' 11,962642" W ± 0,0001 m -0,0035 ± 0,0001 m/y	665,9466 ± 0,0001 m 0,0007 ± 0,0000 m/y
VIL2	40527M001	Villahermosa, Mexico	17° 59' 25,478075" N ± 0,0001 m -0,0003 ± 0,0001 m/y	92° 55' 51,953407" W ± 0,0001 m -0,0074 ± 0,0001 m/y	27,7587 ± 0,0003 m -0,0043 ± 0,0002 m/y
VIVI	41931S001	Villavicencio, Colombia	4° 4' 28,780481" N ± 0,0001 m 0,0095 ± 0,0001 m/y	73° 35' 2,375944" W ± 0,0002 m -0,0063 ± 0,0003 m/y	407,2881 ± 0,0004 m -0,0023 ± 0,0004 m/y
YOPA	41932S001	Yopal, Colombia	5° 19' 18,339548" N ± 0,0002 m 0,0100 ± 0,0002 m/y	72° 23' 20,379133" W ± 0,0003 m -0,0054 ± 0,0005 m/y	334,3577 ± 0,0006 m 0,0021 ± 0,0005 m/y

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Annex 1: SIRGAS-CON sub-networks

The continental SIRGAS-CON network comprises two levels:

1. One core network (SIRGAS-CON-C), densification of ITRF in Latin America, with a good continental coverage and stabile site locations to ensure high long-term stability of the reference frame.

2. Several densification sub-networks (SIRGAS-CON-D), which should correspond to the national reference frames realized by continuously operating stations. At the moment, there are three SIRGAS-CON-D sub-networks, but in the future, there shall be given so many SIRGAS-CON-D sub-networks as countries in the region.

The SIRGAS-CON-C network (Figure 1.1) is processed by the IGS-RNAAC-SIR (i.e. DGFI: Deutsches Geodätisches Forschungsinstitut, Germany). The SIRGAS-CON-D sub-networks are computed by the SIRGAS Local Processing Centres according to the following distribution:

- Instituto Geográfico Agustín Codazzi, Colombia (IGAC) is in charge of the northern densification sub-network (Figure 1.2); it covers Mexico, Central America, The Caribbean, Colombia, and Venezuela.

- Instituto Brasileiro de Geografia e Estatistica, Brazil (IBGE) processes the middle densification sub-network (Figure 1.3), which comprises stations operating in Brazil, Ecuador, Bolivia, Suriname, French Guyana, Guyana, Peru, and Bolivia.

- Instituto de Geodesia y Geodinámica at the Universidad Nacional del Cuyo, Argentina (IGG-CIMA) computes the southern densification sub-network (Figure 1.4), which includes the stations located in Uruguay, Paraguay, Argentina, Chile, and the Antarctica.

These four processing centres deliver loosely constrained weekly solutions for the densification SIRGAS-CON-D sub-networks, which are combined with the continental SIRGAS-CON-C network to get homogeneous precision for station positions and velocities in a continental level. Figure 1.5 shows the number of analysis centres processing the different SIRGAS-CON stations.

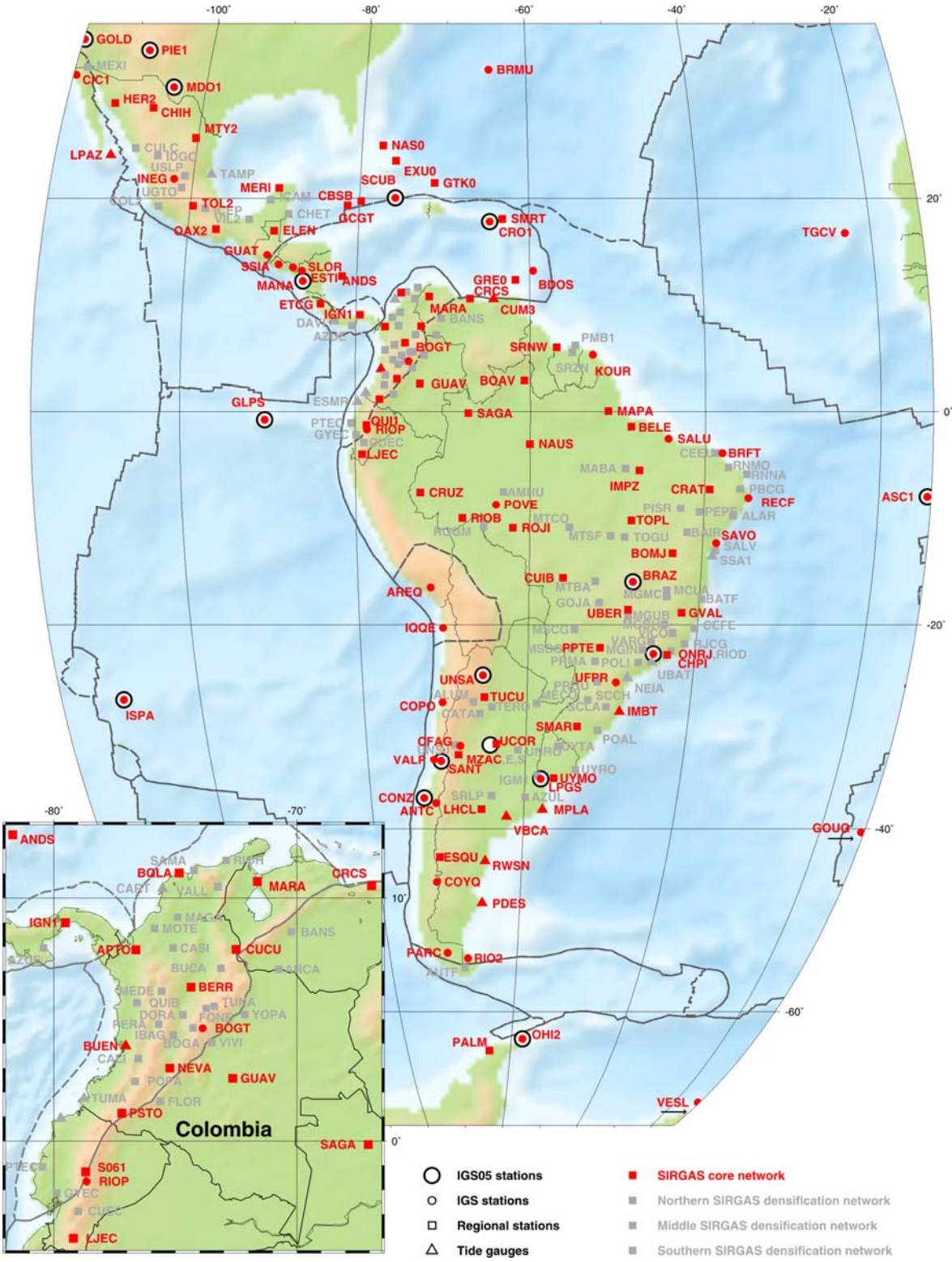


Figure 1.1. *SIRGAS-CON-C core network.*

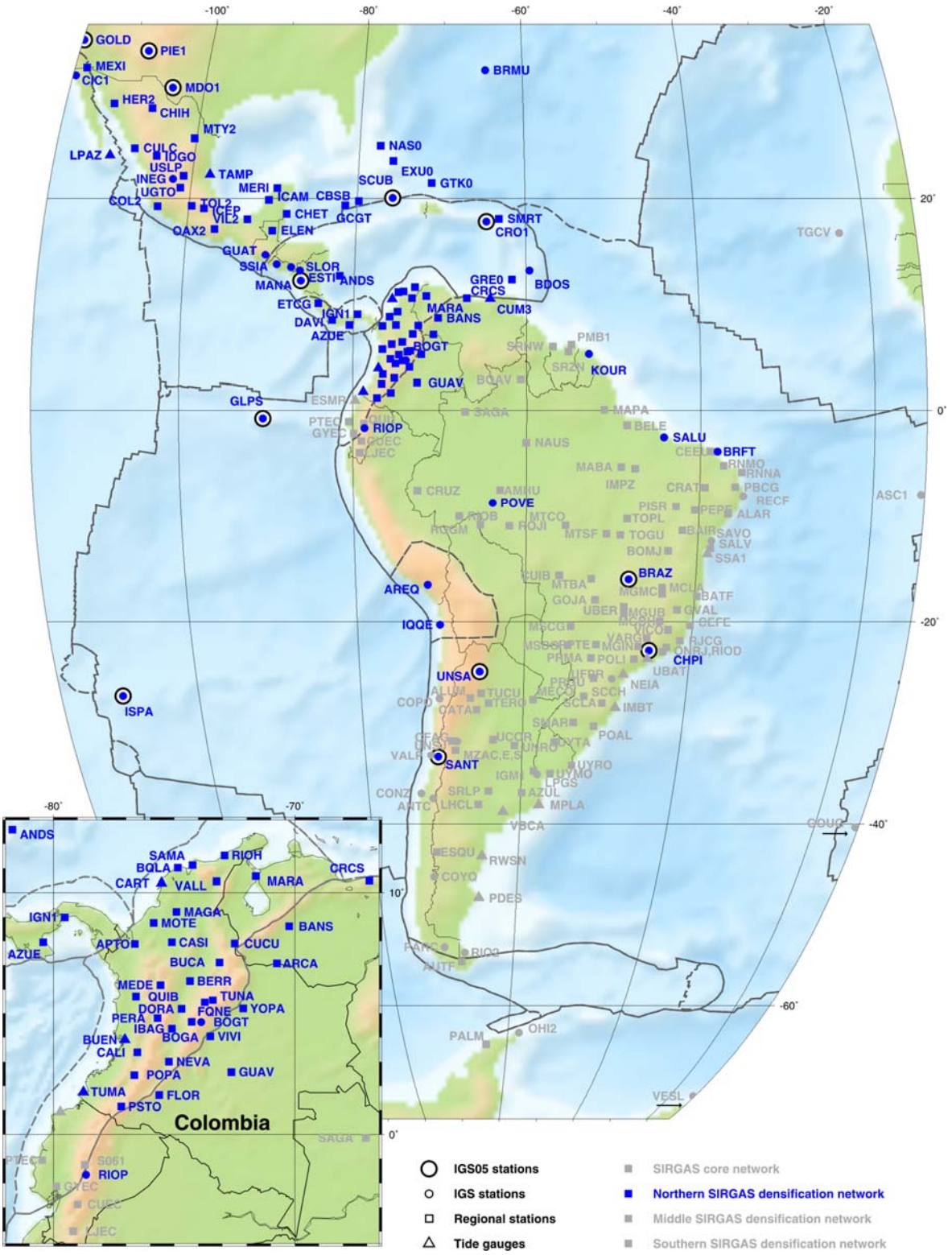


Figure 1.2. *SIRGAS-CON-D-North densification sub-network.*

Figure 1.3. *SIRGAS-CON-D-Middle densification sub-network.*

Figure 1.4. *SIRGAS-CON-D-South densification sub-network.*

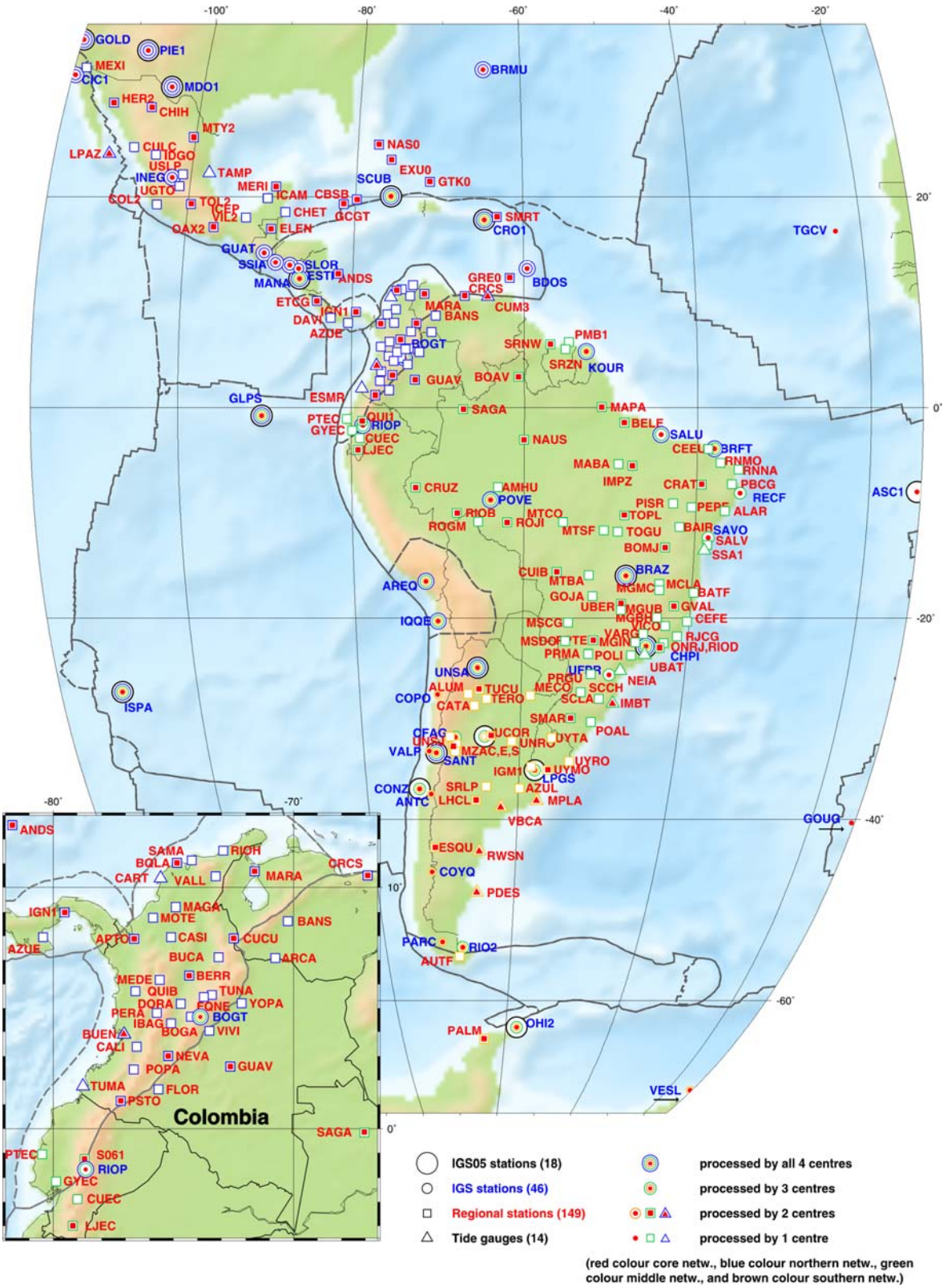


Figure 1.5. *Number of processing centres per SIRGAS-CON station.*

Annex 2: Procedure to generate loosely constrained weekly solutions for the SIRGAS-CON sub-networks

1) Elevation mask and data sampling rate are set to 3° and 30 s, respectively;

2) Absolute calibration values for the antenna phase centre corrections published by the IGS are applied;

3) Satellite orbits, satellite clock offsets, and Earth orientation parameters are fixed to the combined IGS weekly solutions;

4) The quasi ionosphere free (QIF) strategy is applied for solving the L1 and L2 phase ambiguities;

5) Periodic site movements due to ocean tide loading are modelled according to the FES2004 ocean tide model (Letellier 2004). The corresponding values are provided by M.S. Bos and H.-G. Scherneck at http://www.oso.chalmers.se/~loading/;

6) Zenith delay due to the tropospheric refraction (~ wet part) is estimated at a 2 hours interval within the network adjustment. The Niell (1996) dry mapping function is applied to interpolate the a priori zenith delay (~ dry part) modelled using the Saastamoinen model (1973);

7) Daily free normal equations are computed and combined to get a loosely constrained weekly solution for station coordinates (all station coordinates are constrained to ±1 m);

8) Stations with large residuals in the weekly combination (more than 20 mm in the N and E components, and more than 30 mm in the Up component) are reduced from the normal equations. Steps (7) and (8) are iterative;

9) These loosely constrained solutions in SINEX format are identified with the name CCC*wwww*7.SNX, CCC identifies the corresponding processing centre (i.e. CIM, DGF, IBG, IGA), *wwww* stands for the GPS week, and 7 for including the seven days of the week. The individual solutions delivered by the SIRGAS Processing Centres are available at ftp://ftp.dgfi.badw-muenchen.de/pub/gps/SIRGAS/.

Annex 3: Procedure to combine the loosely constrained weekly solutions for the SIRGAS-CON sub-networks

The SIRGAS Processing Centres DGFI, CIMA, IBGE, and IGAC deliver loosely constrained weekly solutions for the assigned SIRGAS-CON sub-network. In these solutions, satellite orbits, satellite clock offsets, and Earth orientation parameters are fixed to the final weekly IGS values and coordinates for all sites are loosely constrained to ±1 m. These individual contributions are integrated in a unified solution by the SIRGAS Combination Centres: DGFI and IBGE. The processing strategy applied by DGFI for the combination of the individual SIRGAS-CON sub-networks applies the Bernese Software V.5.0 (Dach et al. 2007) and corresponds to:

1) Individual solutions are reviewed/corrected for possible format problems, station inconsistencies, utilization of erroneous equipment, etc.;

2) Constraints included in the delivered normal equations are removed;

3) Sub-networks are individually aligned to the IGS05 reference frame by applying the NNR and NNT conditions. The included IGS05 reference stations are those with available coordinates in the IGS constrained weekly combinations, i.e. files igs*yy*P*wwww*.snx (*yy* = year, *wwww* = GPS week);

4) Coordinates obtained in (3) for each processing centre are compared to the IGS weekly values and to each other to identify possible outliers;

5) Stations with large residuals (more than 10 mm in the north or east components, and more than 20 mm in the Up component) are reduced from the normal equations. Steps (3), (4), and (5) are iterative;

6) Variances obtained in the final computation of step (3) are analyzed to estimate scaling factors for relative weighting of the individual solutions;

7) Once inconsistencies and outliers are reduced from the individual free normal equations, a combination for a loosely constrained weekly solution for station coordinates (all station coordinates constrained to ±1 m) is computed. This solution is submitted to IGS for the global polyhedron.

8) Additionally, a weekly solution aligned to the IGS05 reference frame is computed based on the IGS weekly coordinates (igs*yy*P*wwww*.snx) of the IGS05 stations used in

(3). The weights of the reference coordinates are inversely proportional to the internal precision of the GPS measurements (±1E-04 m in the Bernese Software). This solution provides the final SIRGAS-CON coordinates for further applications.

9) Resulting files of these procedure are:

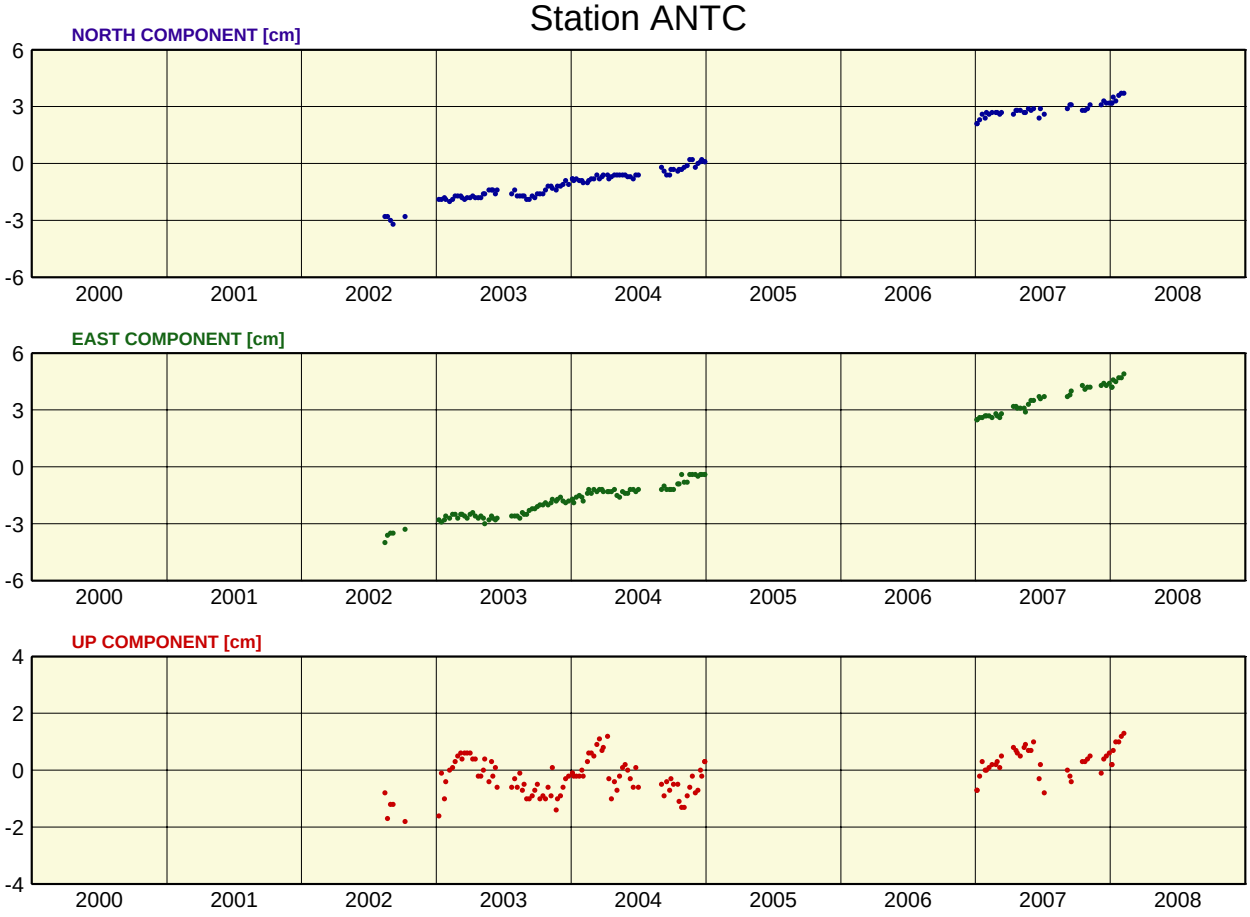
SIR*wwww*7.SNX: SINEX file for the loosely constrained weekly combination.
SIR*wwww*7.SUM: Report of weekly combination.
siryyP*wwww*.snx: SINEX file for the constrained weekly combination.
siryyP*wwww*.crd: Final SIRGAS-CON coordinates for week *wwww*.

The loosely constrained combinations as well as the weekly SIRGAS-CON coordinates are available at ftp://ftp.dgfi.badw-muenchen.de/pub/gps/SIRGAS/ or at http://www.sirgas.org/index.php?id=153.

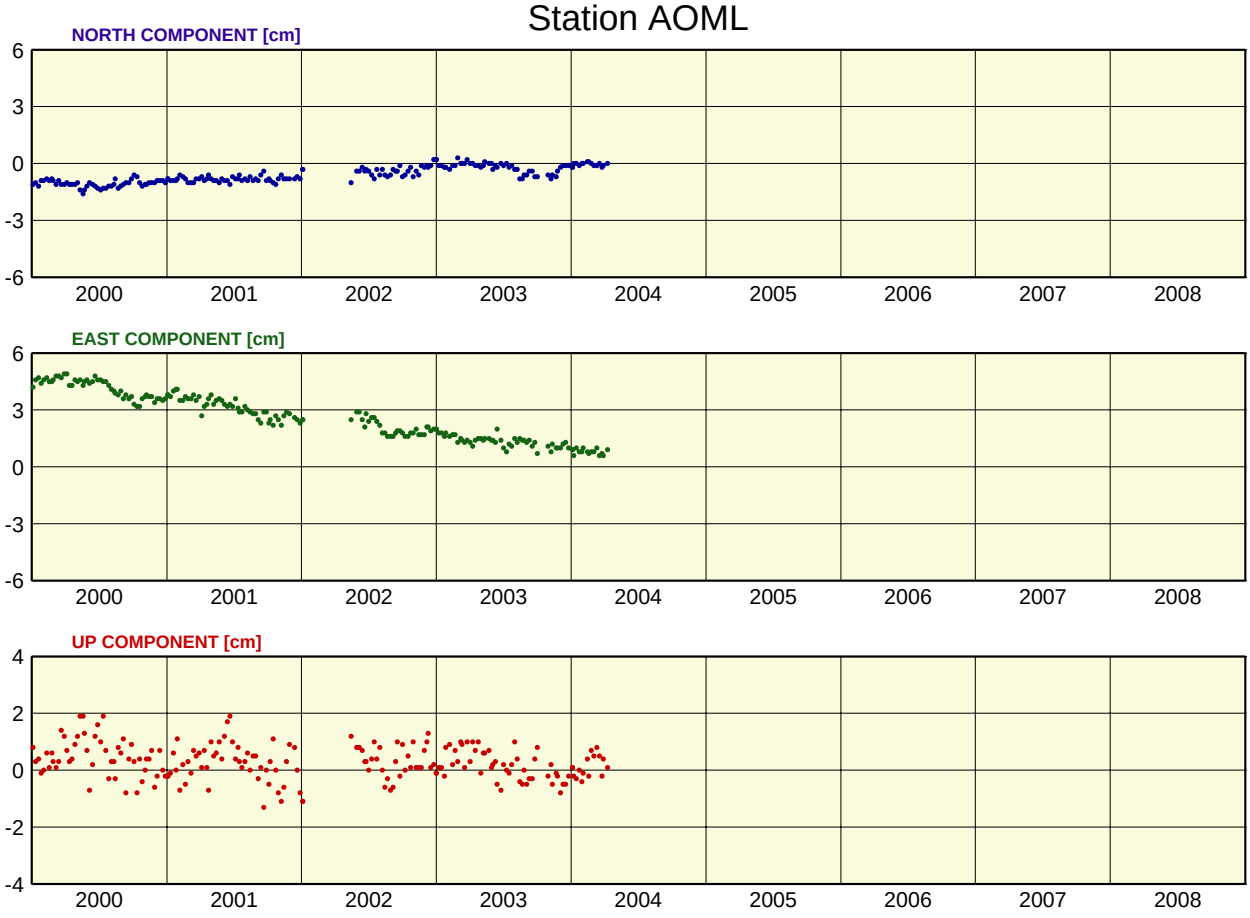
Annex 4: Time series of station positions

The time series of the station coordinates for the time span covered by the SIR09P01 solution (i.e. January 2, 2000 till January 3, 2009) are presented in the following. Coordinate variations are given in centimetres and they are plotted on a weekly basis.

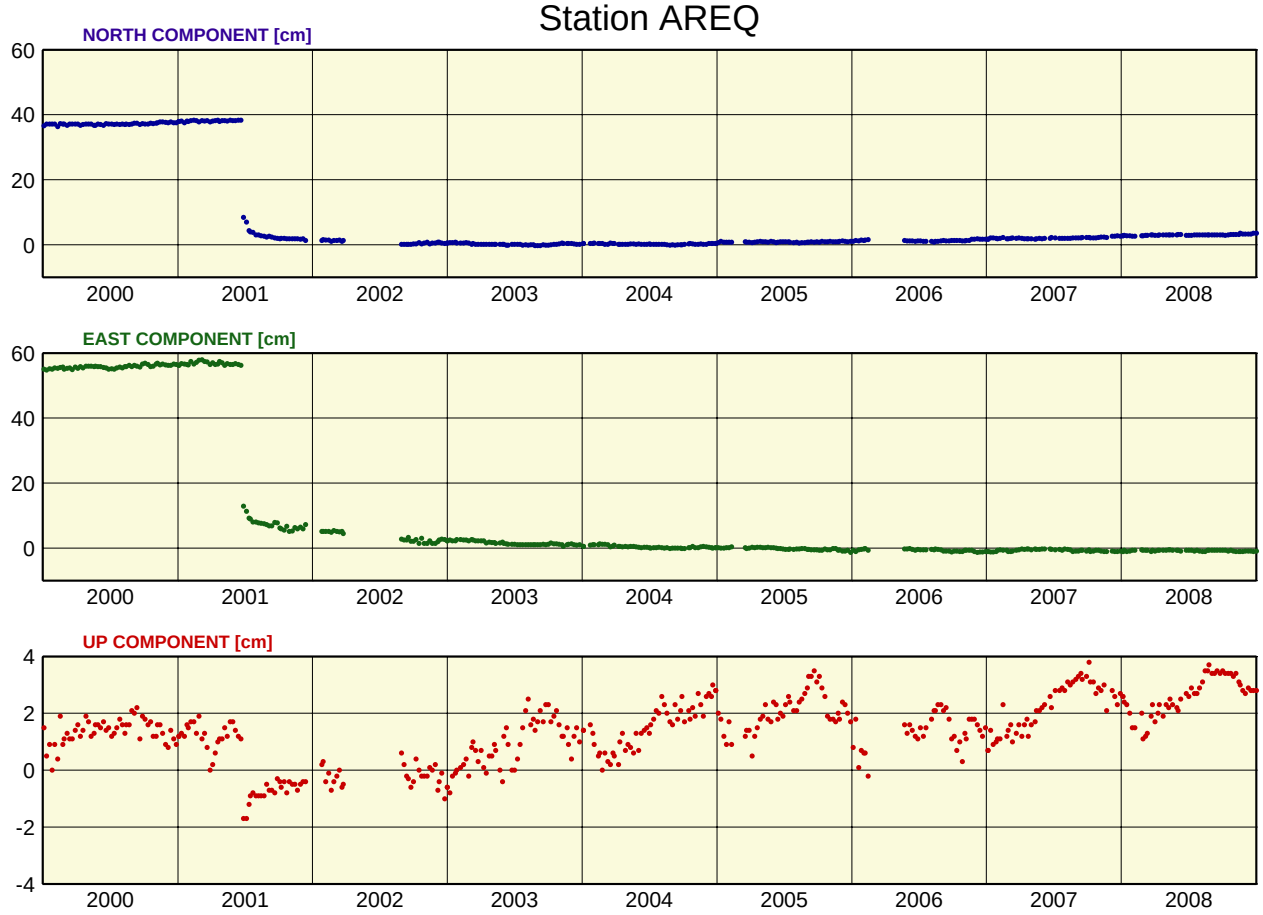
Station ANTC



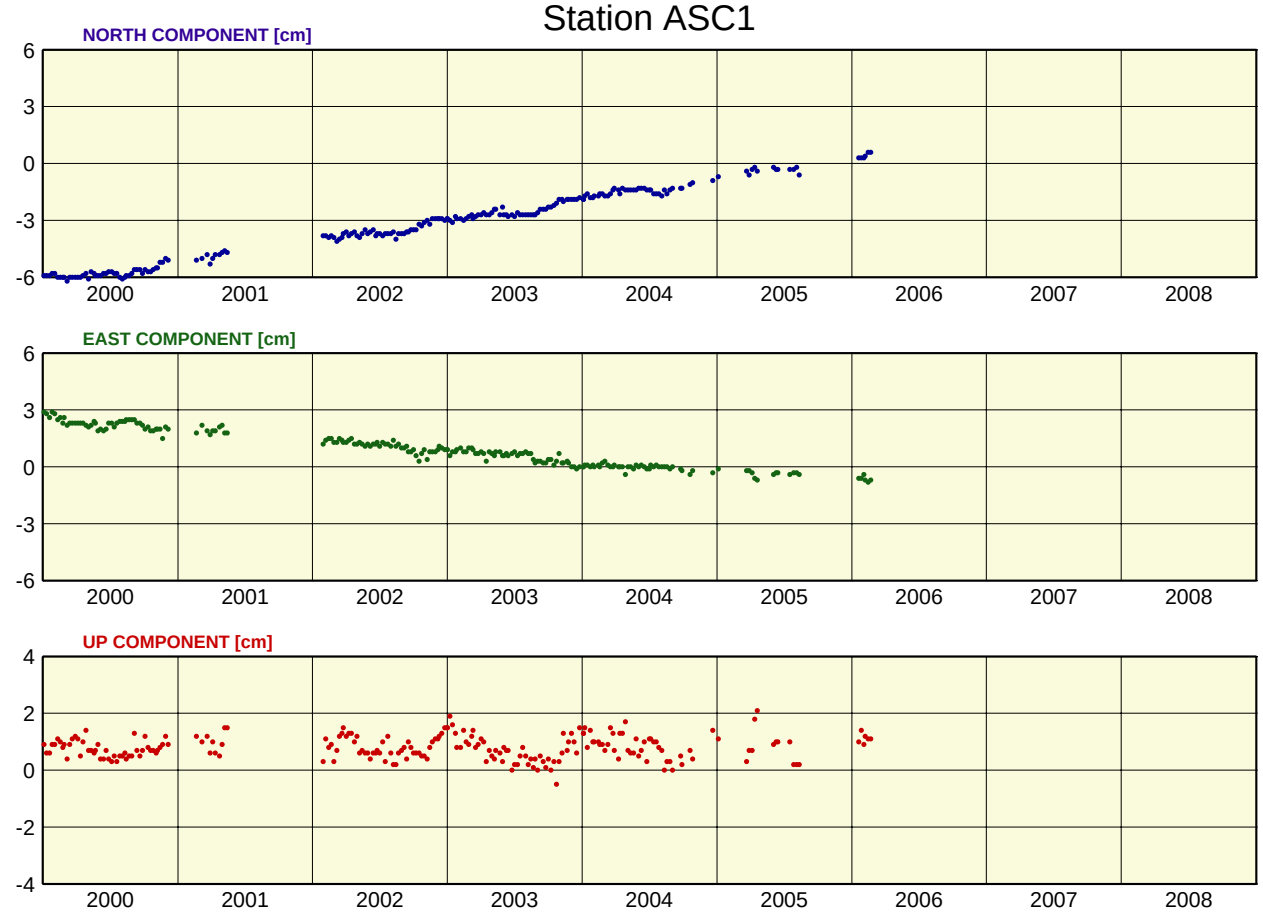
Station AOML



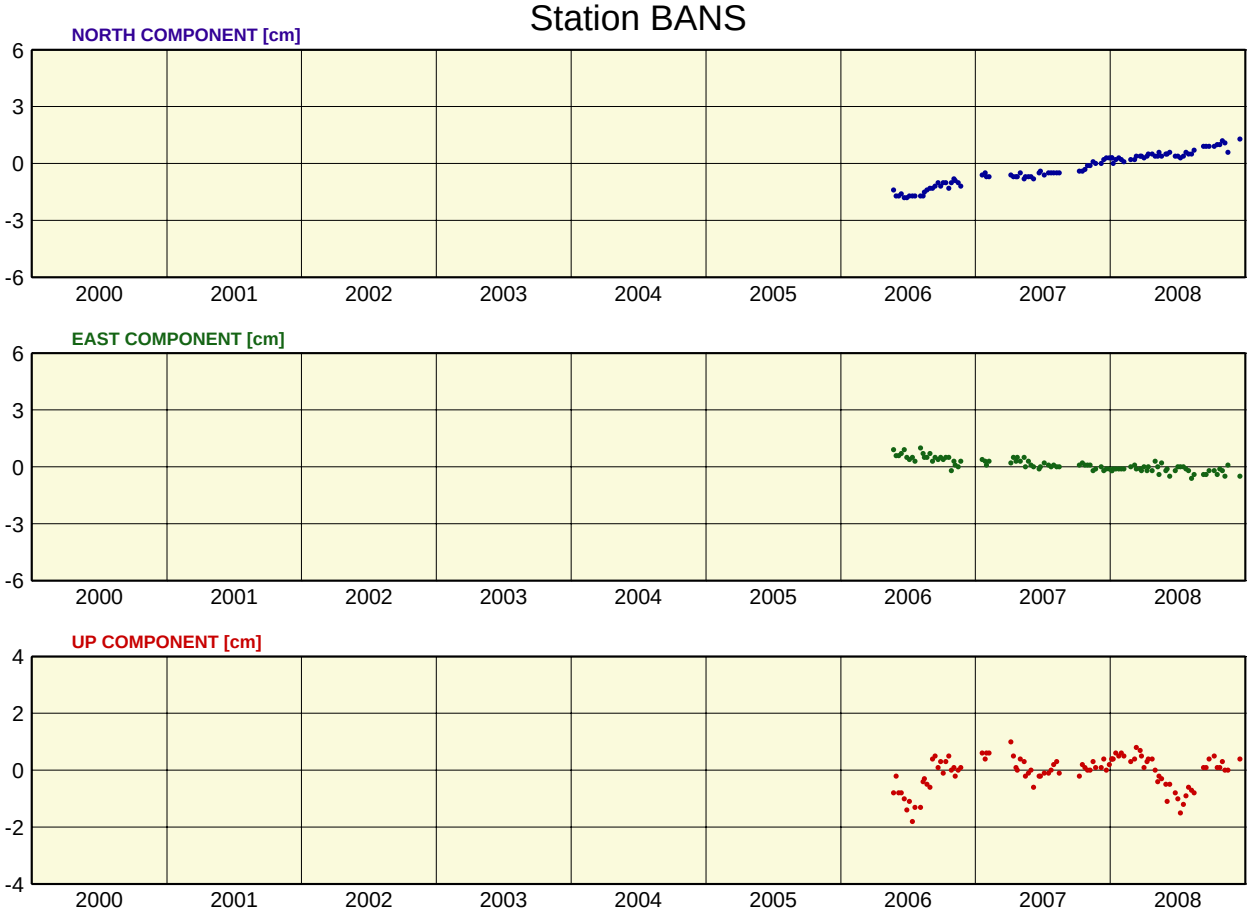
Station AREQ



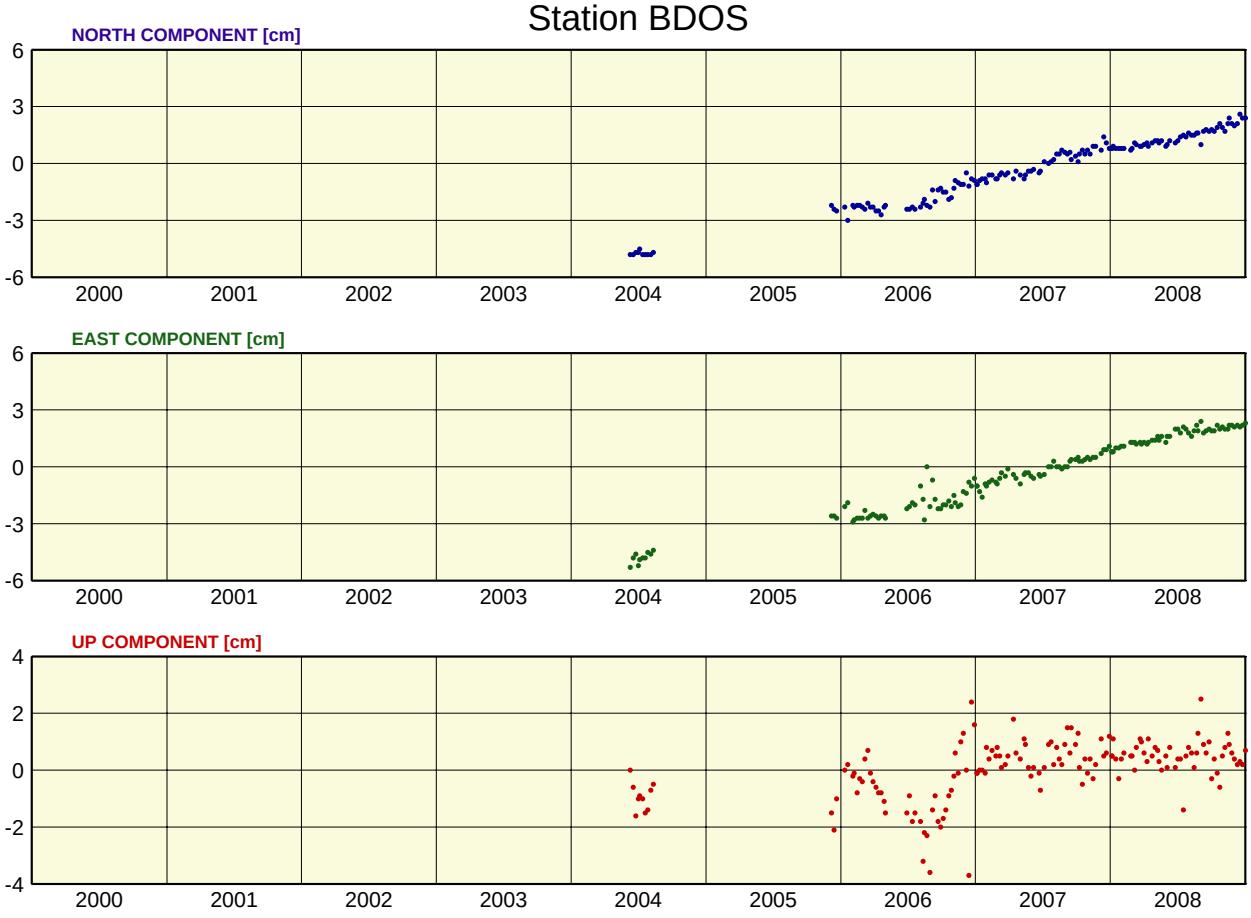
Station ASC1



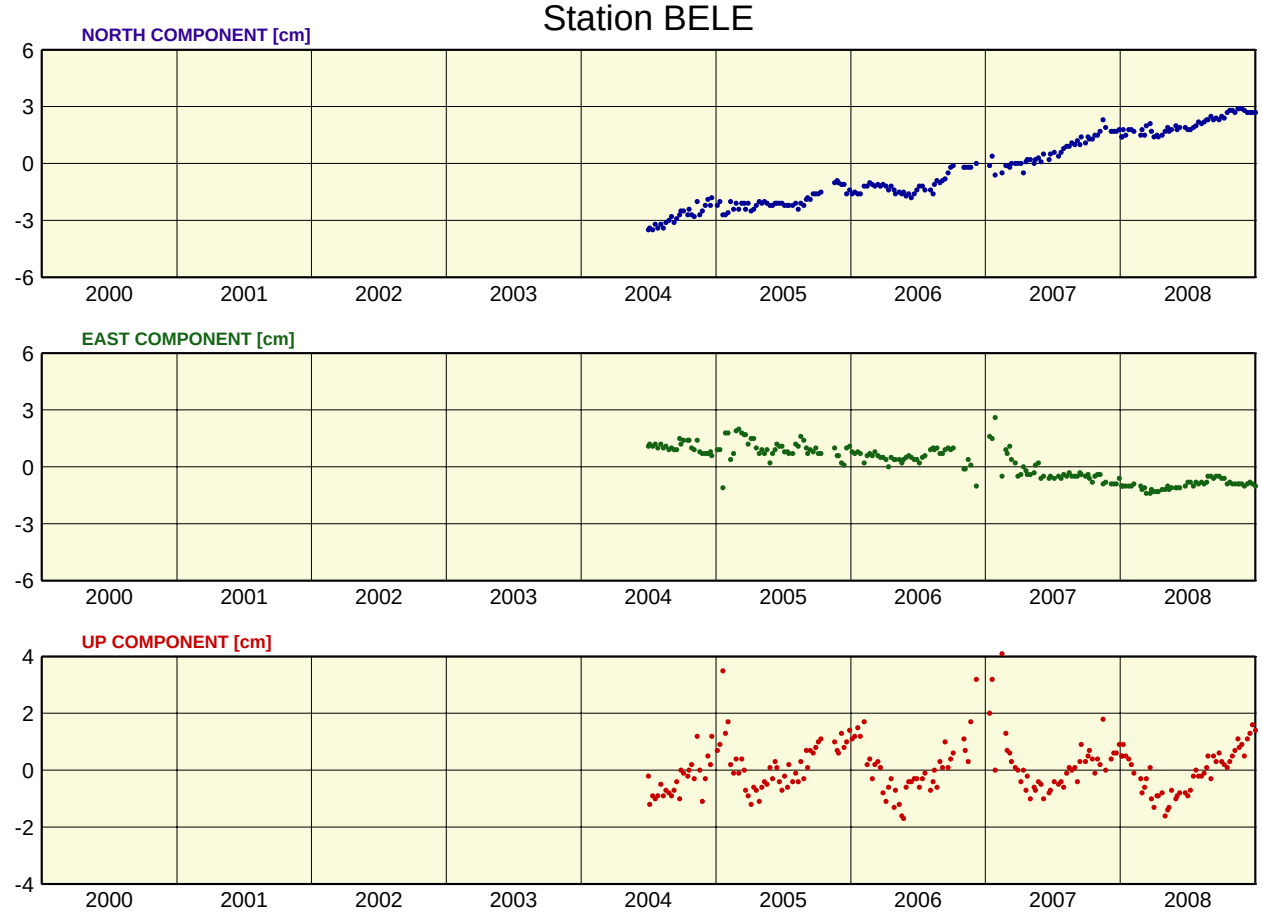
Station BANS



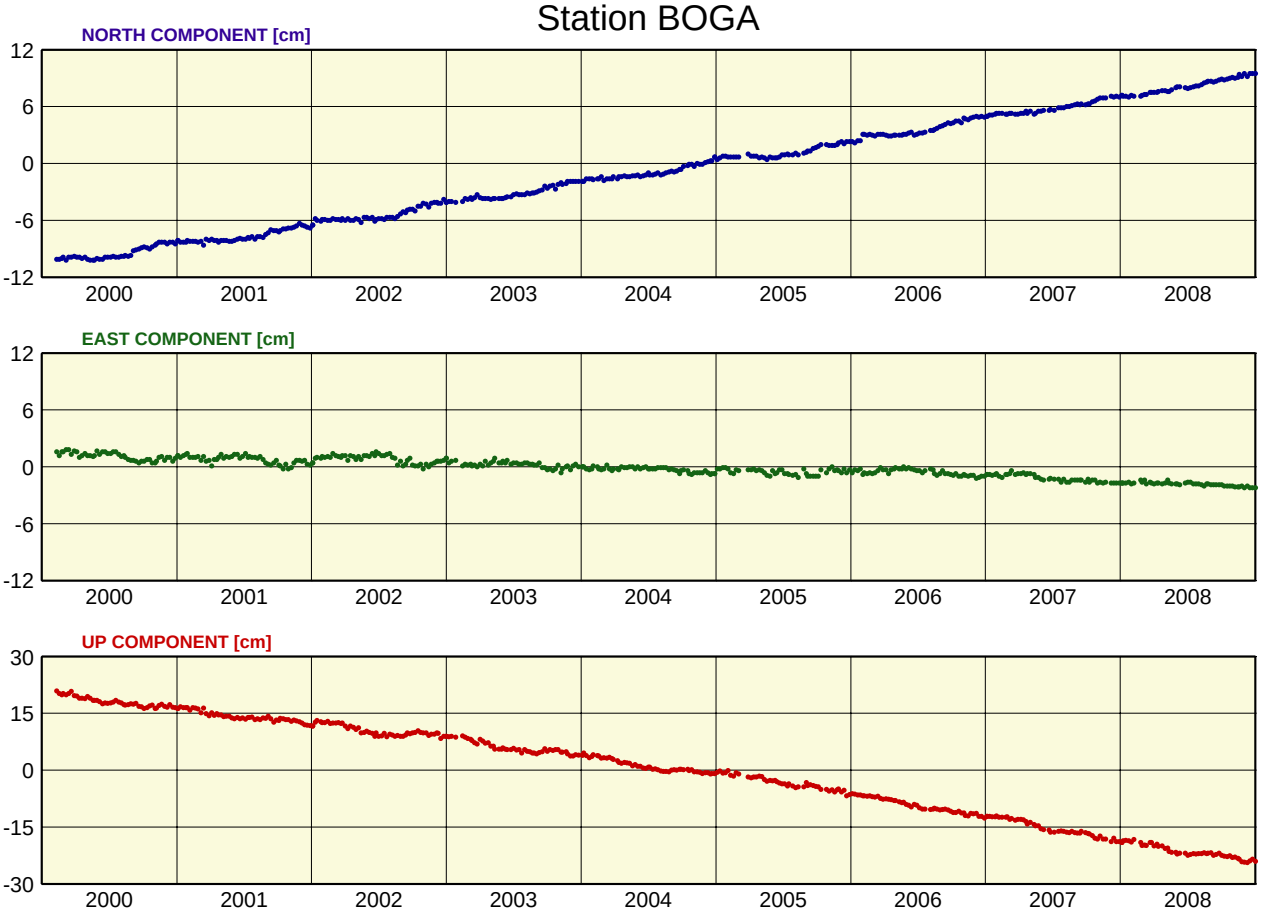
Station BDOS



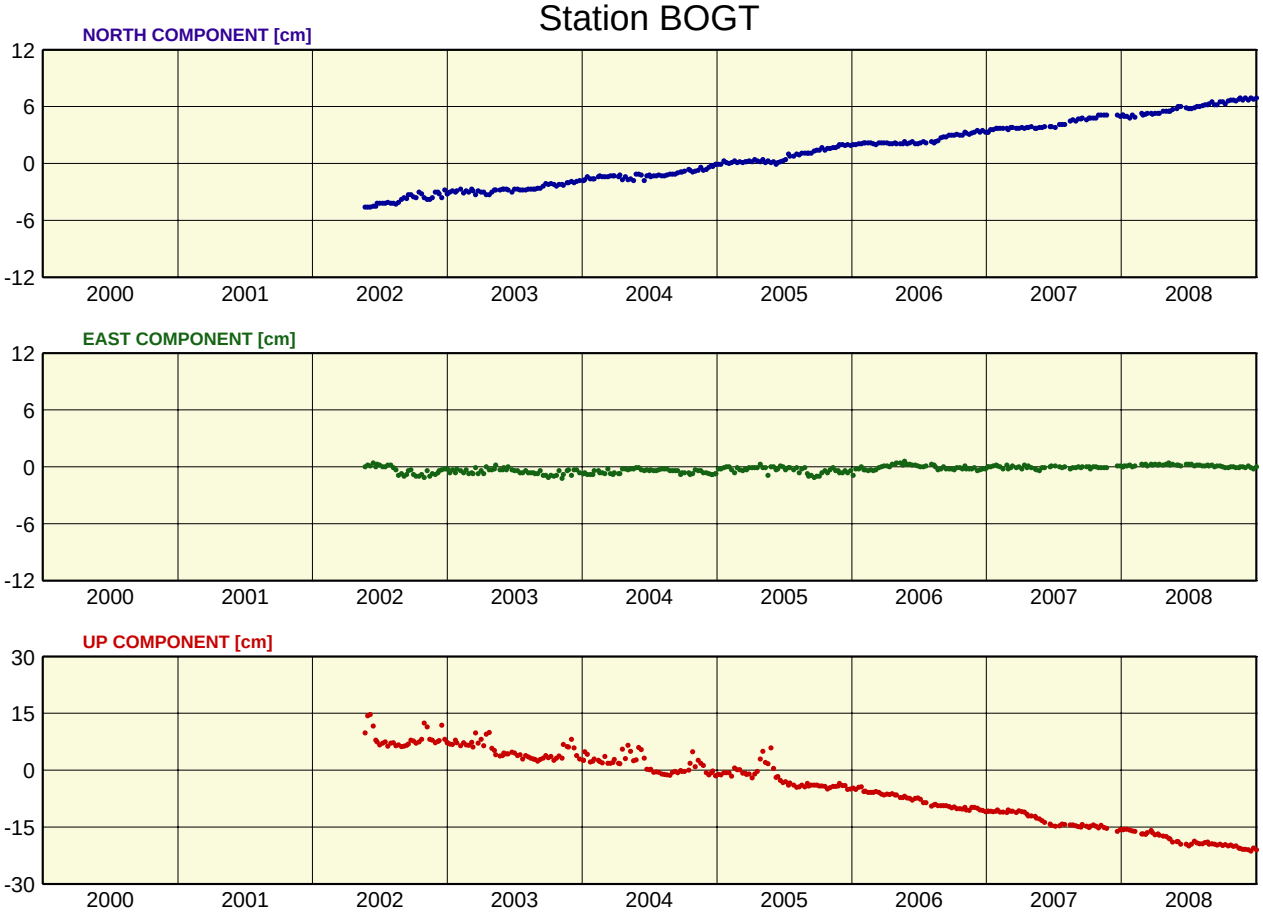
Station BELE



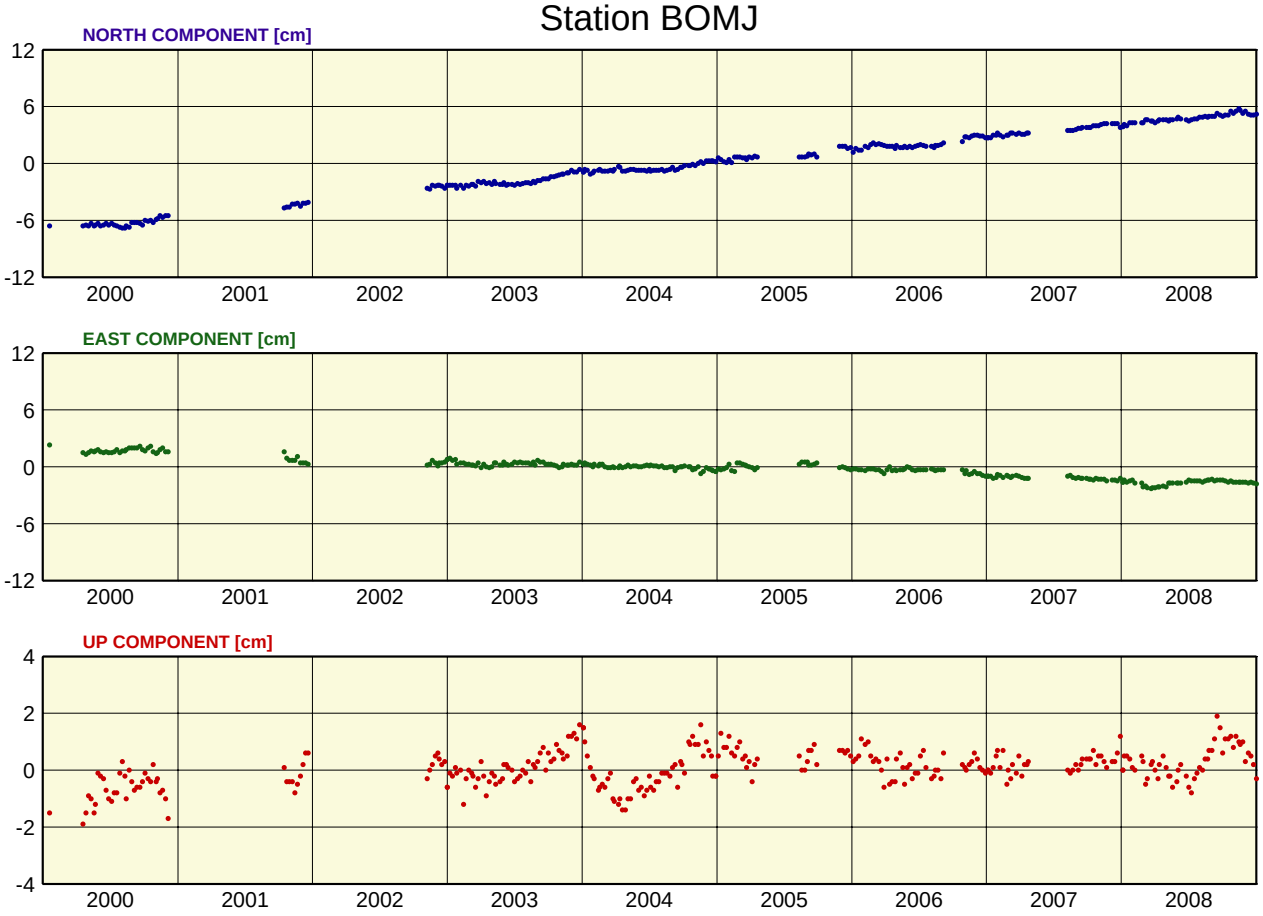
Station BOGA



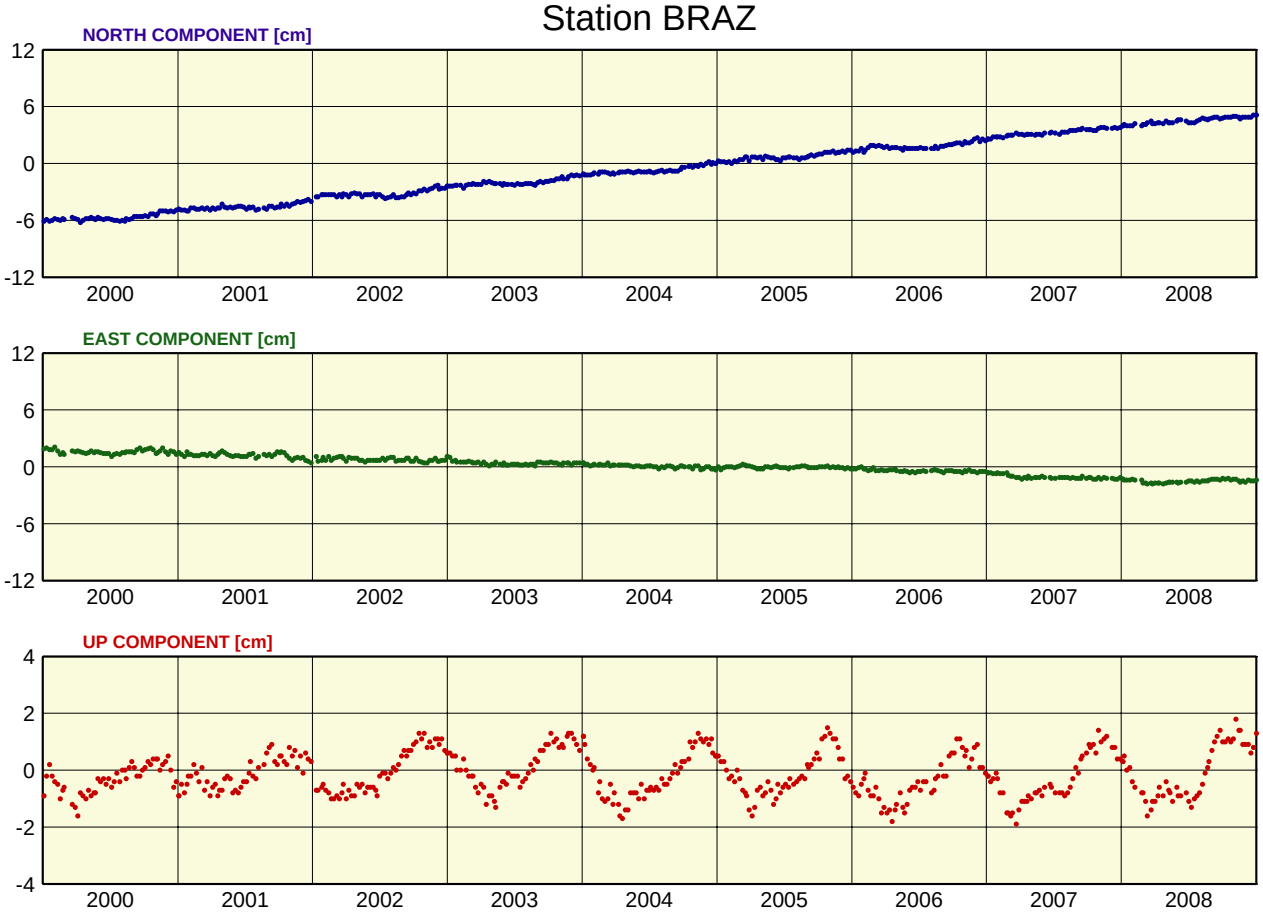
Station BOGT



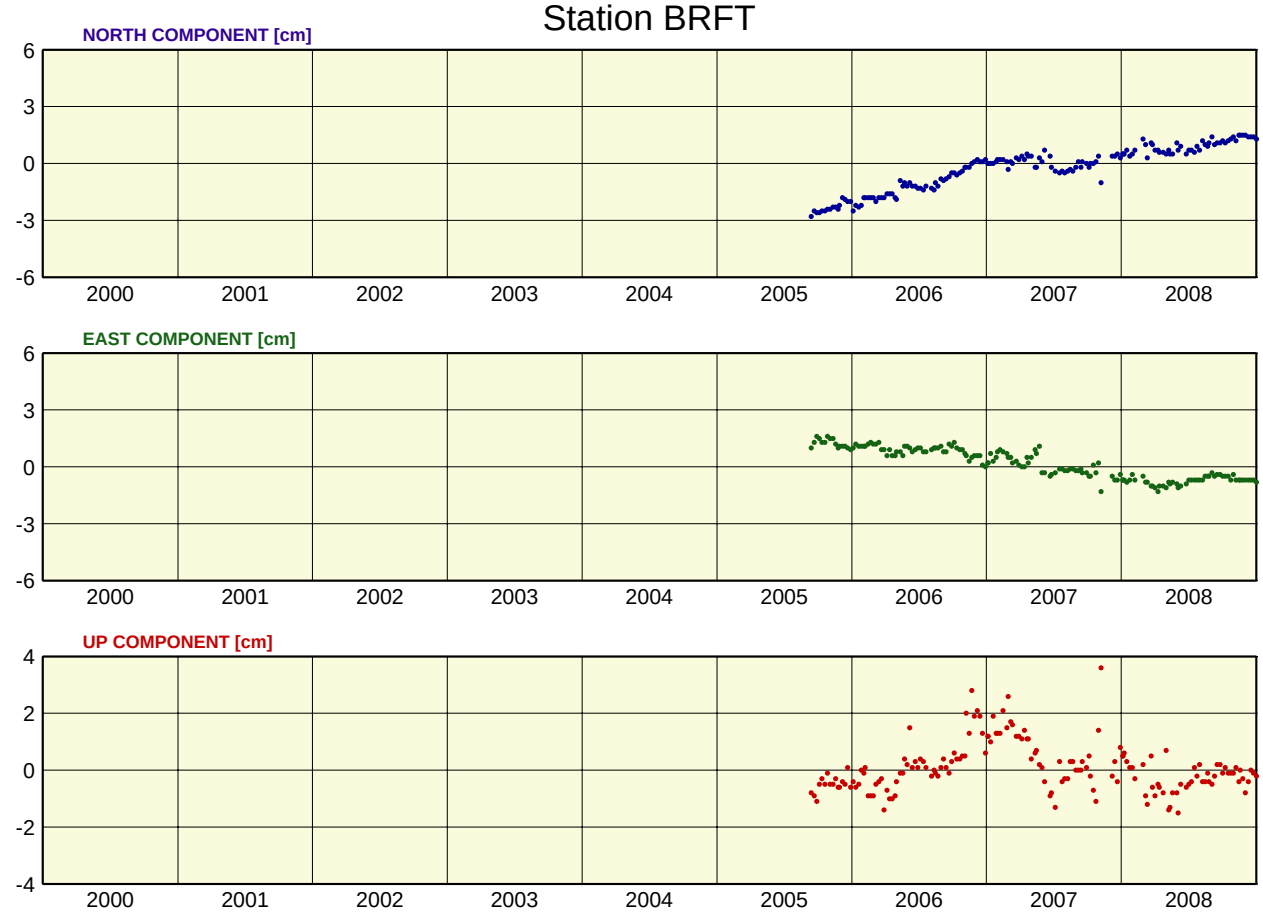
Station BOMJ



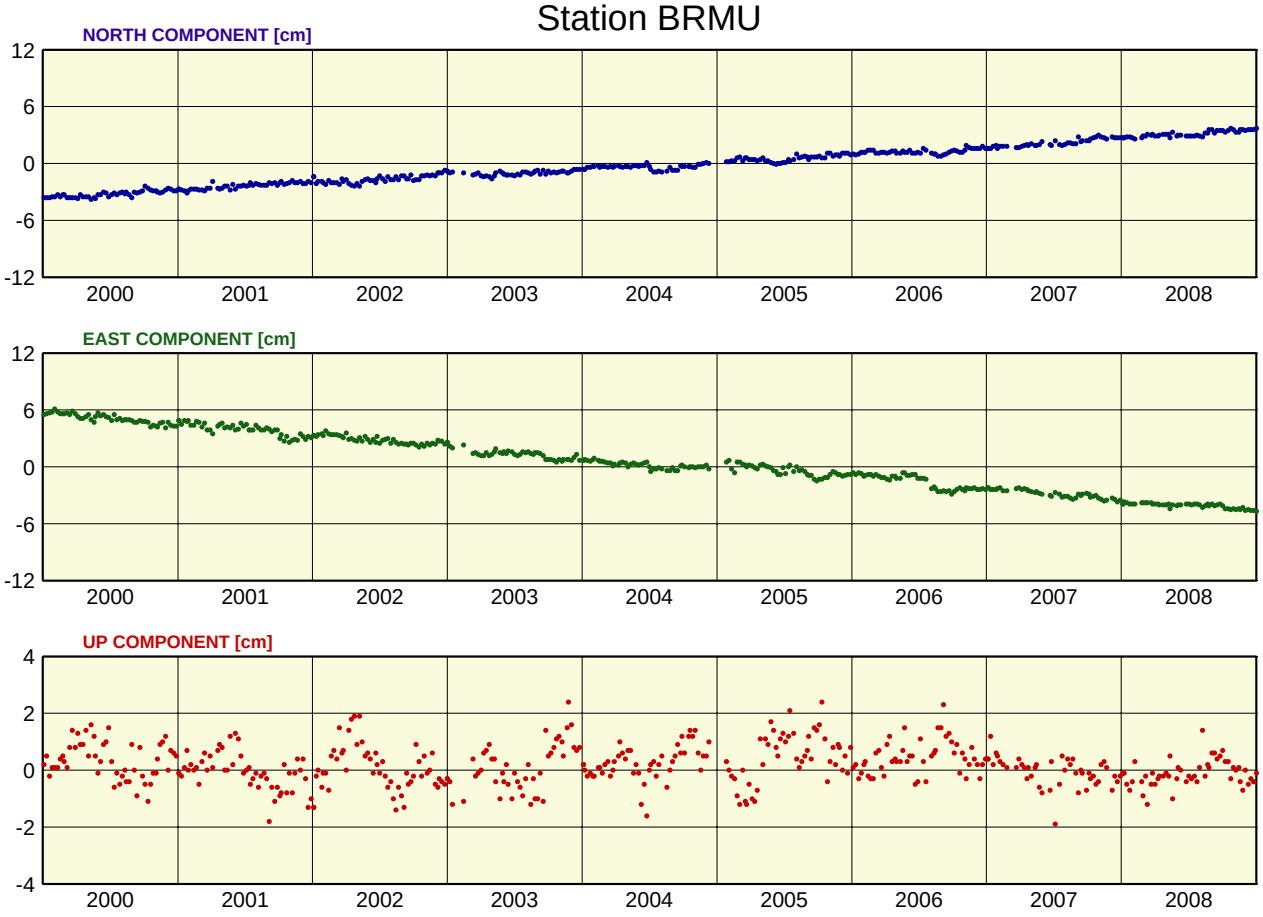
Station BRAZ



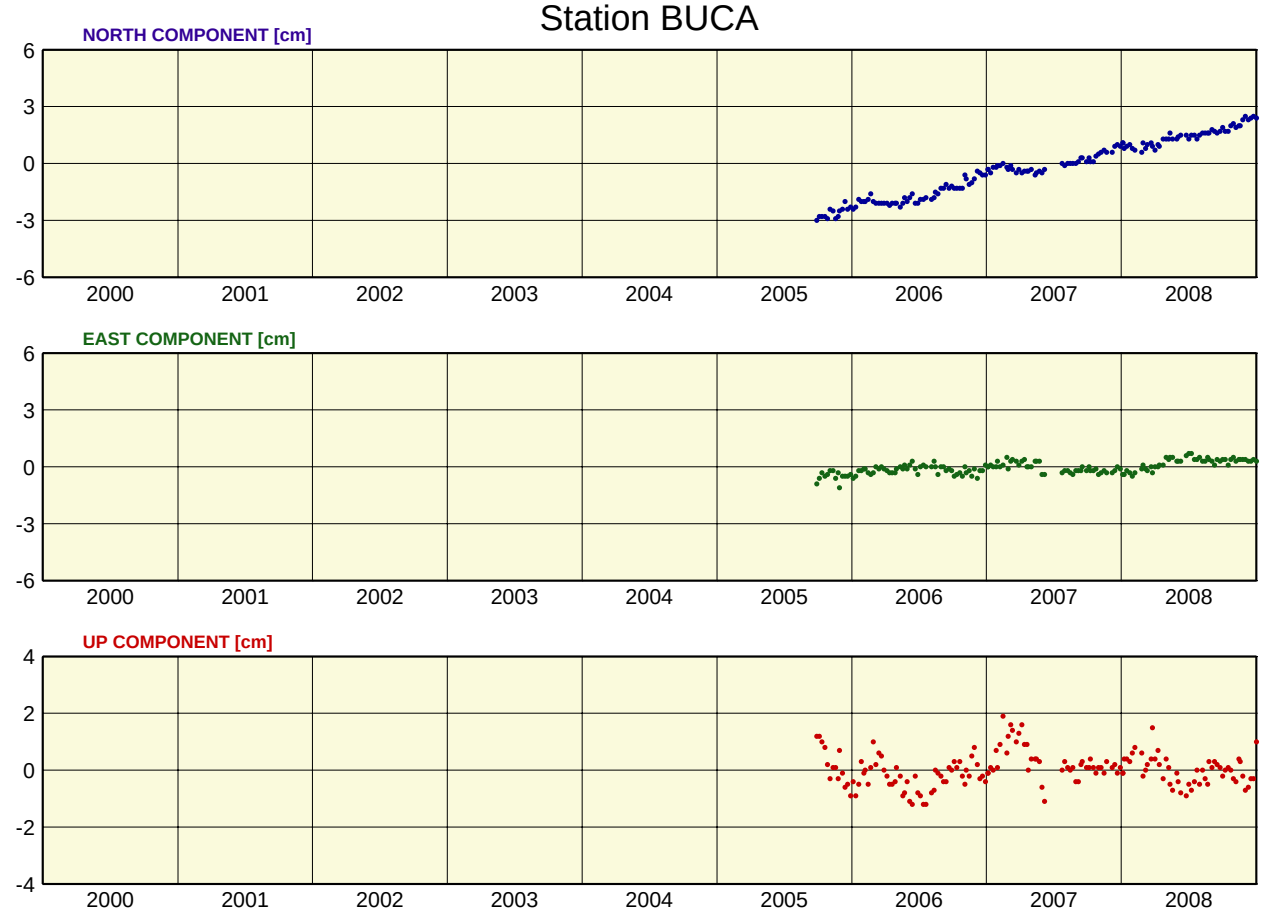
Station BRFT



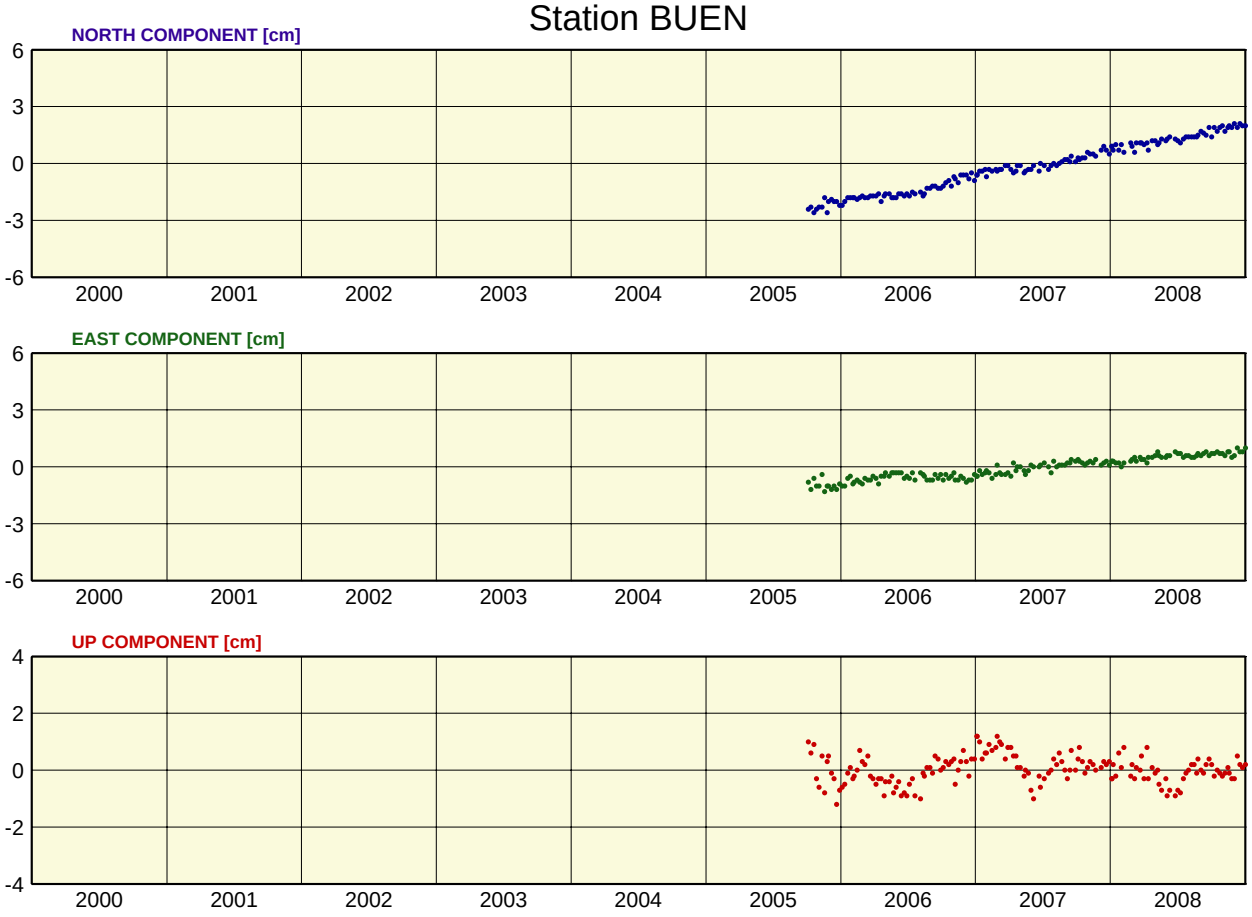
Station BRMU



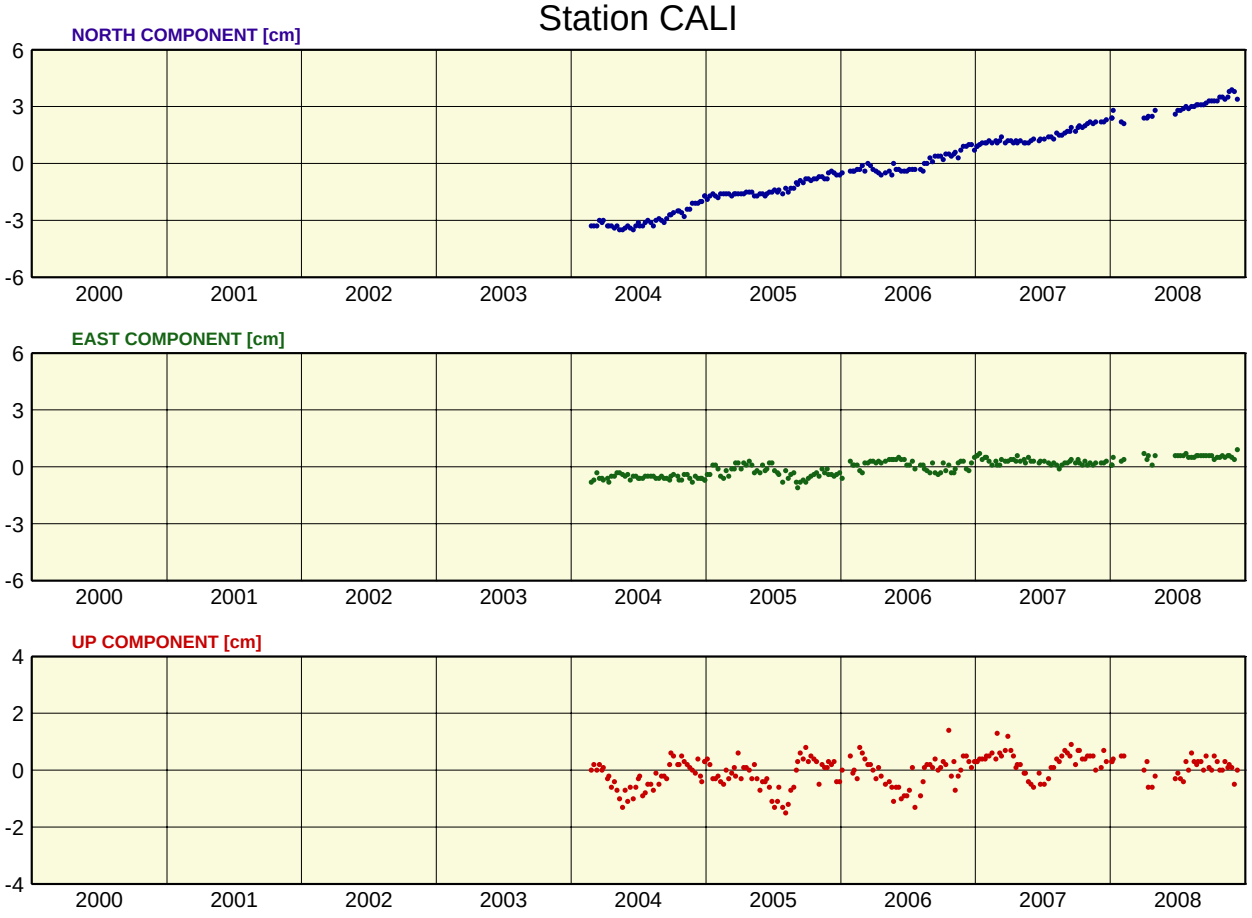
Station BUCA



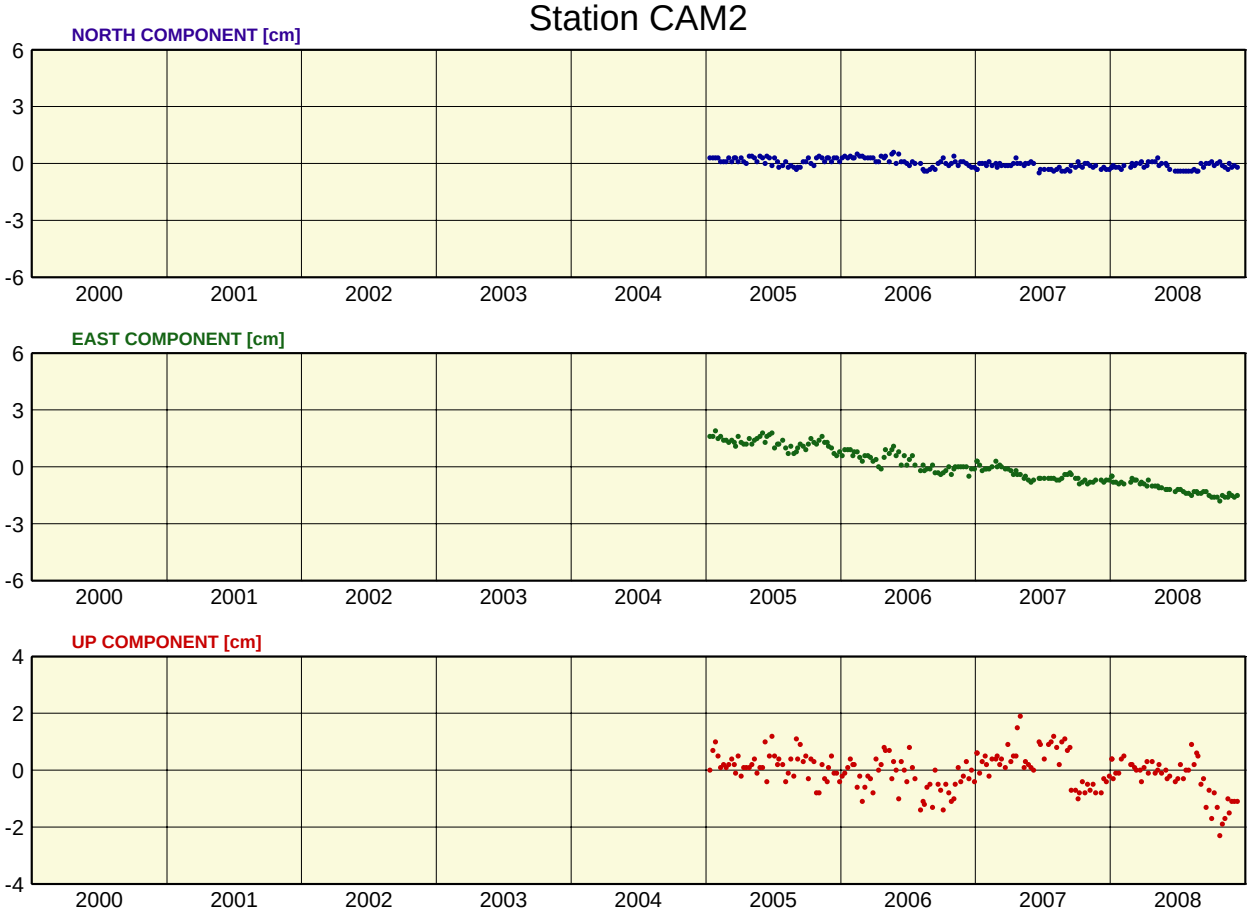
Station BUEN



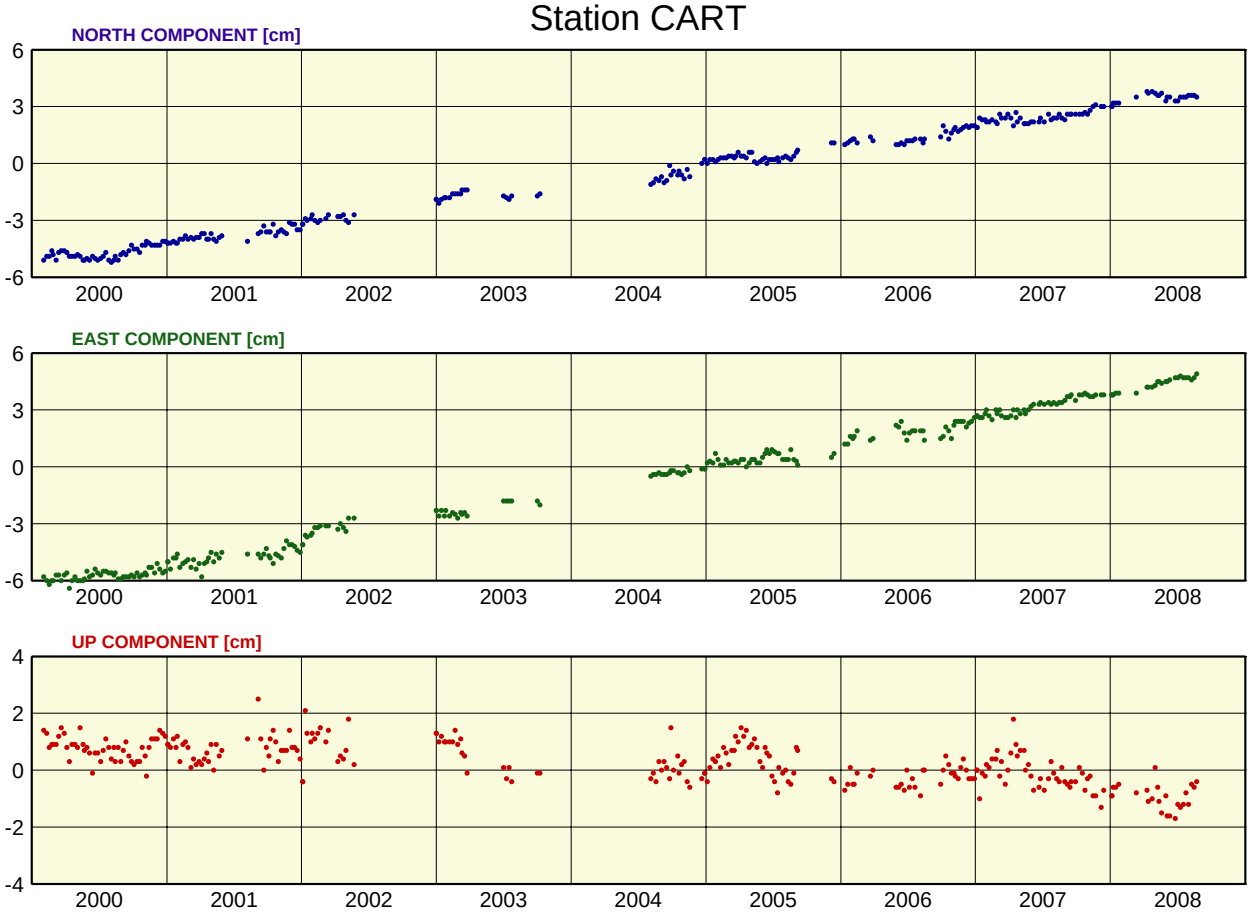
Station CALI



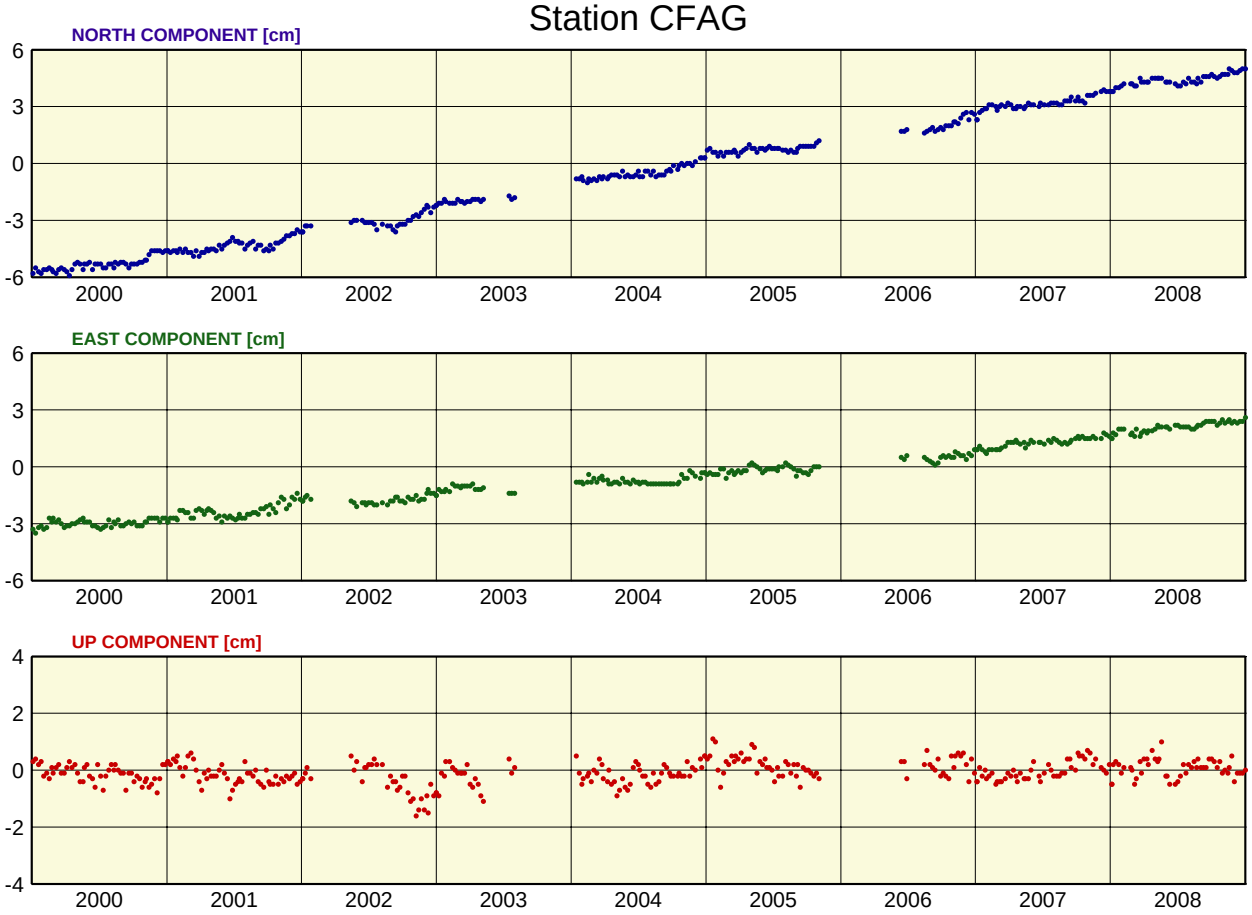
Station CAM2



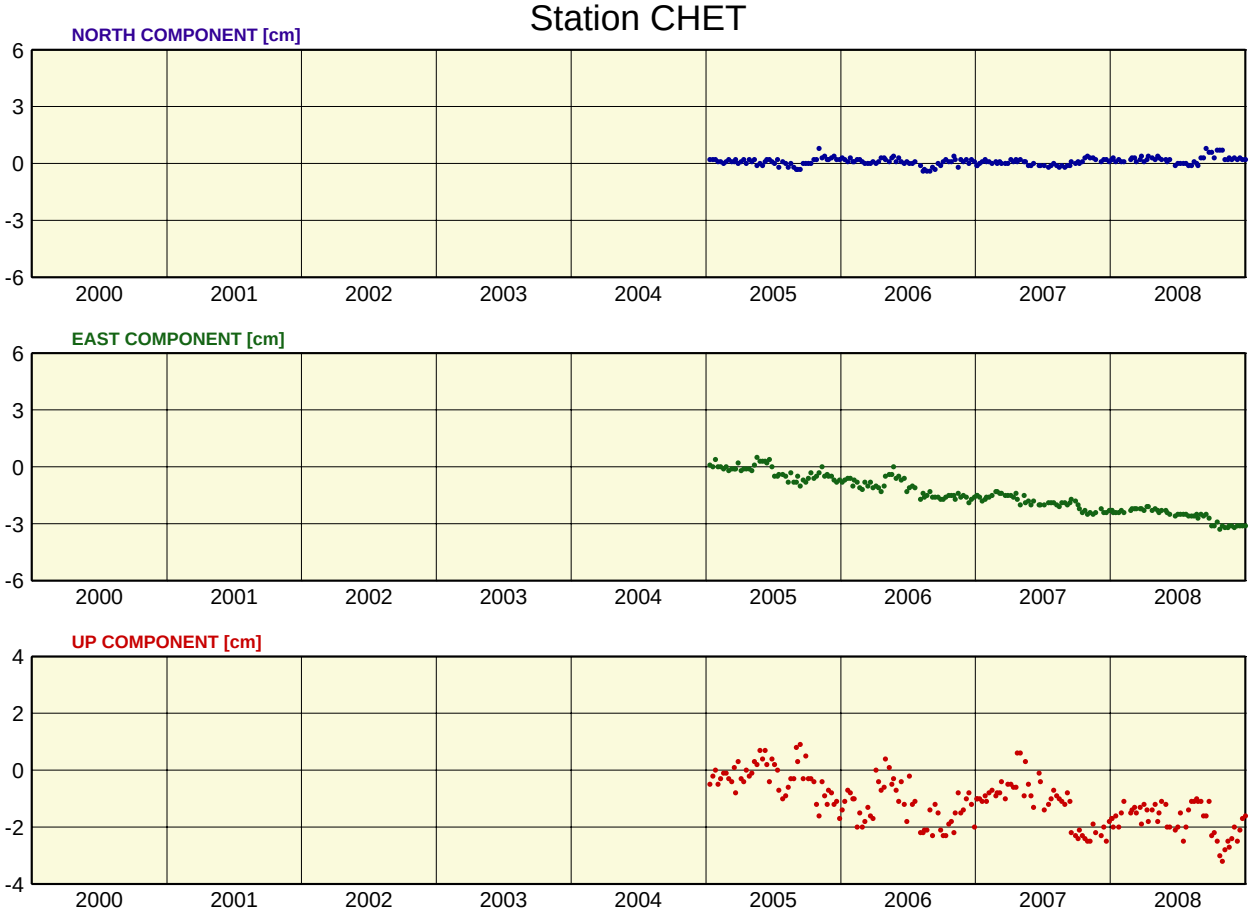
Station CART



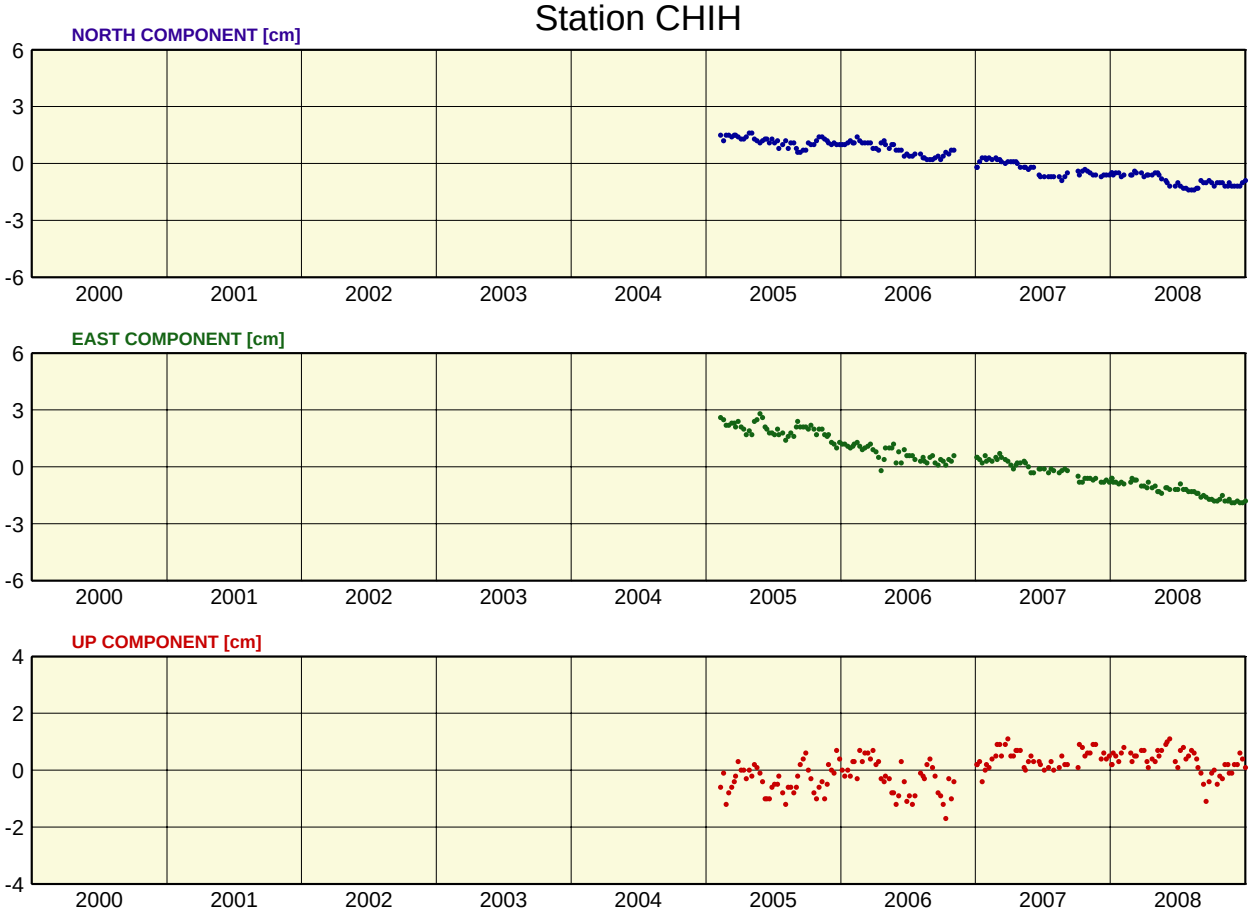
Station CFAG



Station CHET



Station CHIH



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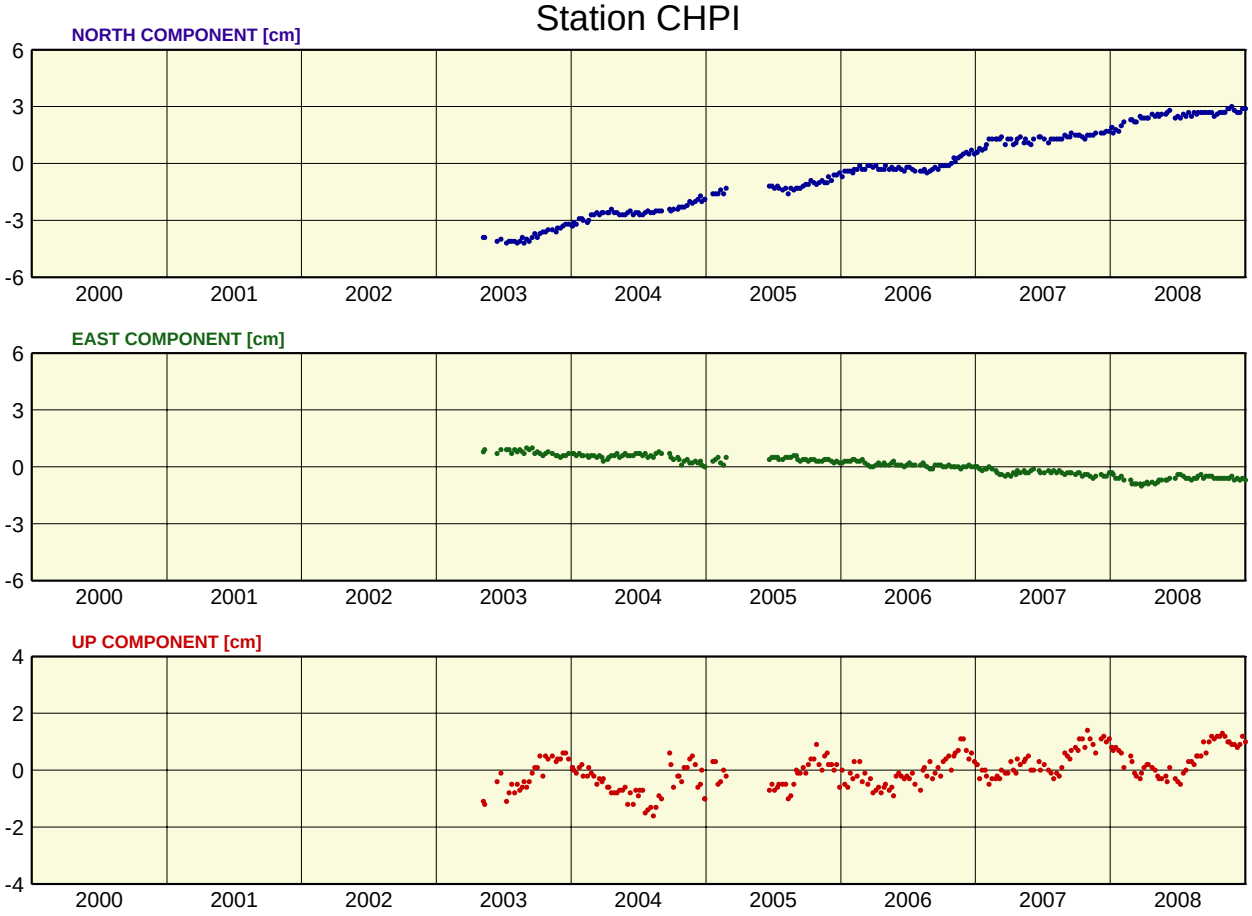
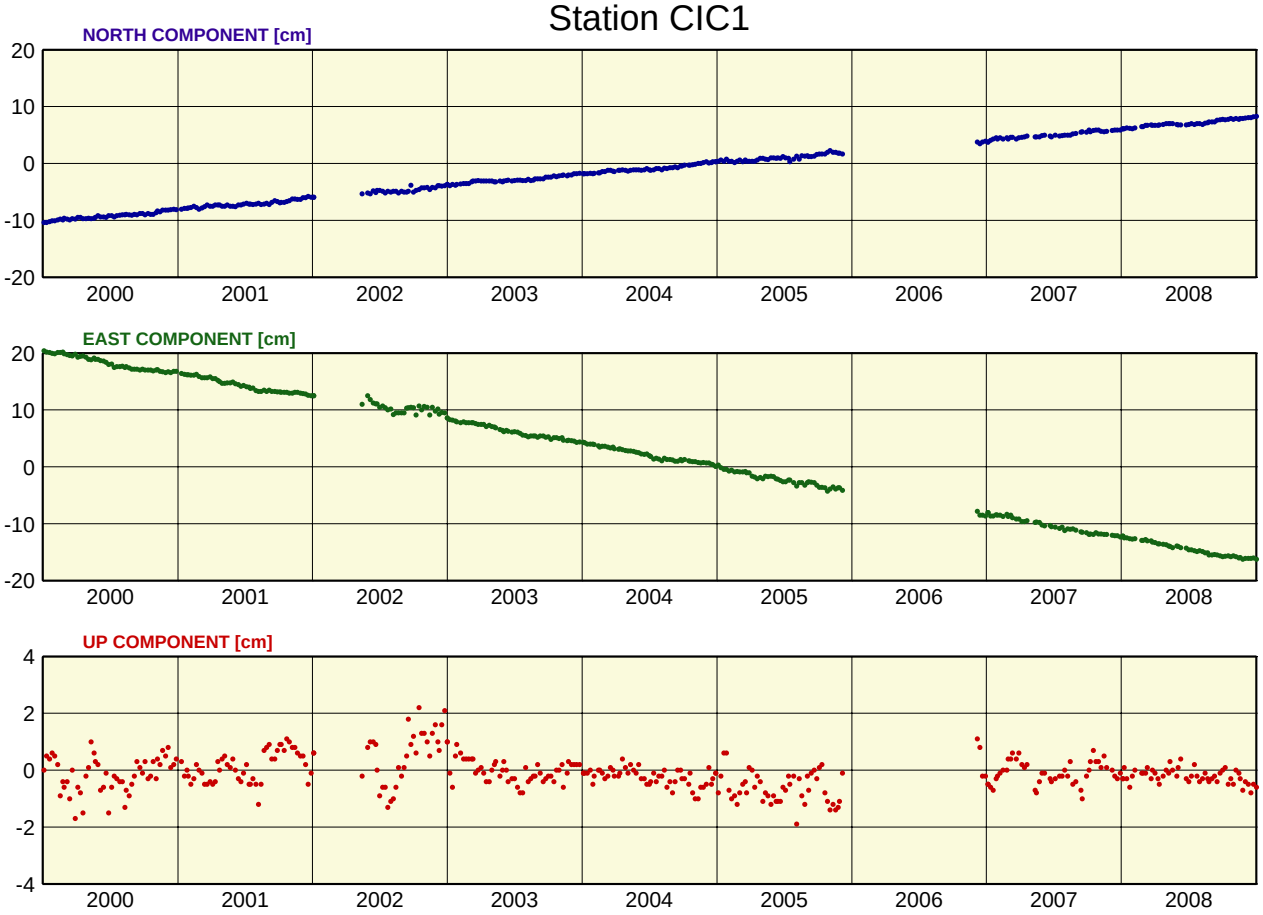
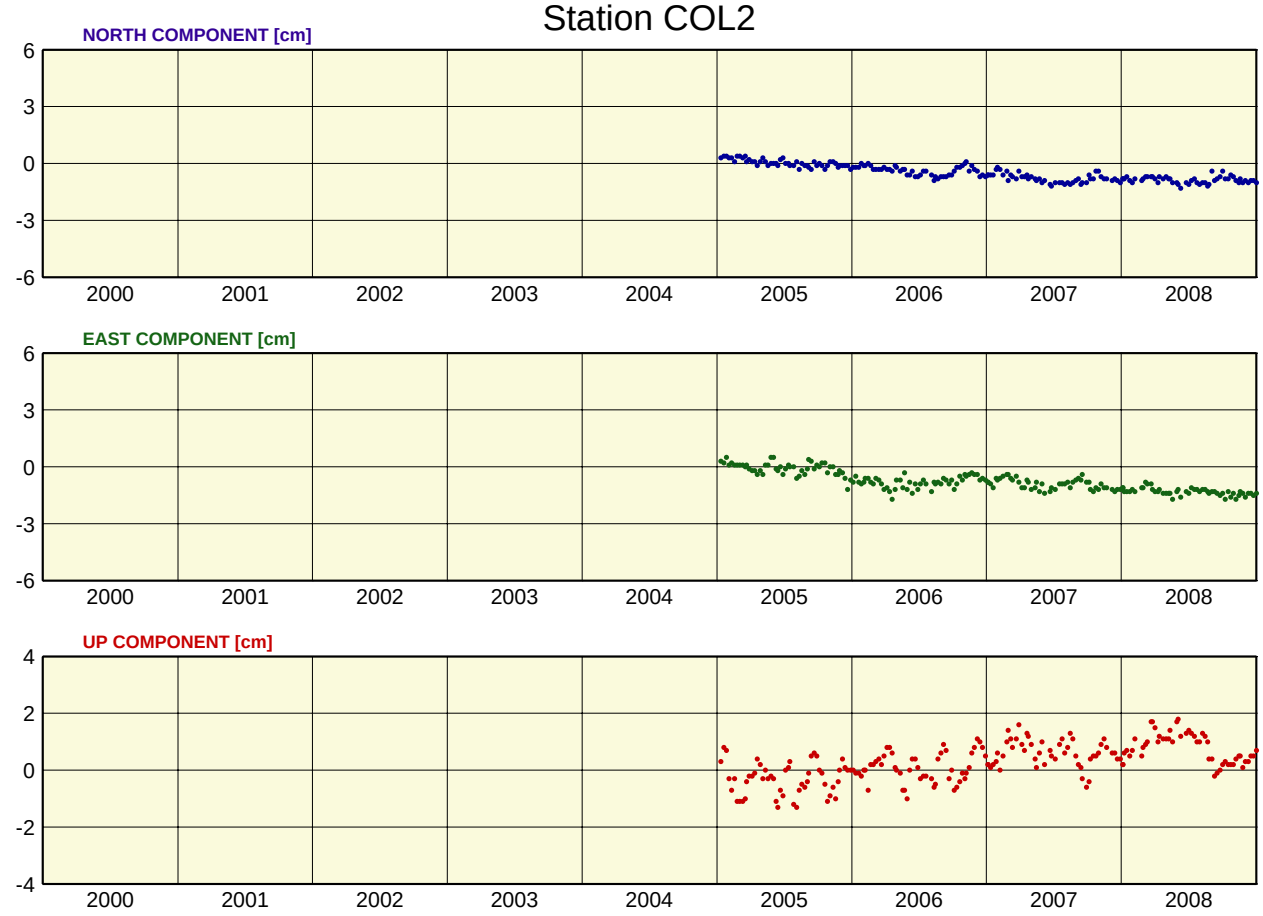


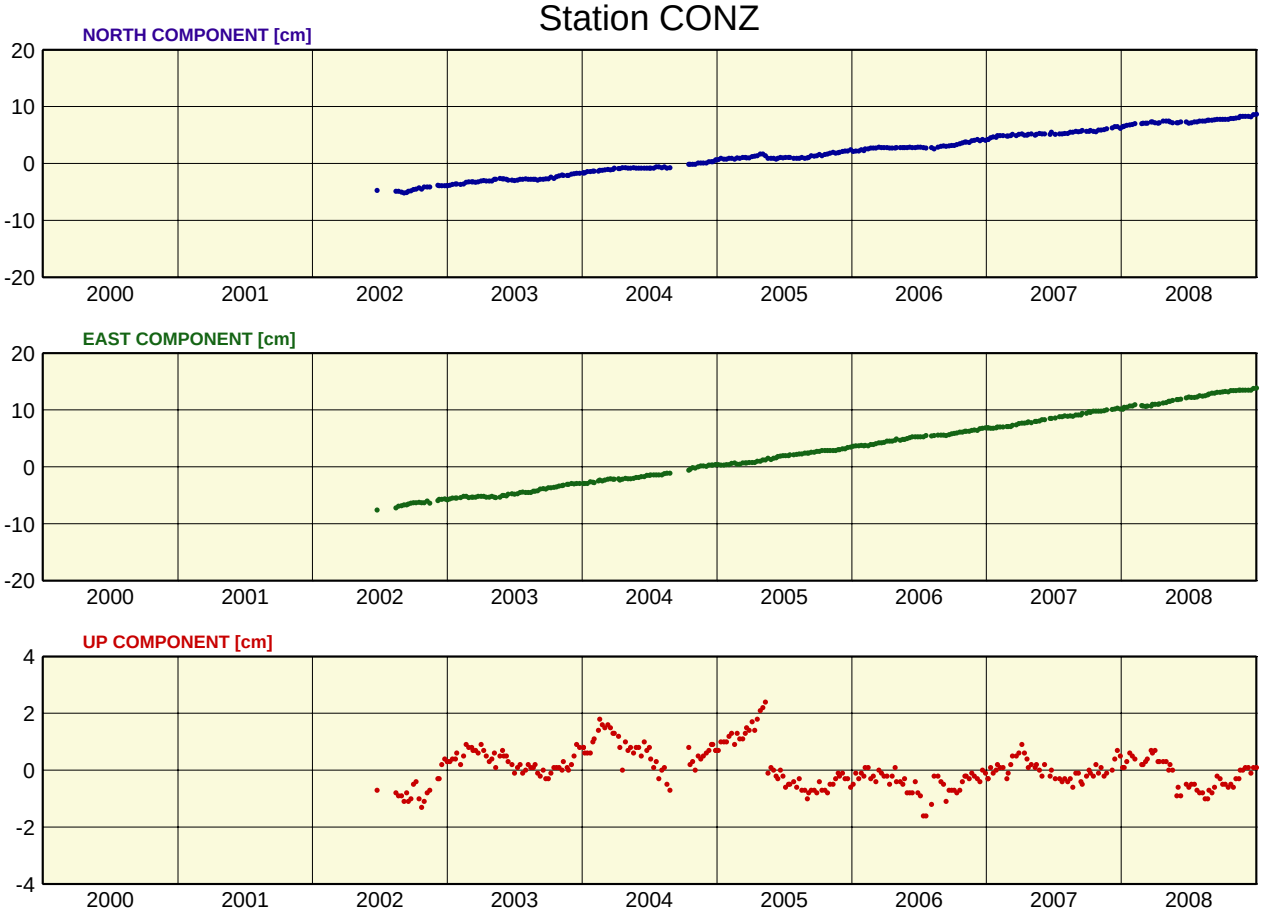
Station CIC1



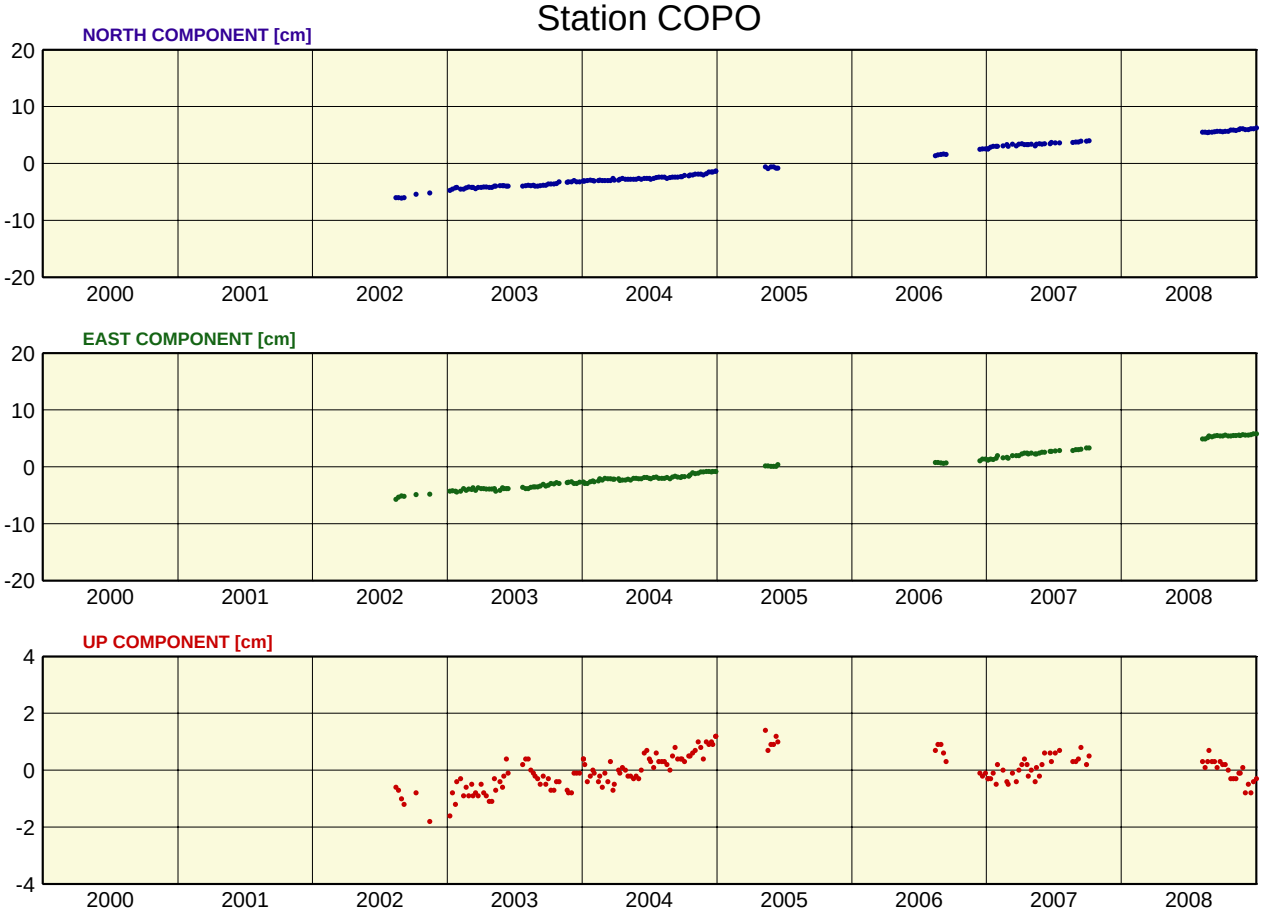
Station COL2



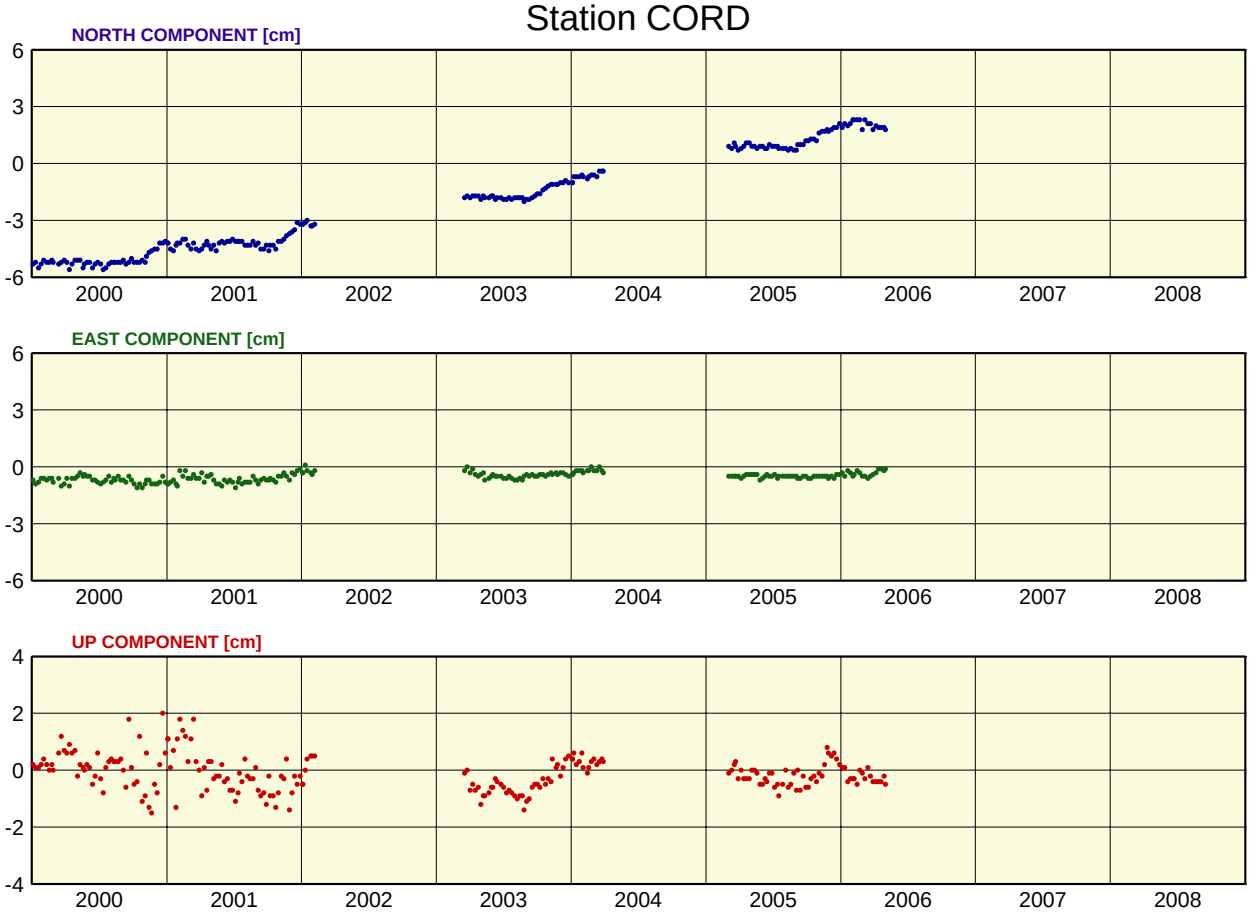
Station CONZ



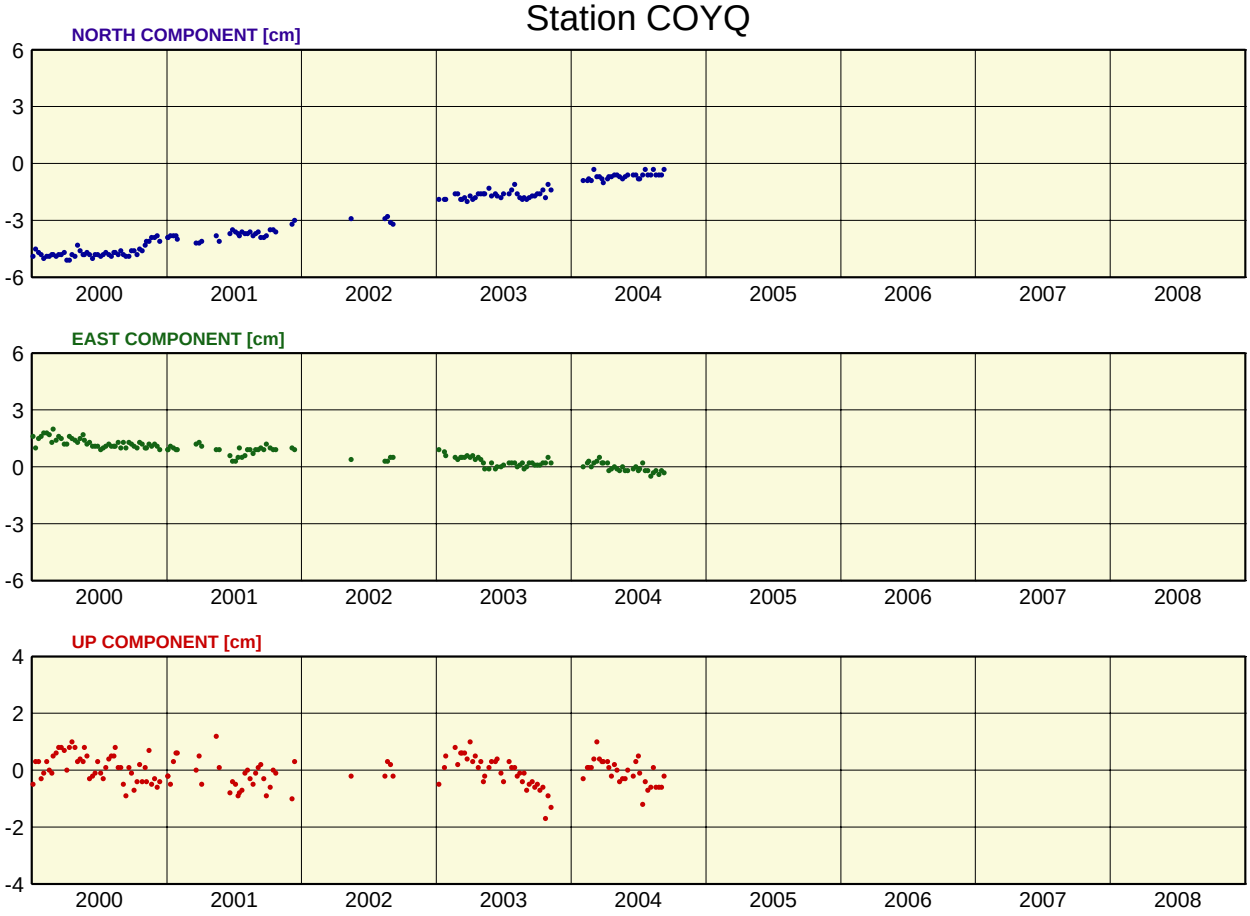
Station COPO



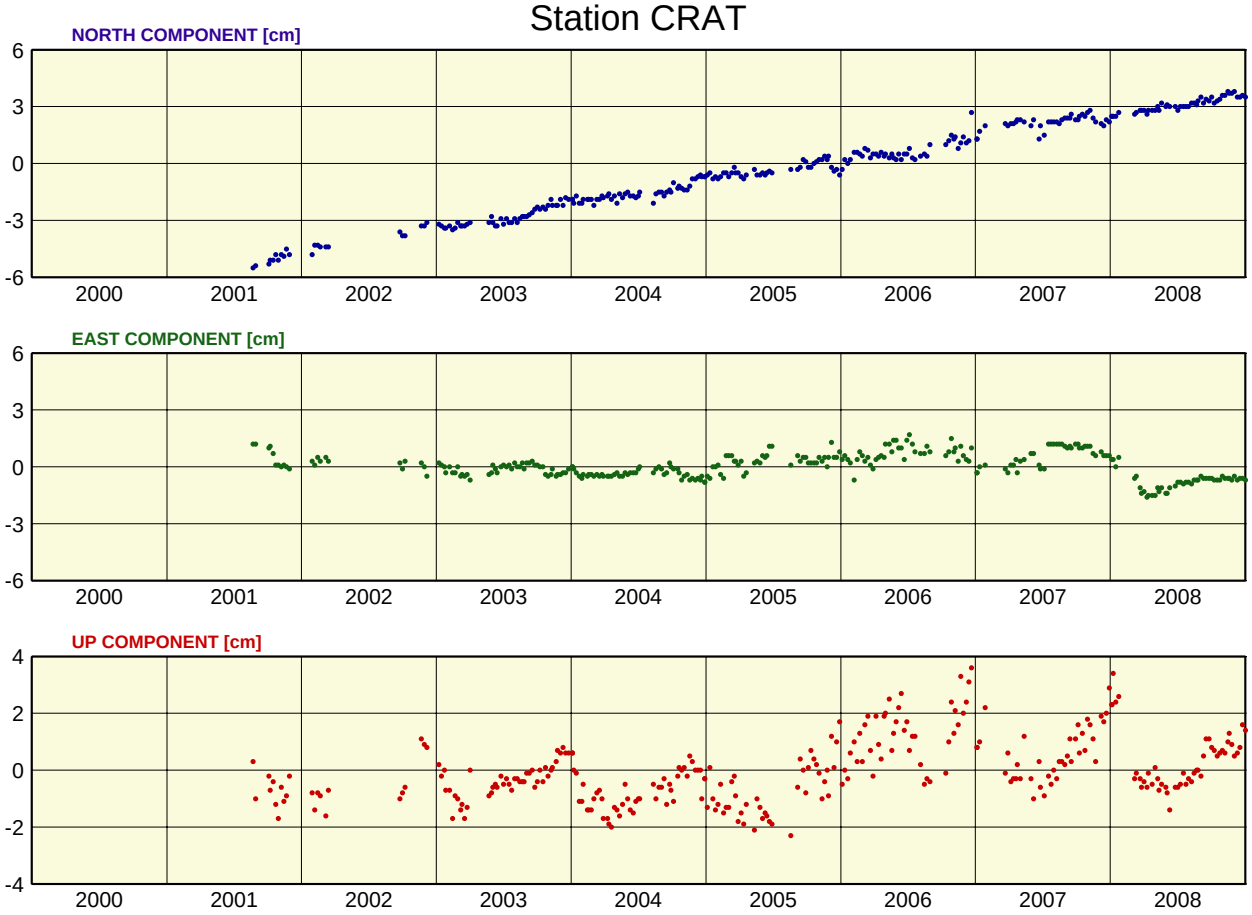
Station CORD



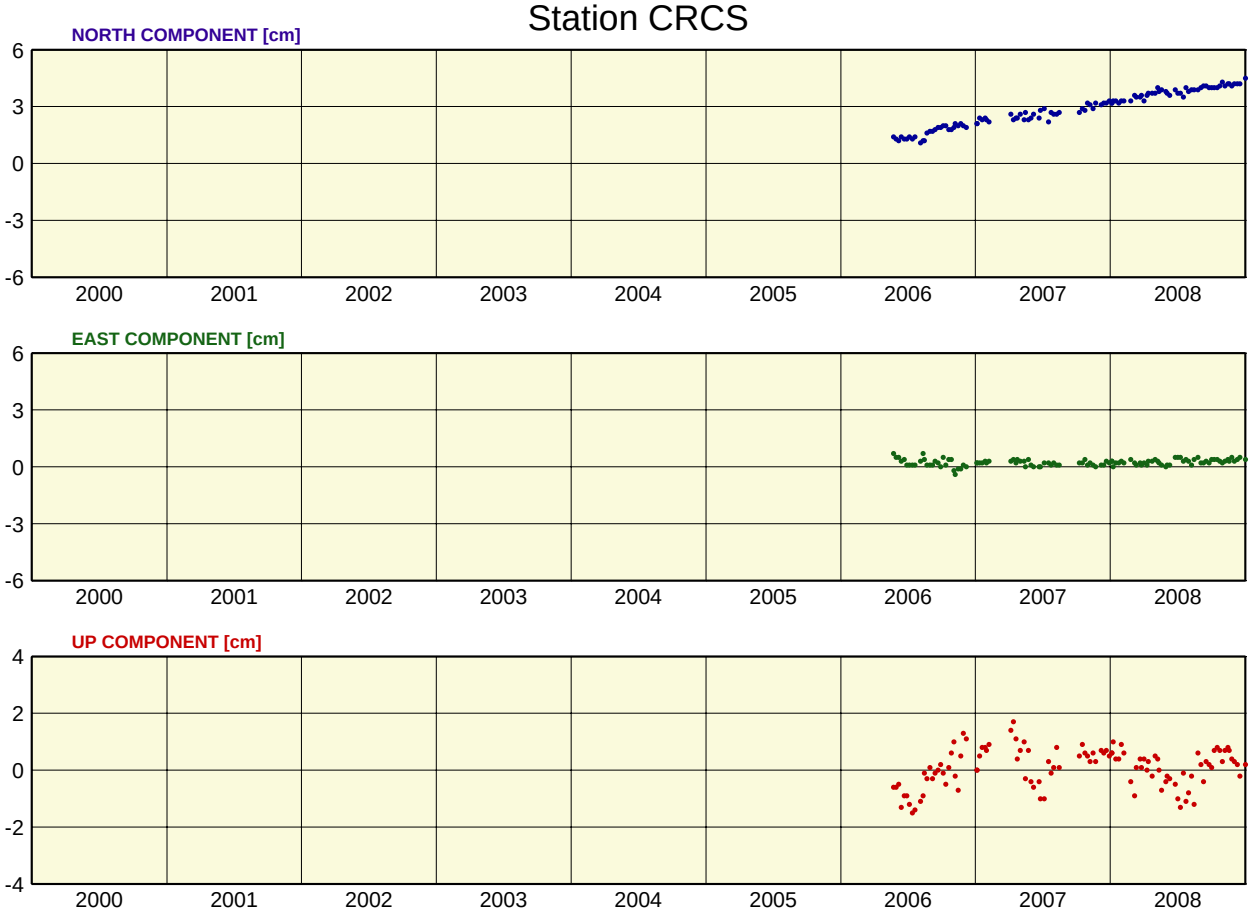
Station COYQ



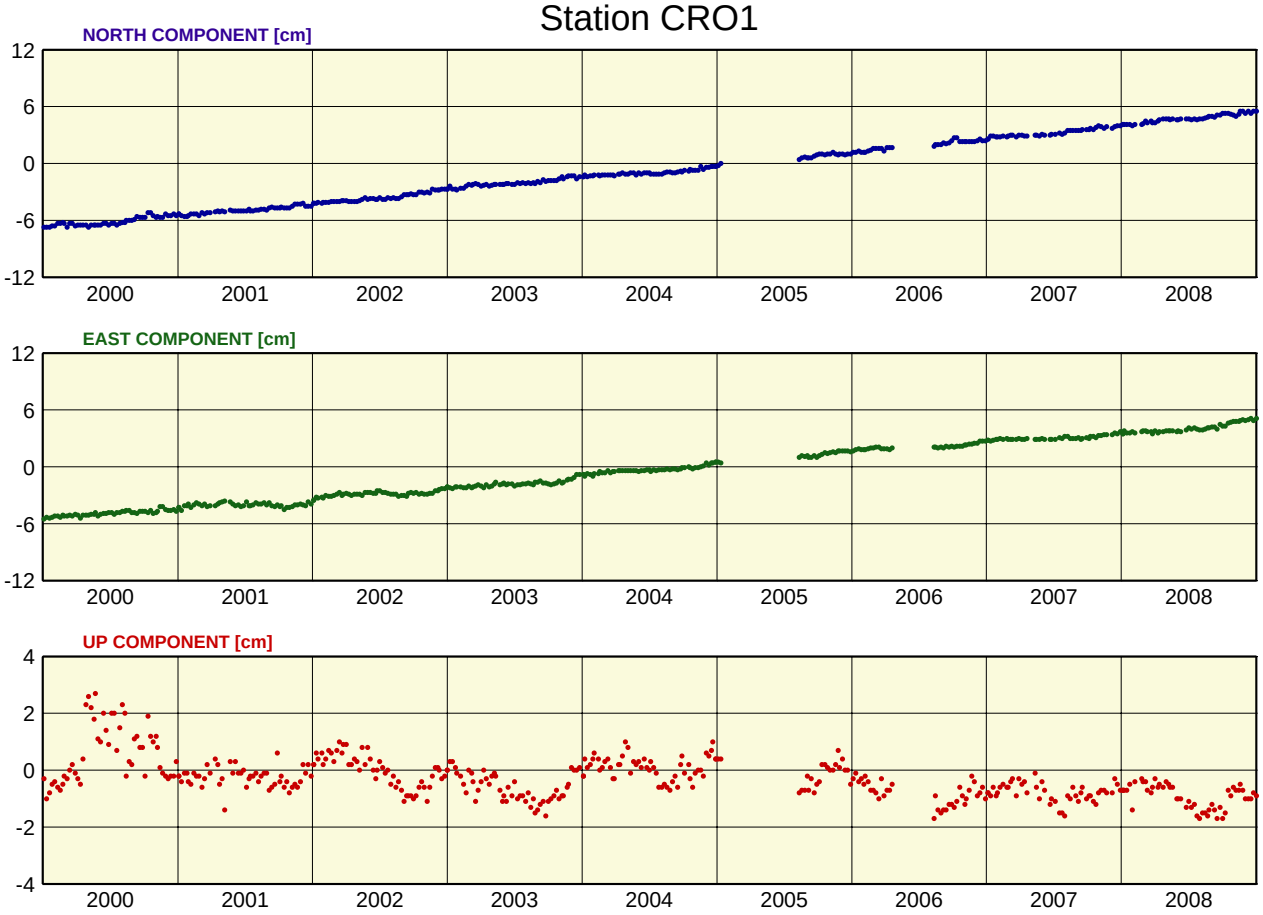
Station CRAT



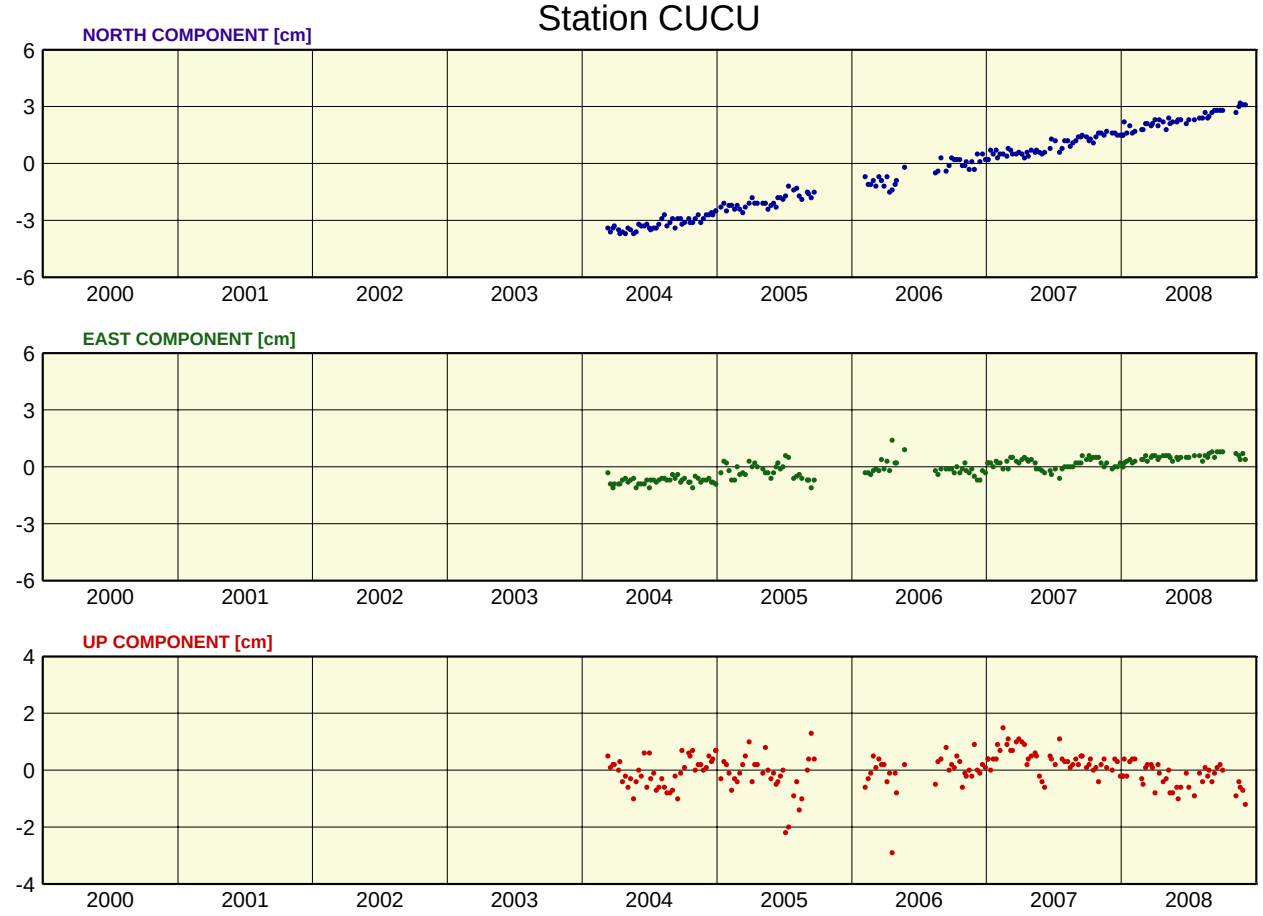
Station CRCS



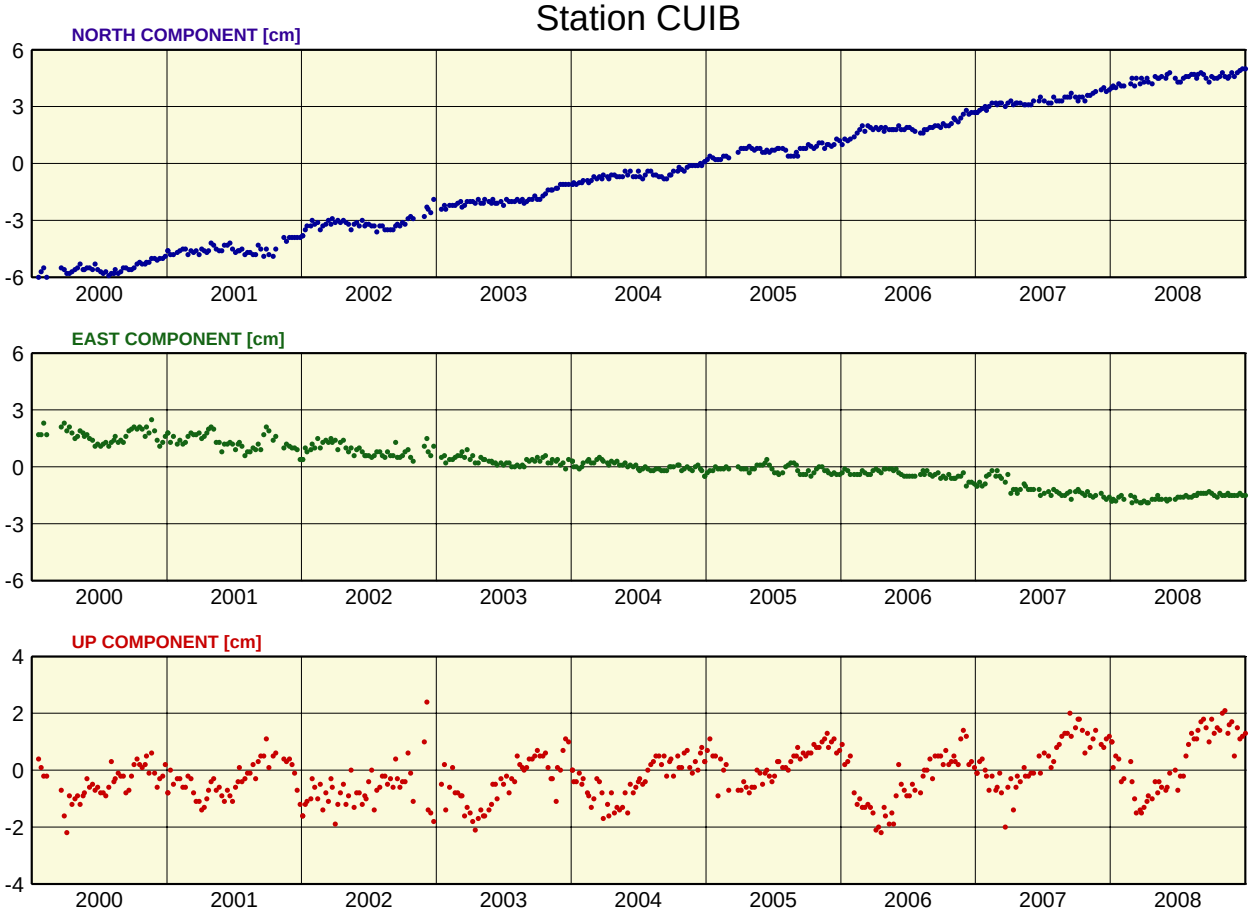
Station CRO1



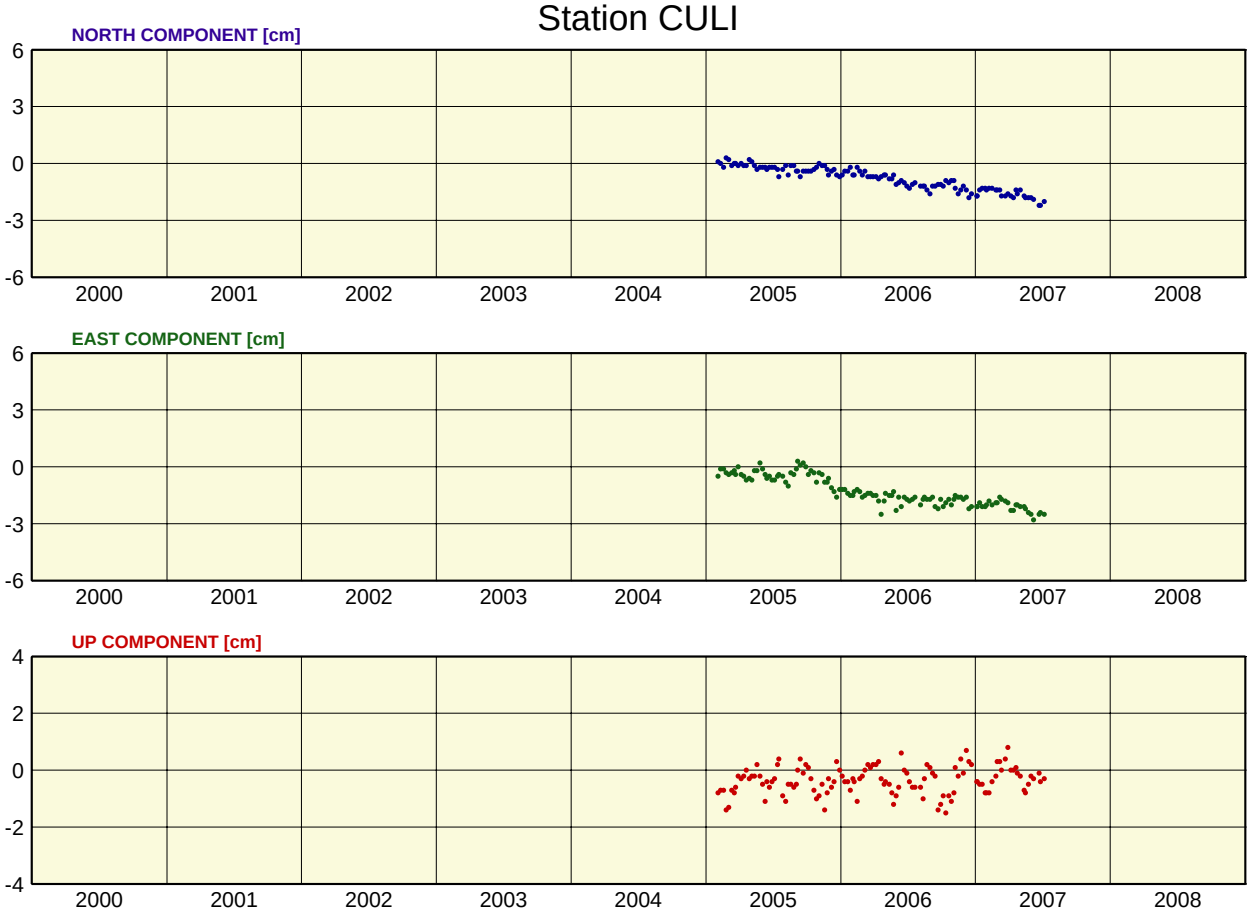
Station CUCU



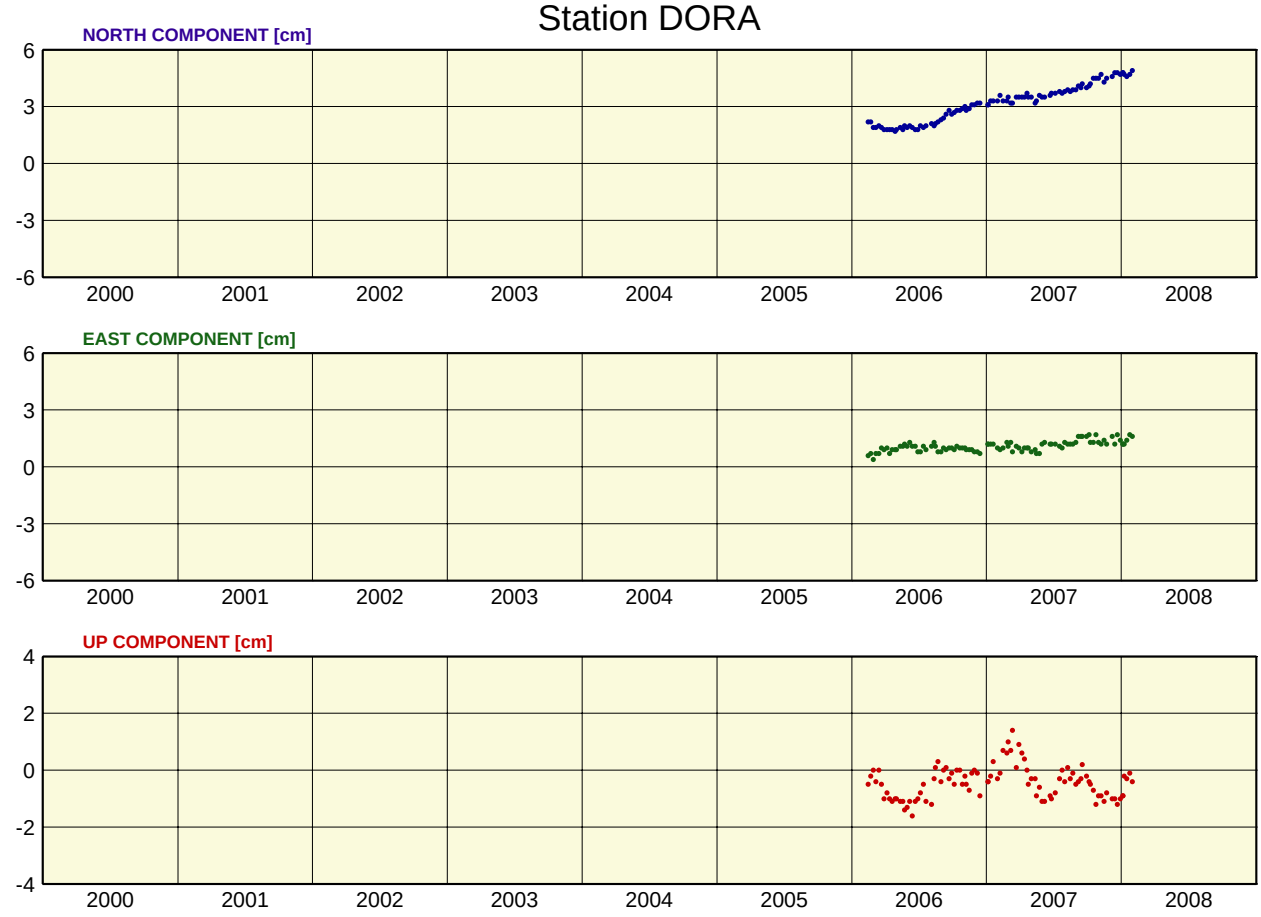
Station CUIB



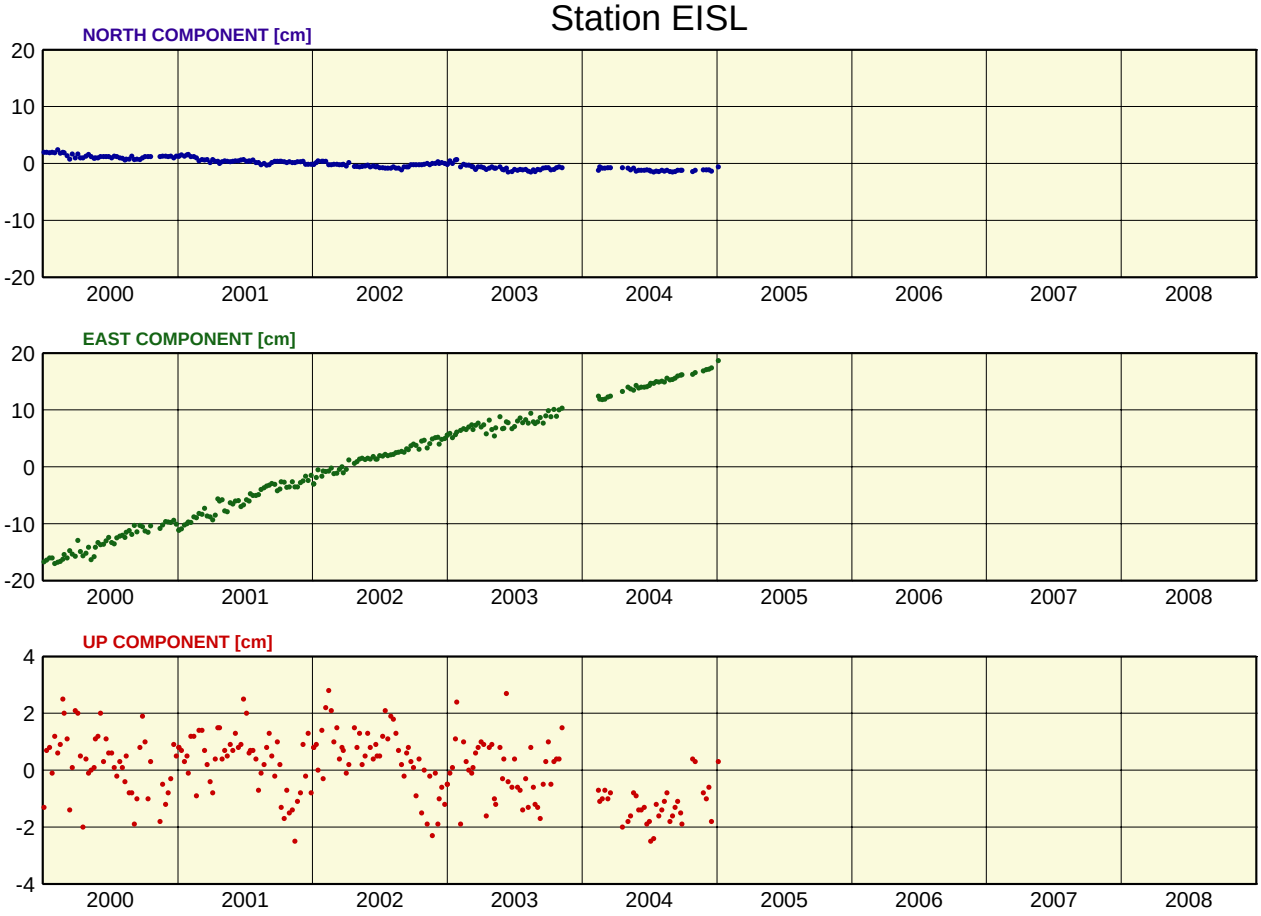
Station CULI



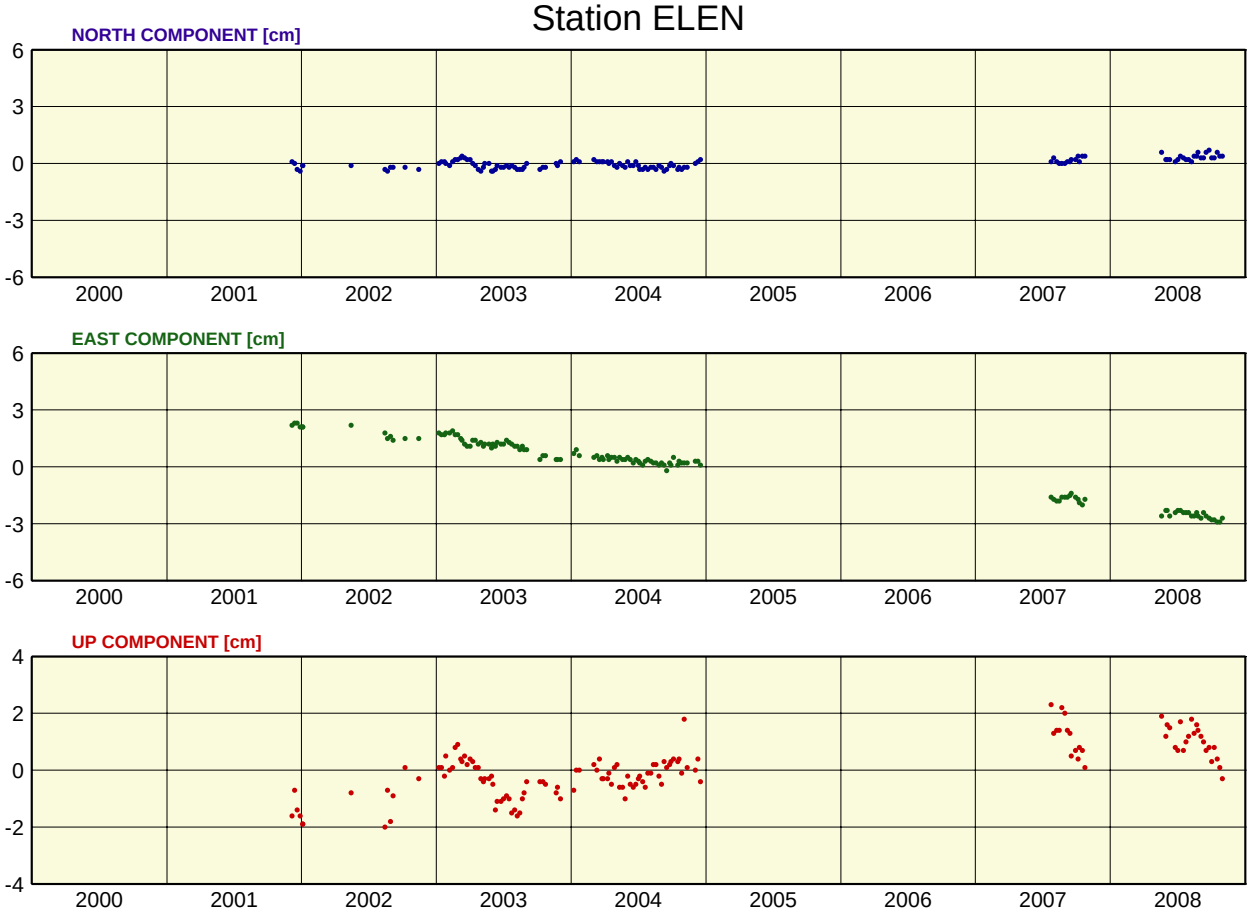
Station DORA



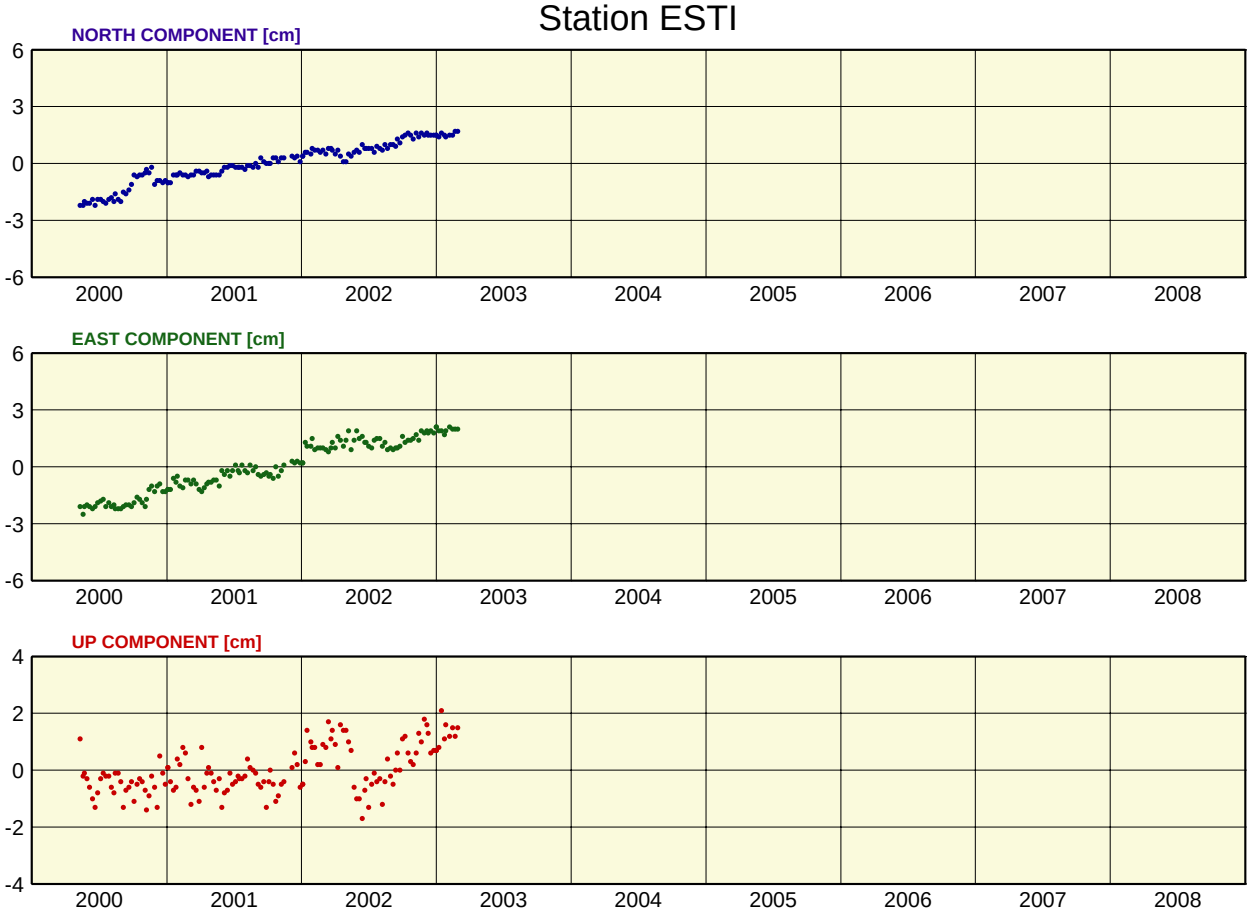
Station EISL



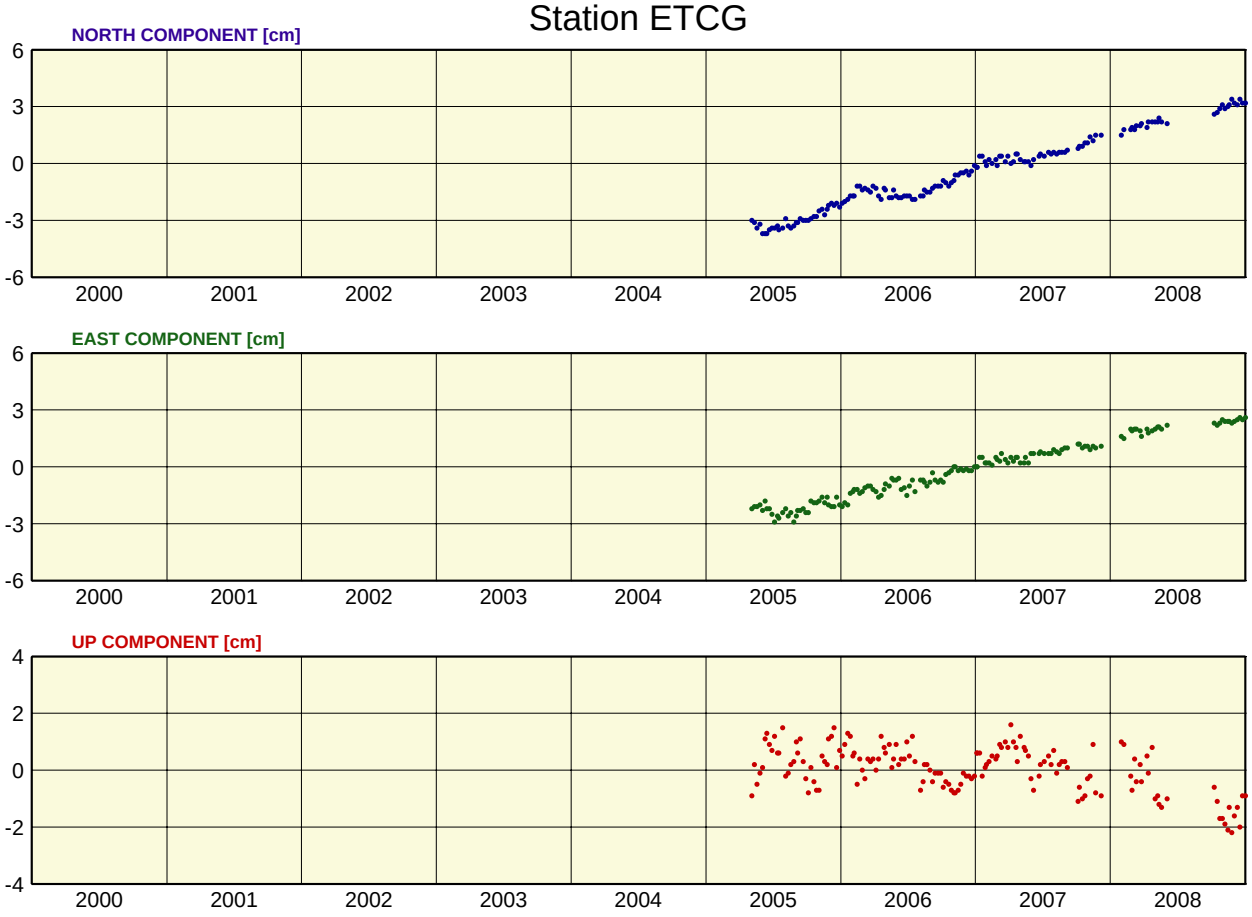
Station ELEN



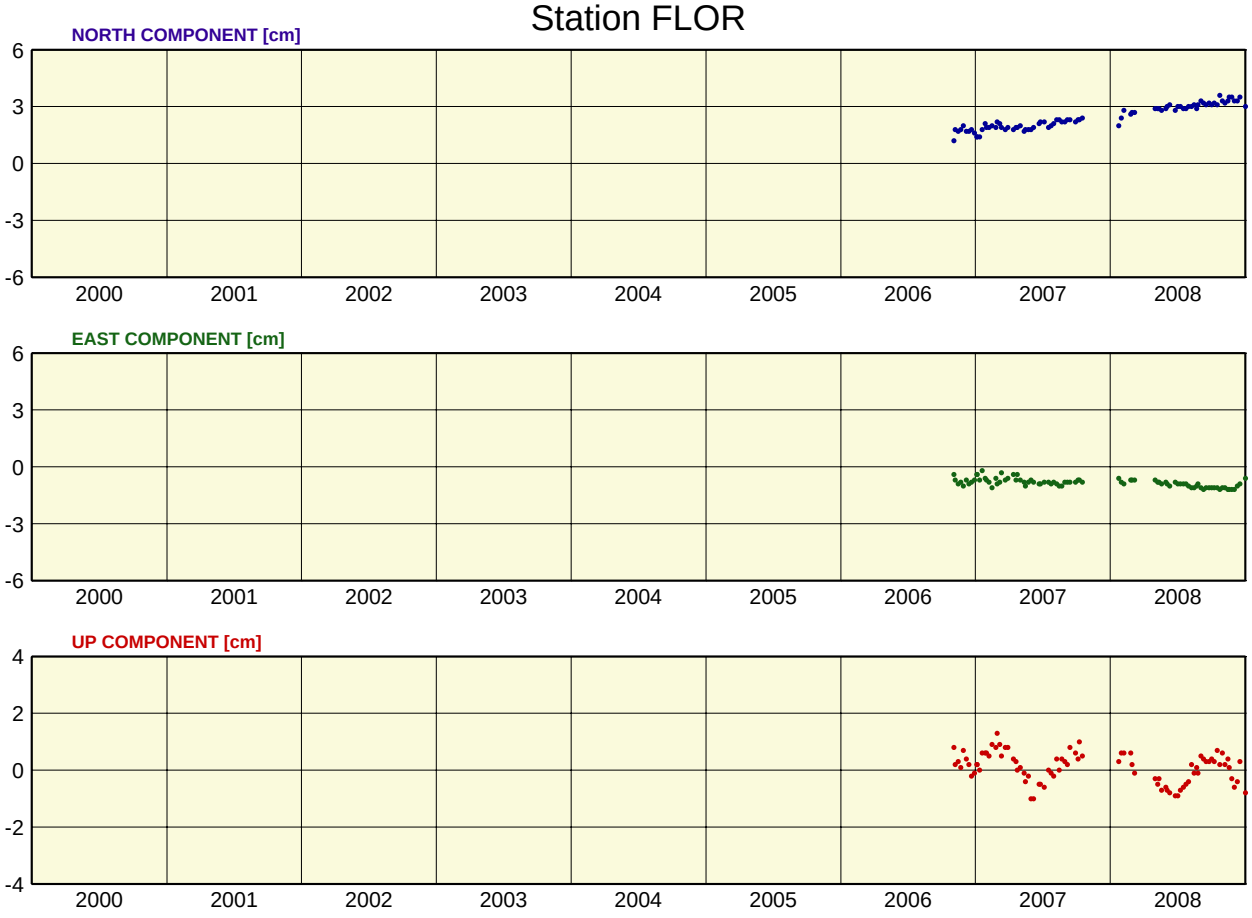
Station ESTI



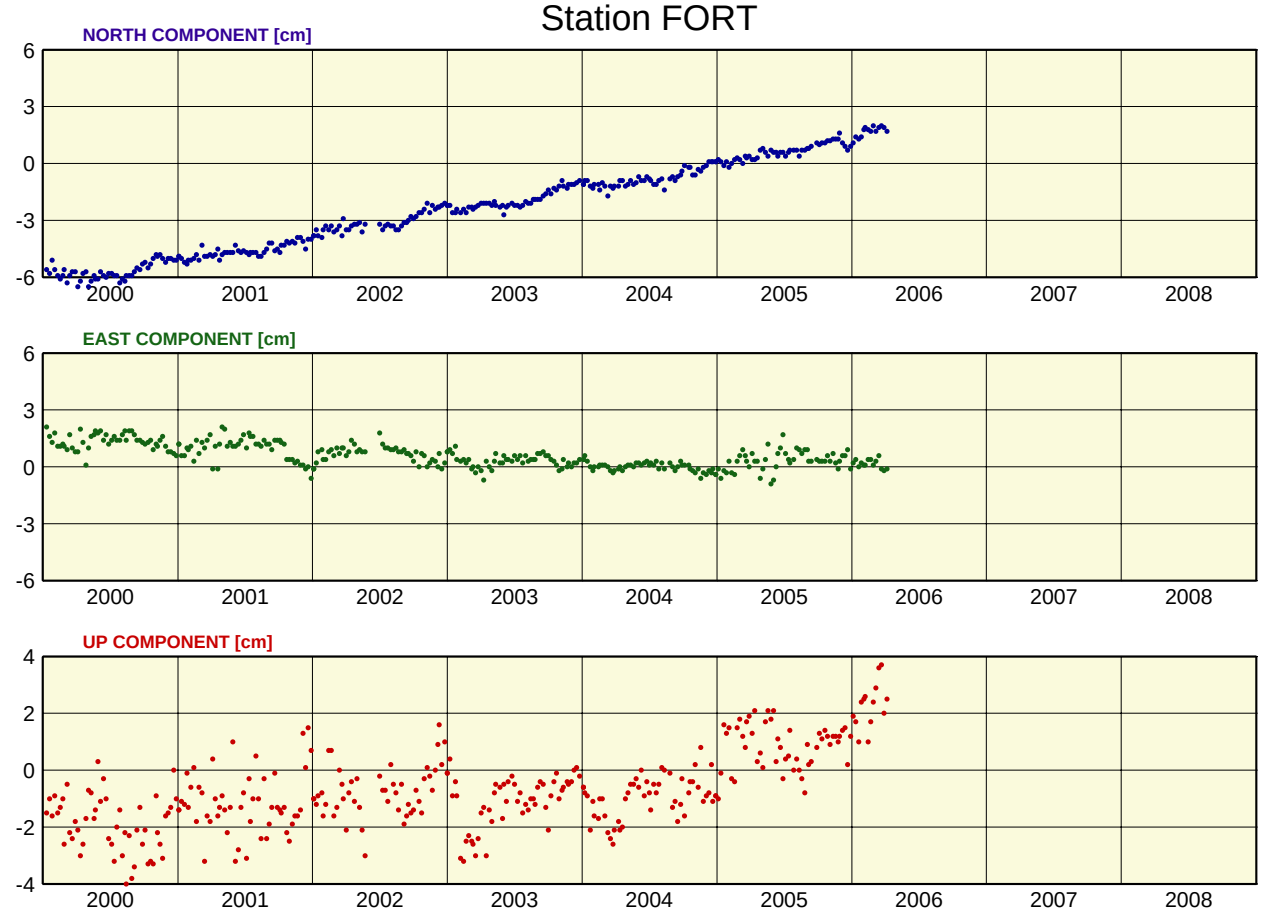
Station ETCG



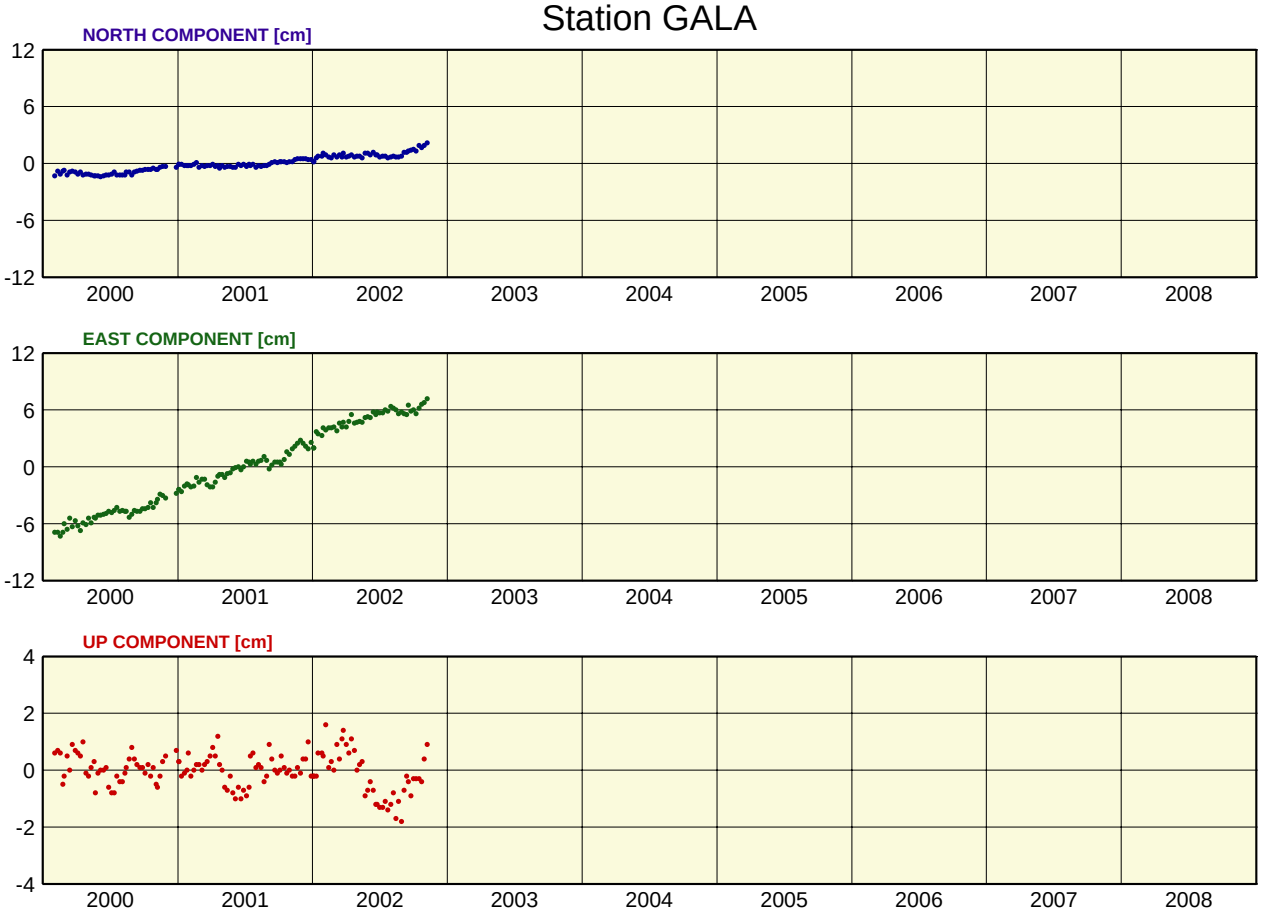
Station FLOR



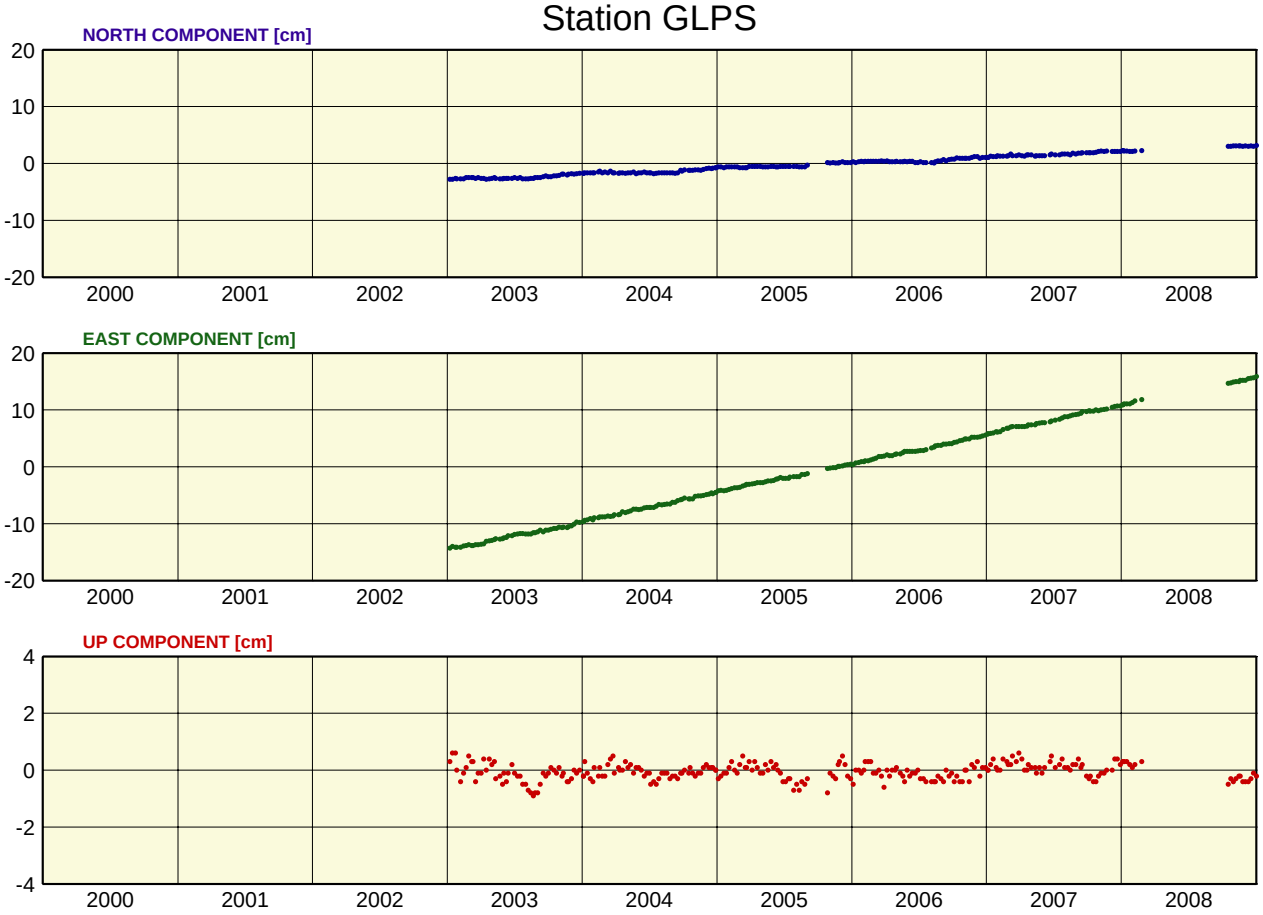
Station FORT



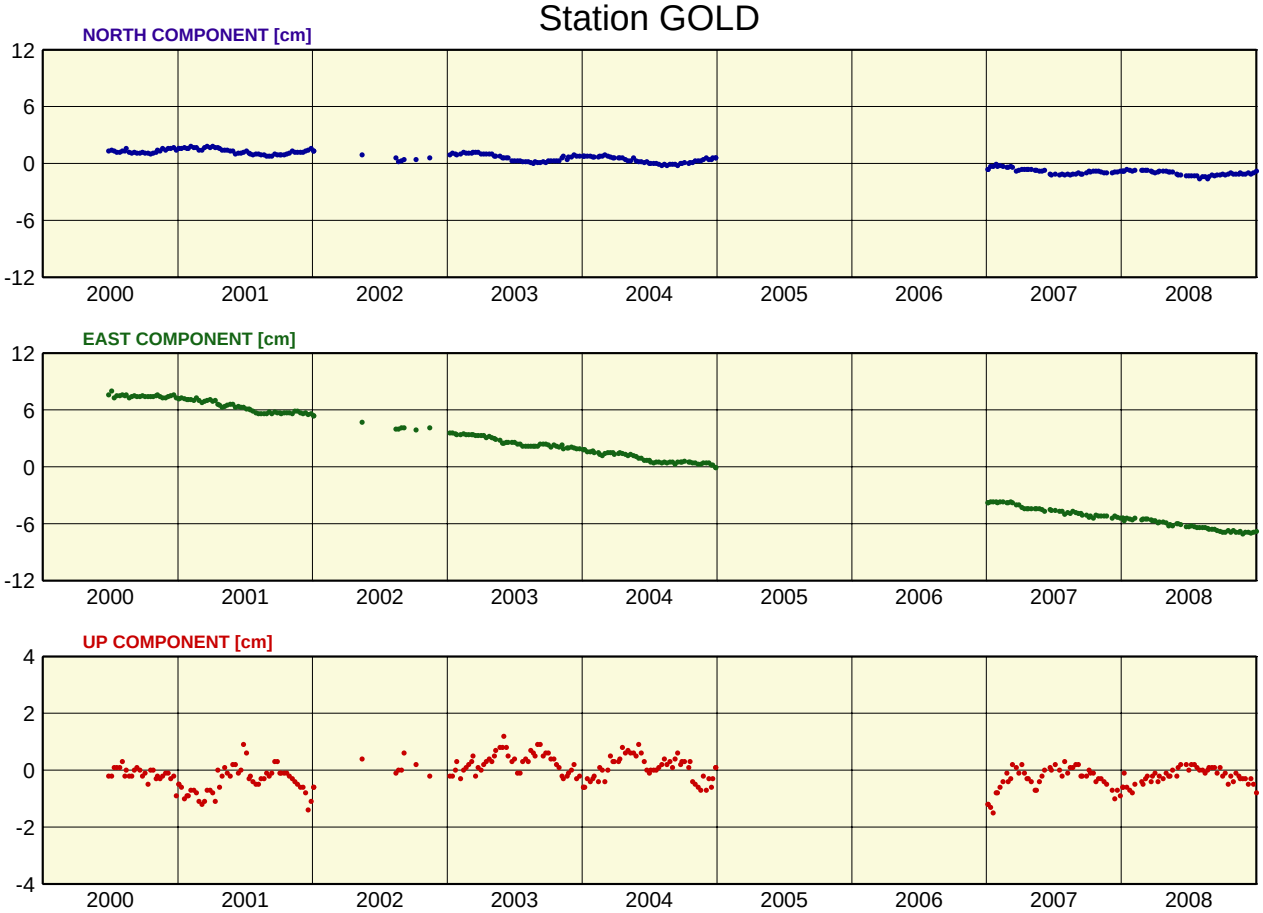
Station GALA



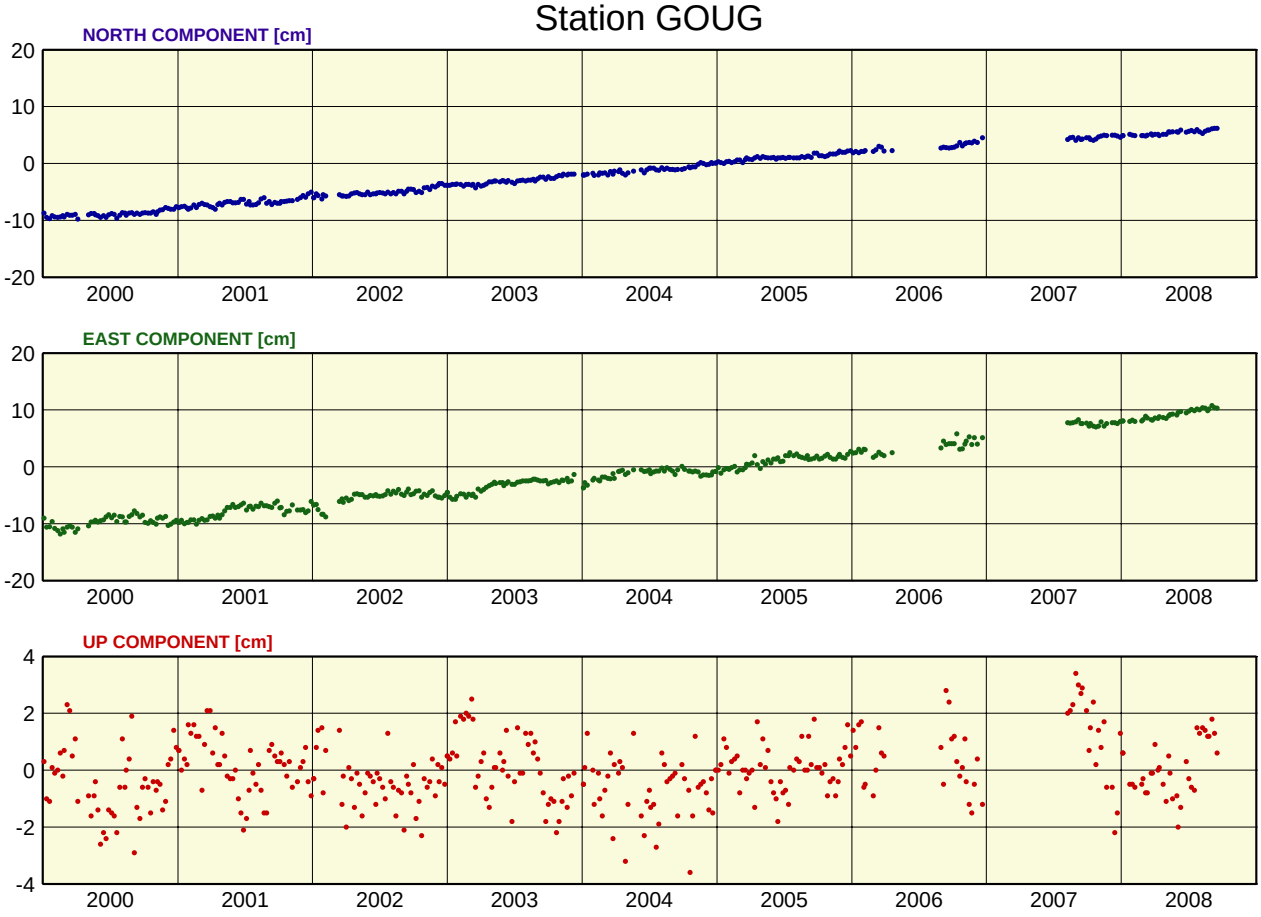
Station GLPS



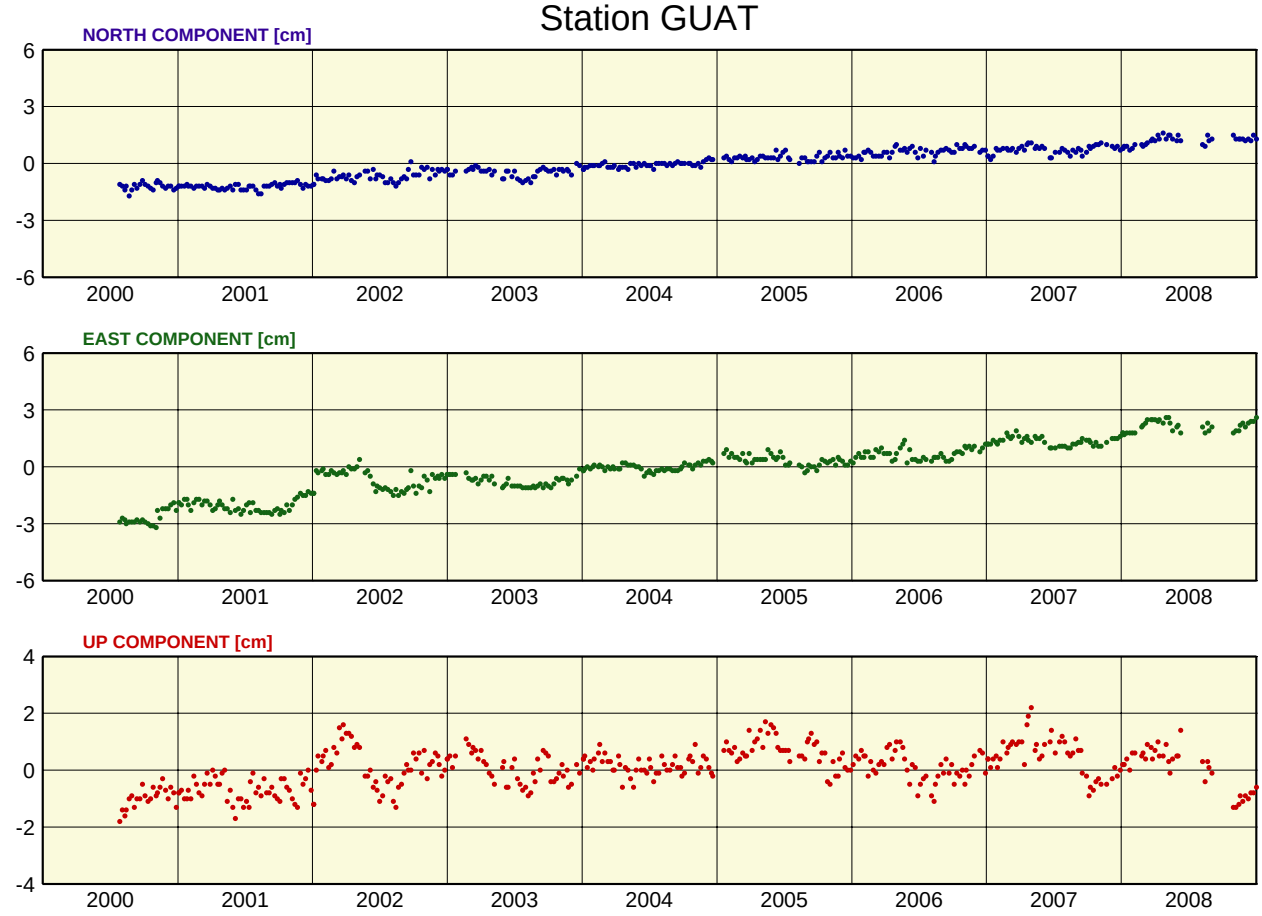
Station GOLD



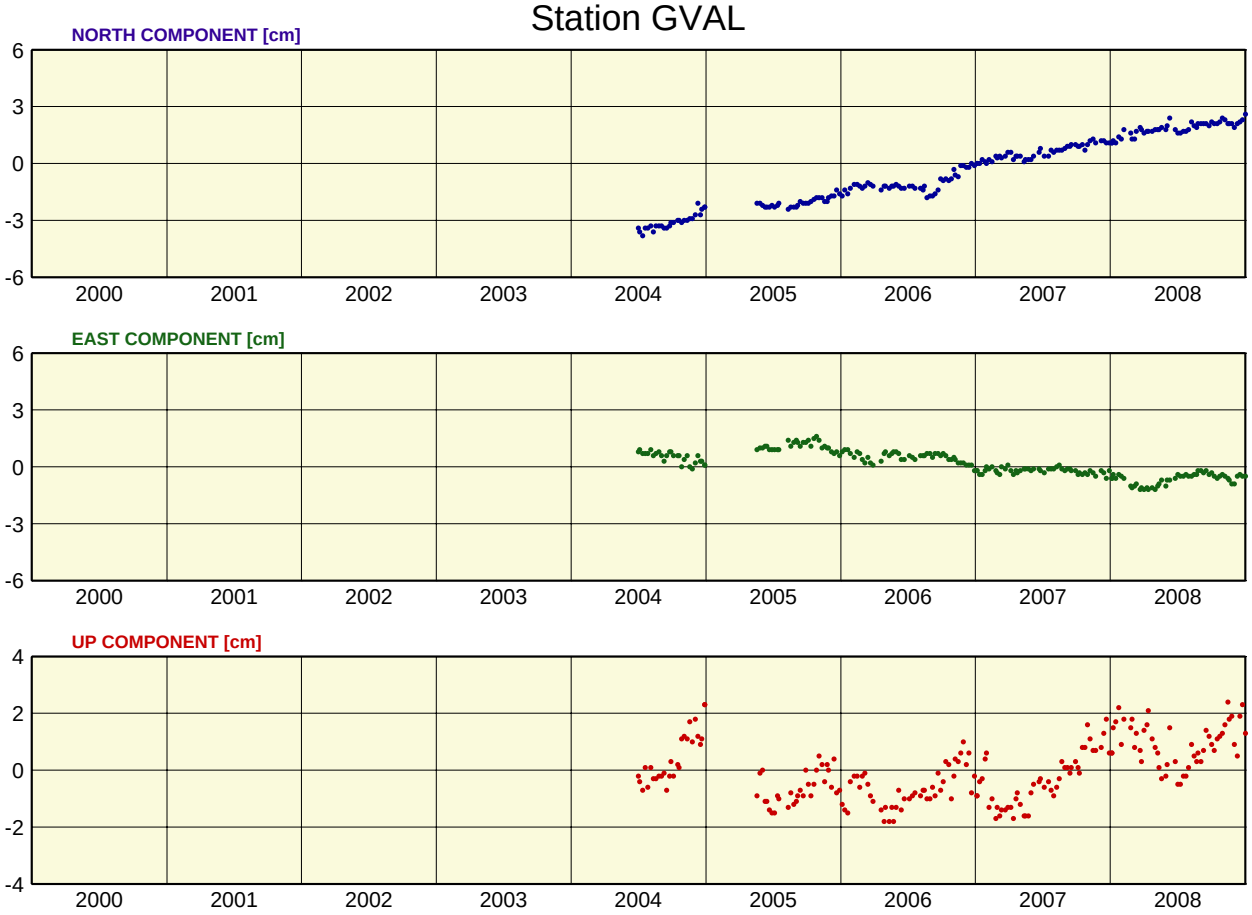
Station GOUG



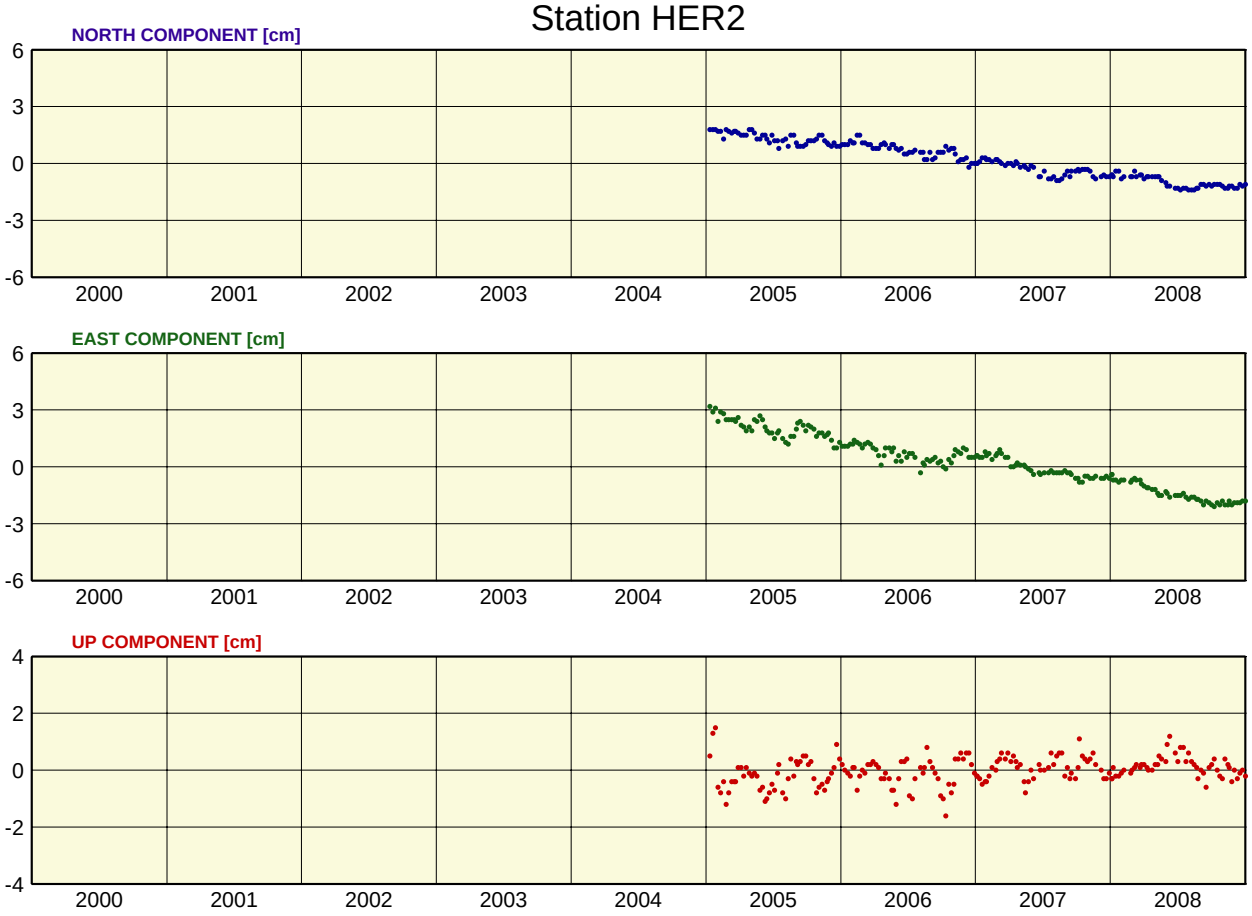
Station GUAT



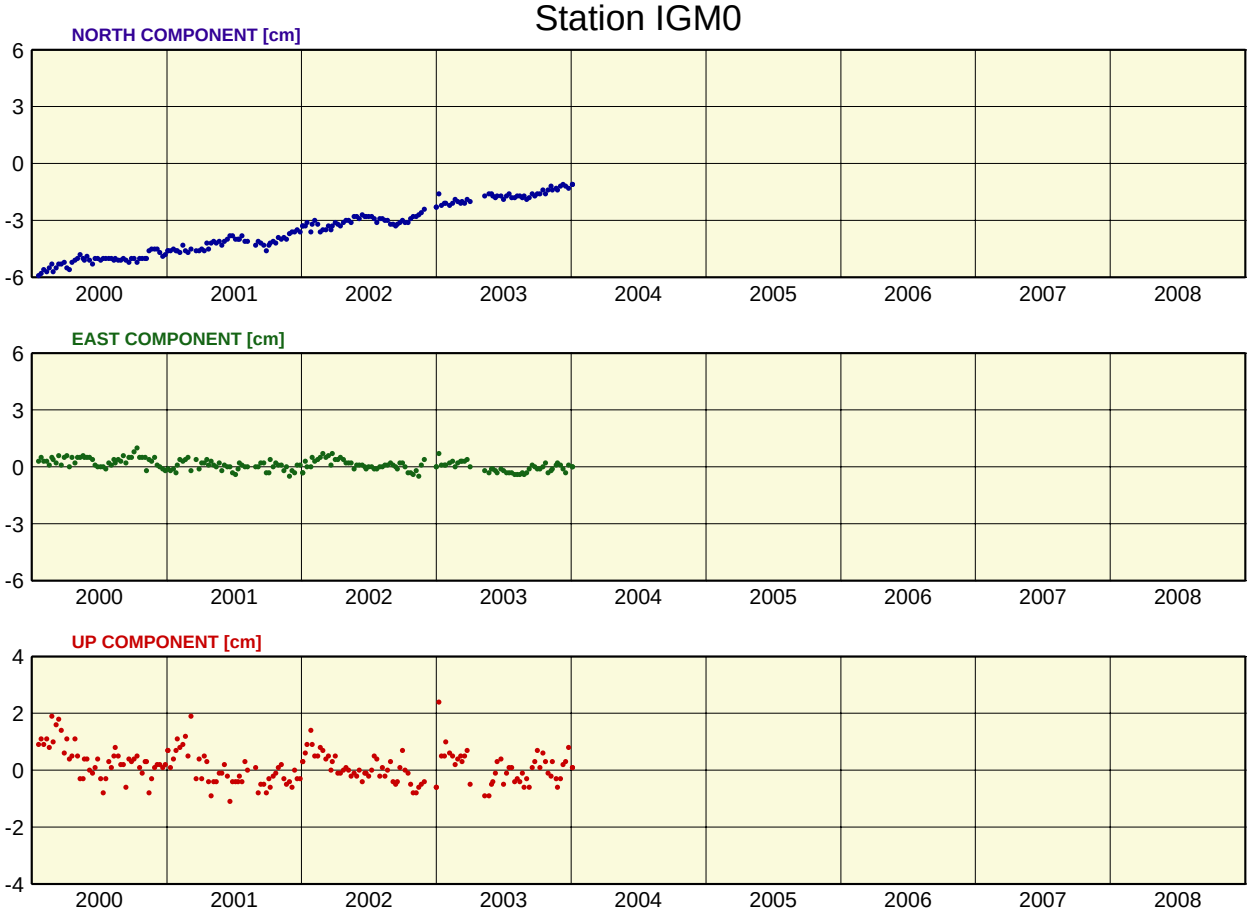
Station GVAL



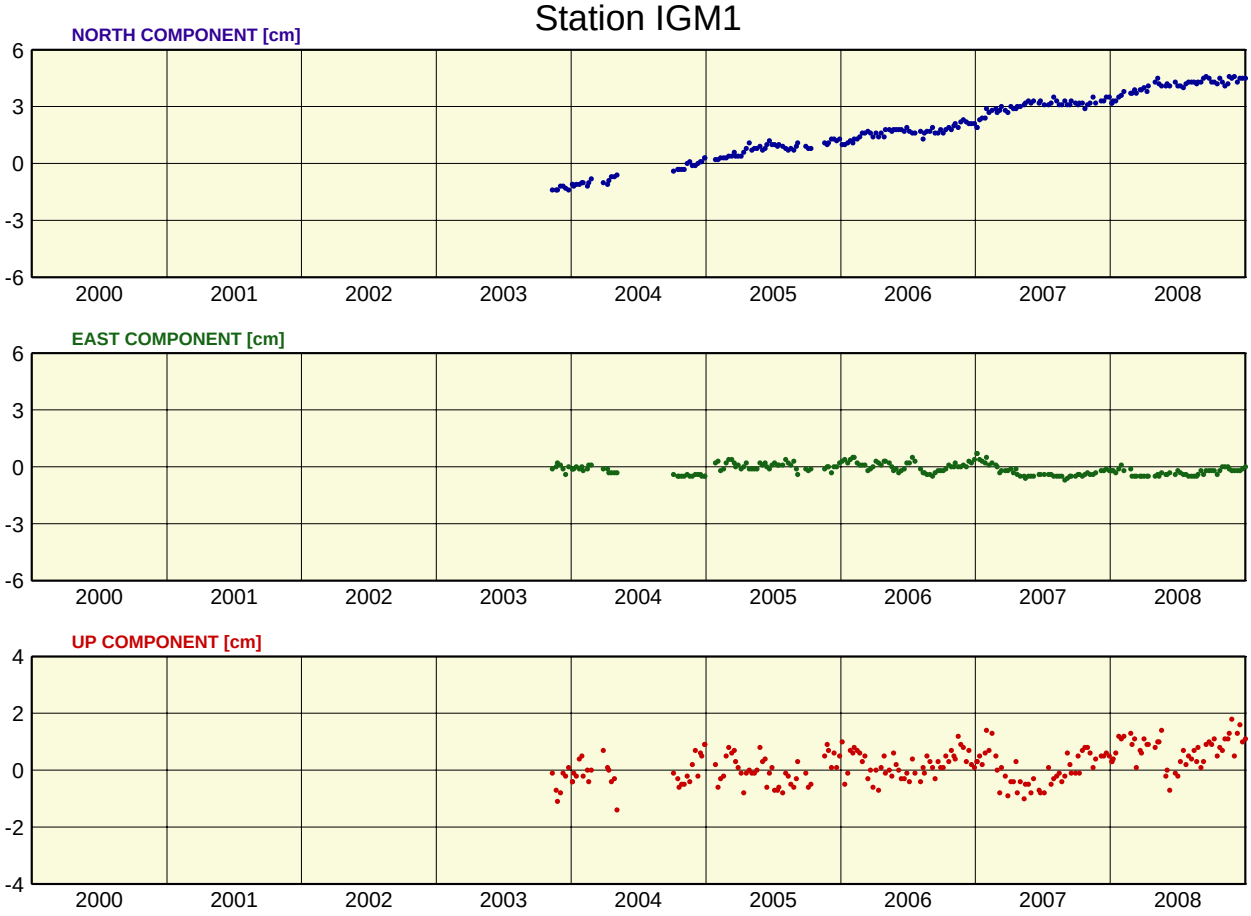
Station HER2



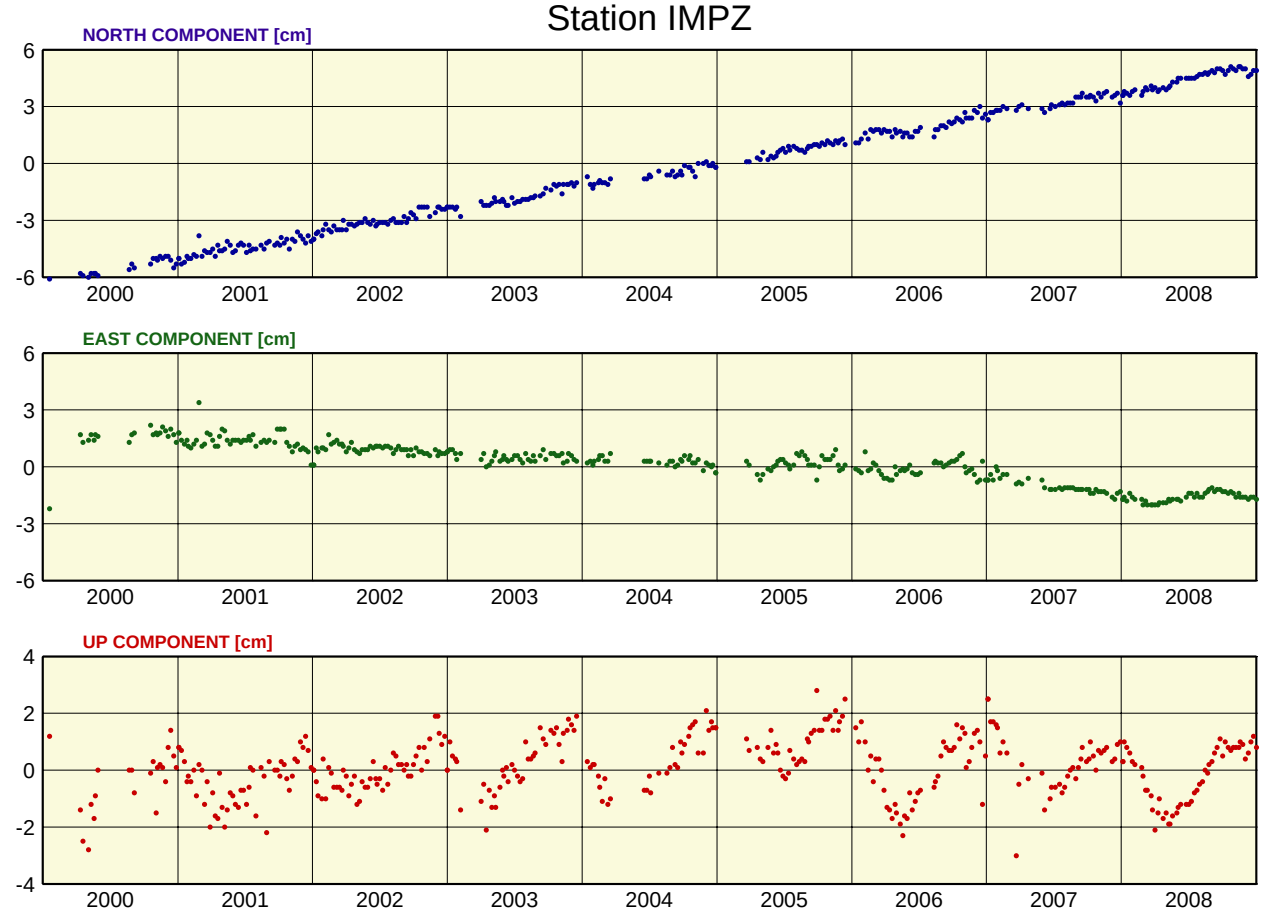
Station IGM0



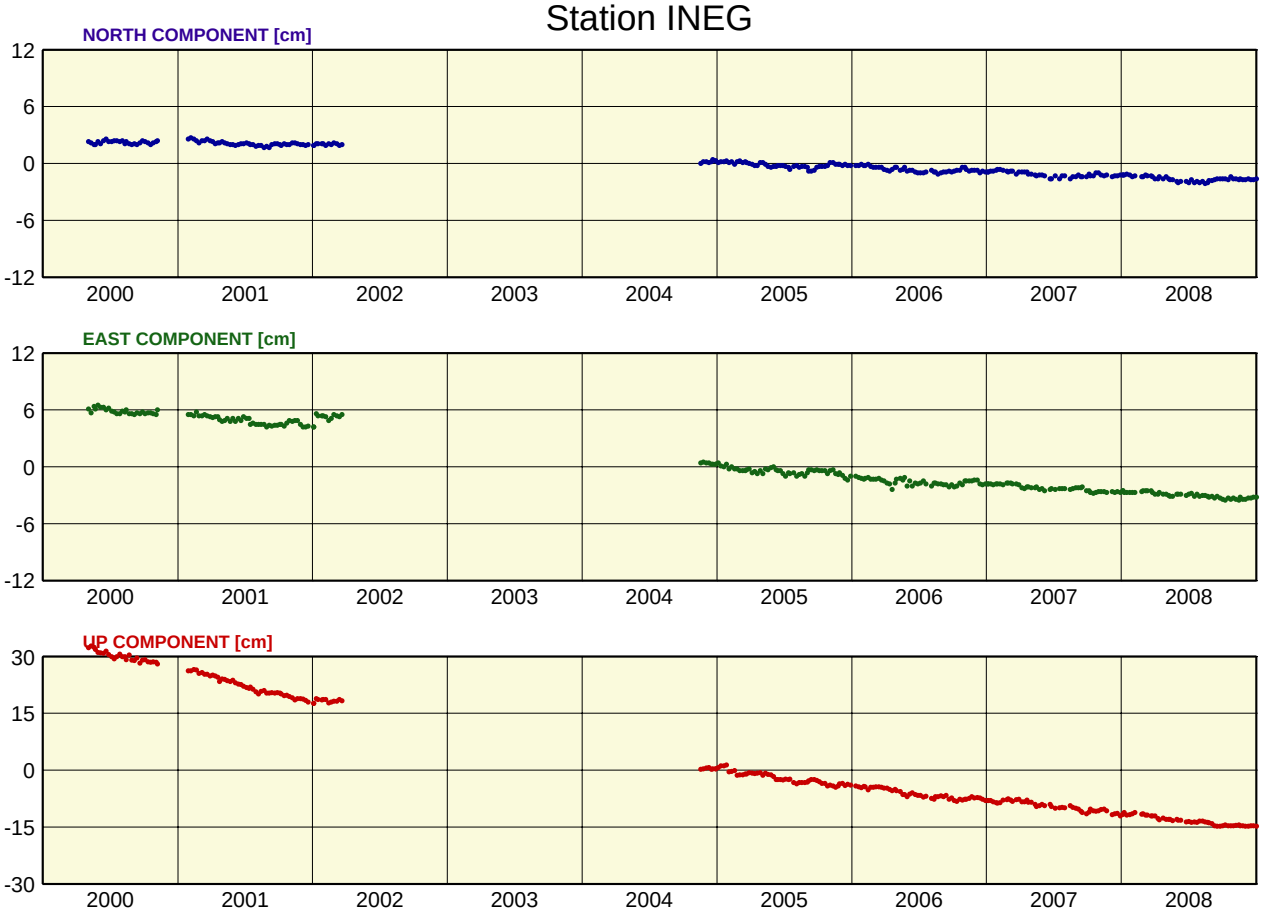
Station IGM1



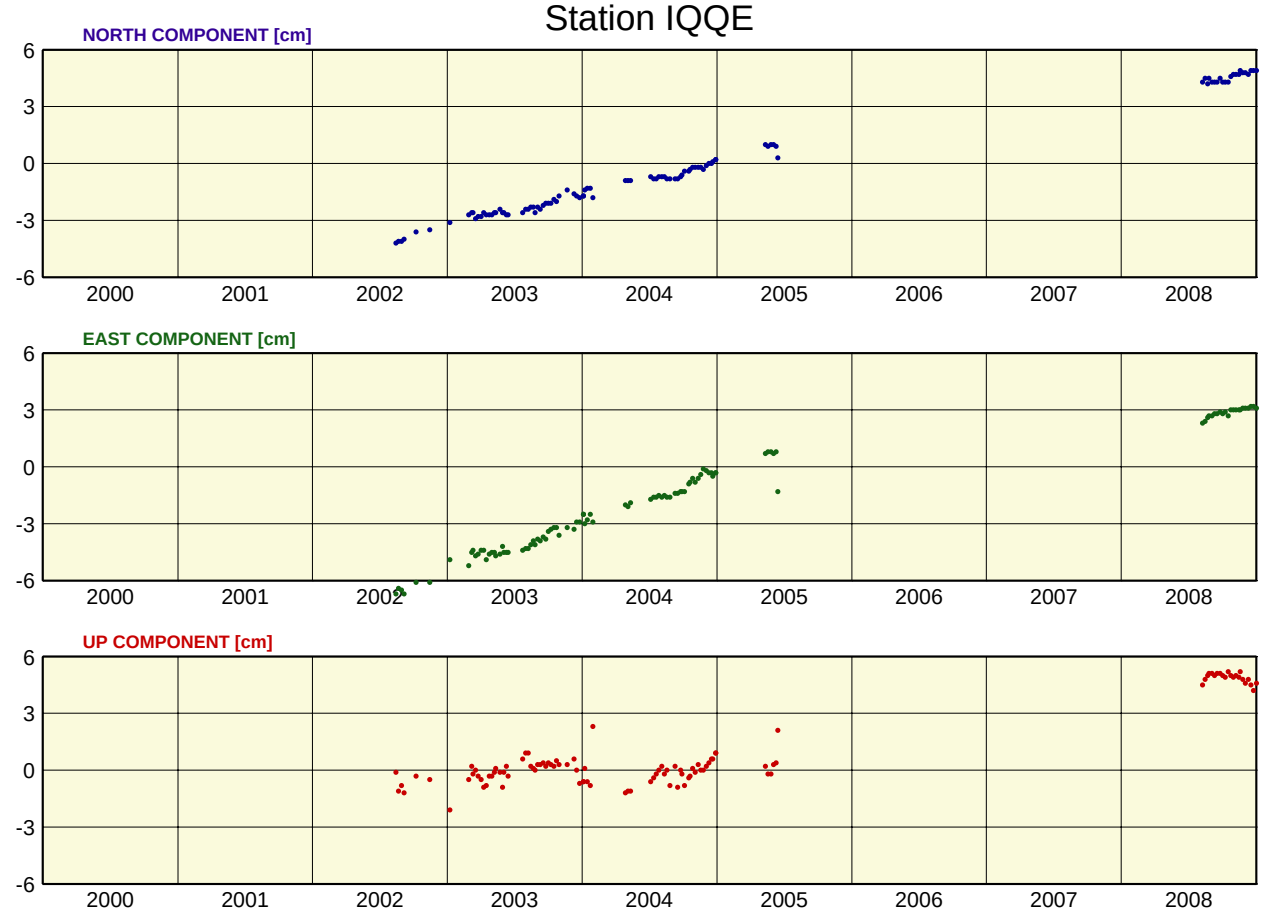
Station IMPZ



Station INEG



Station IQQE



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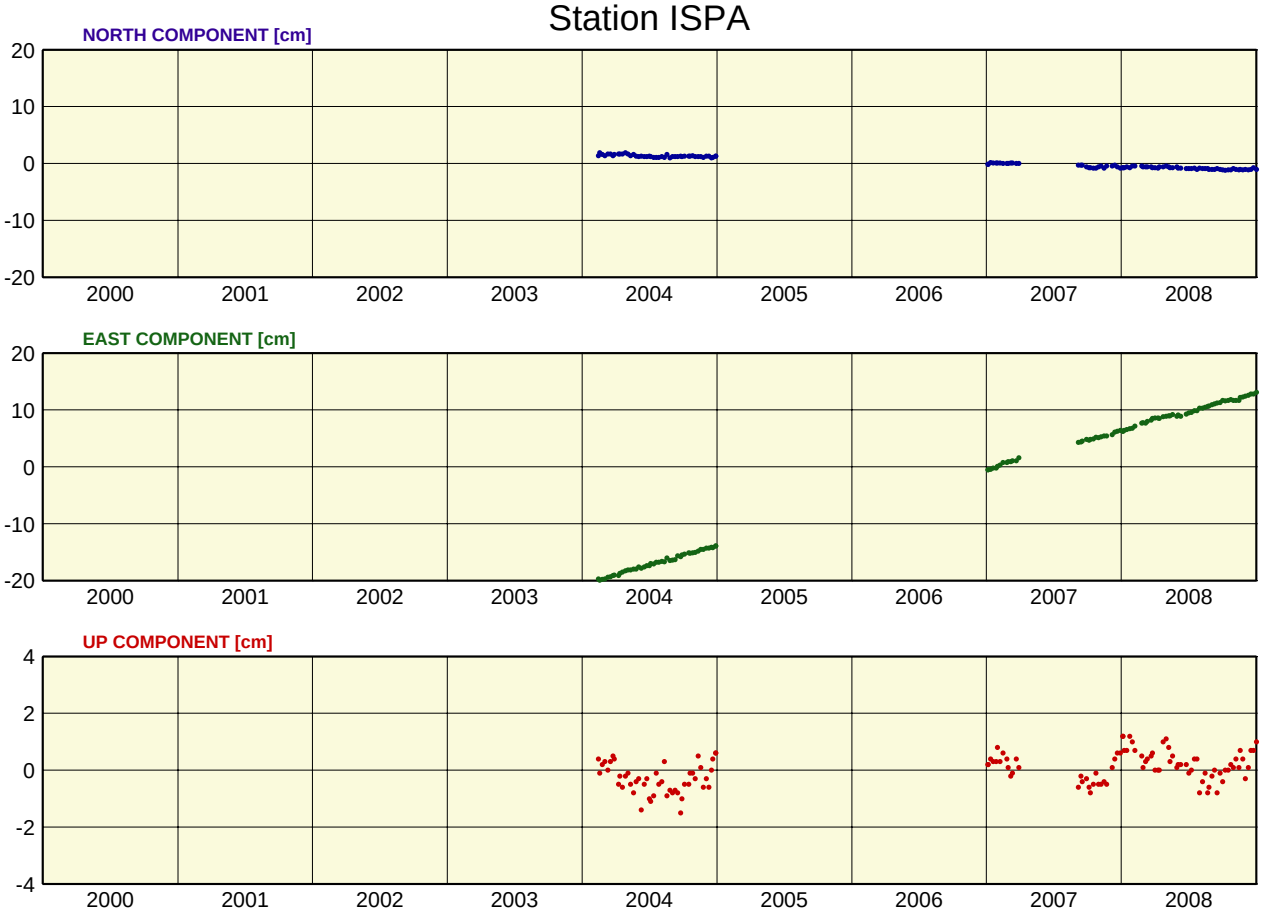

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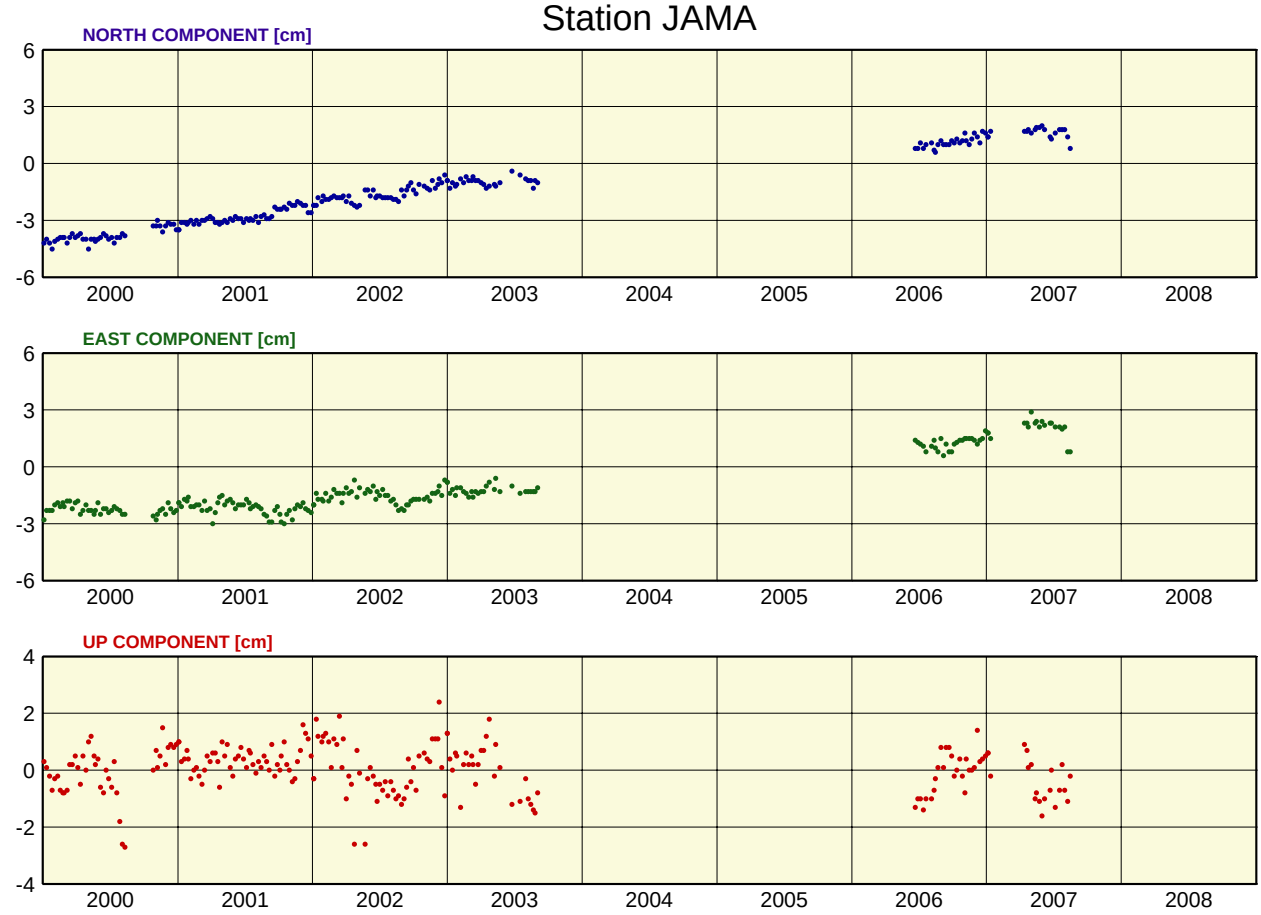

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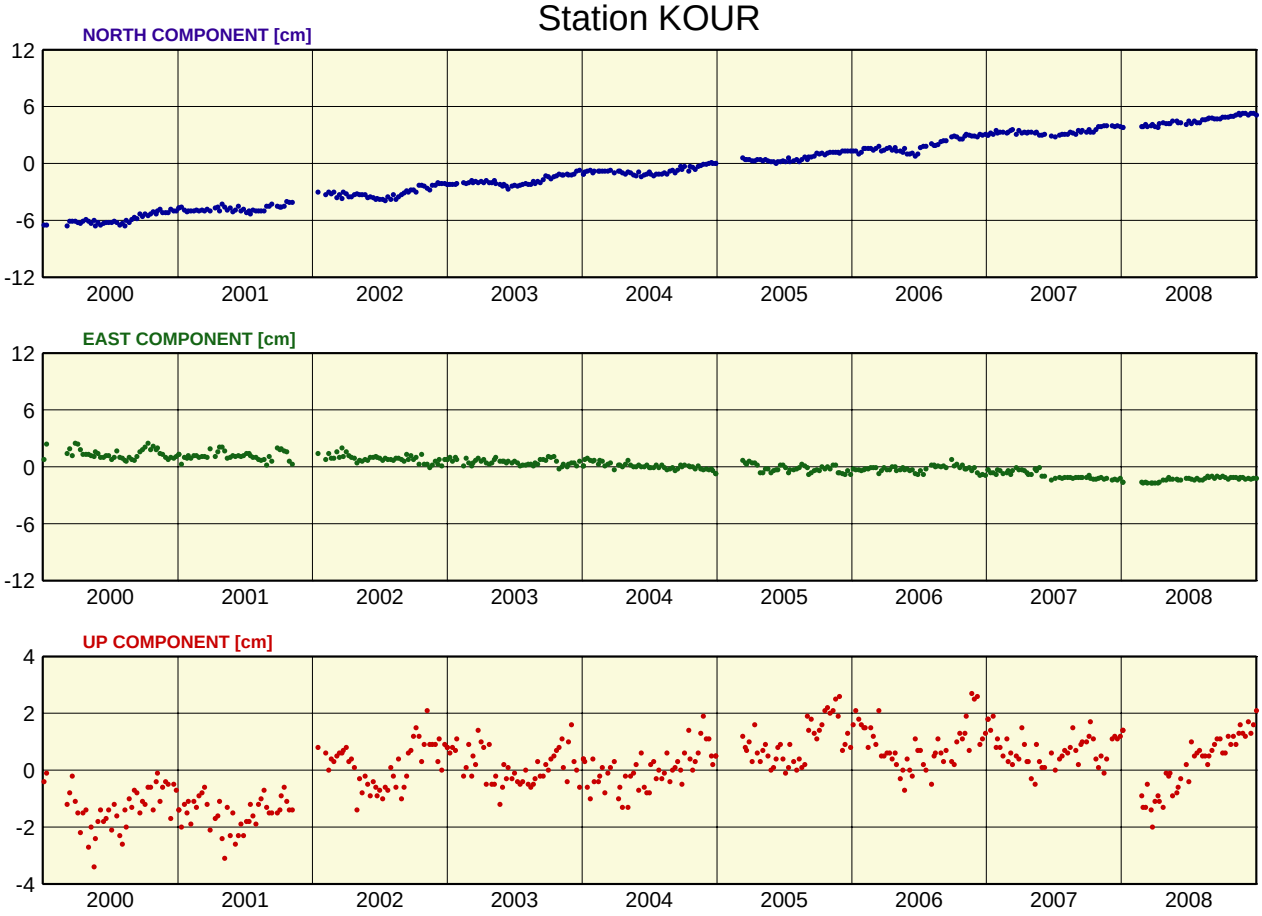

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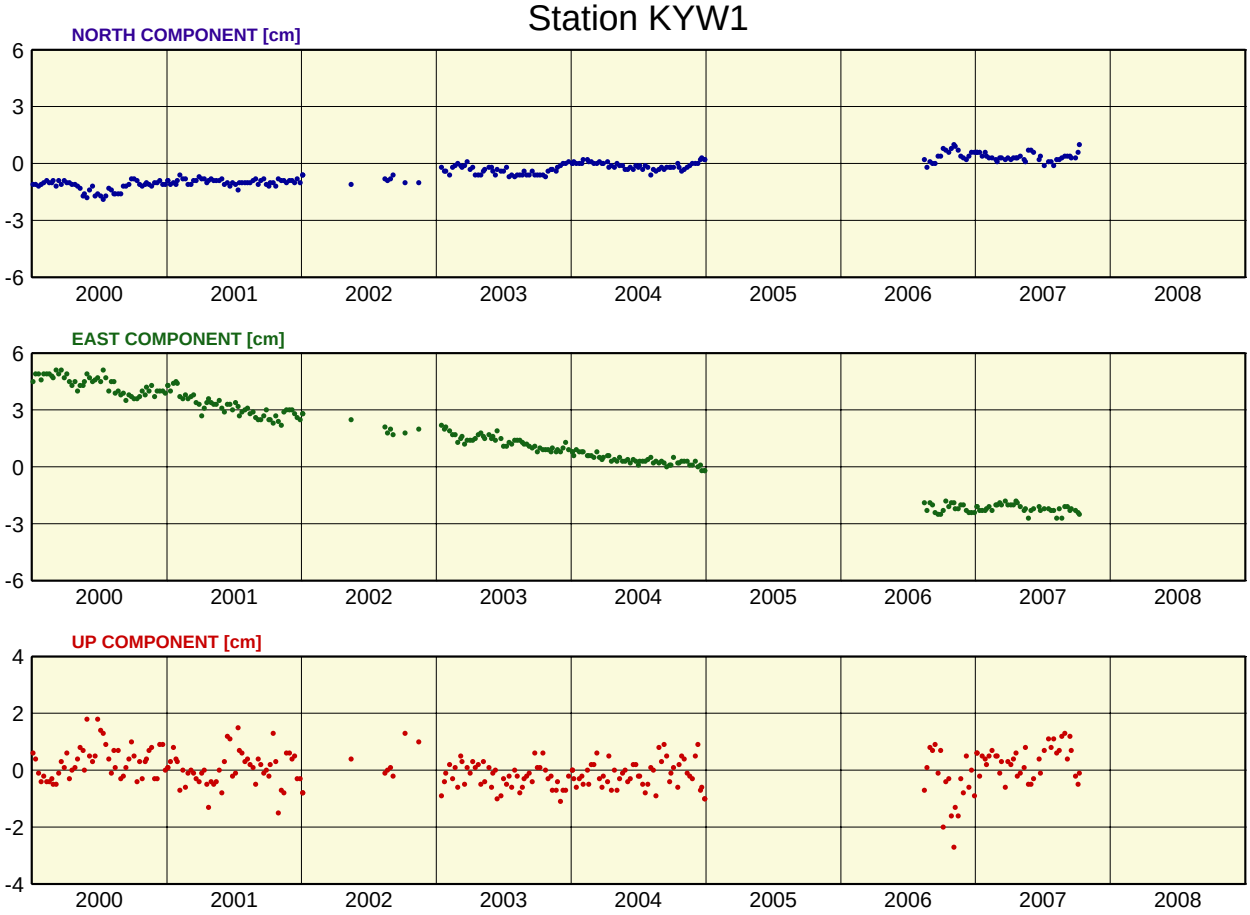

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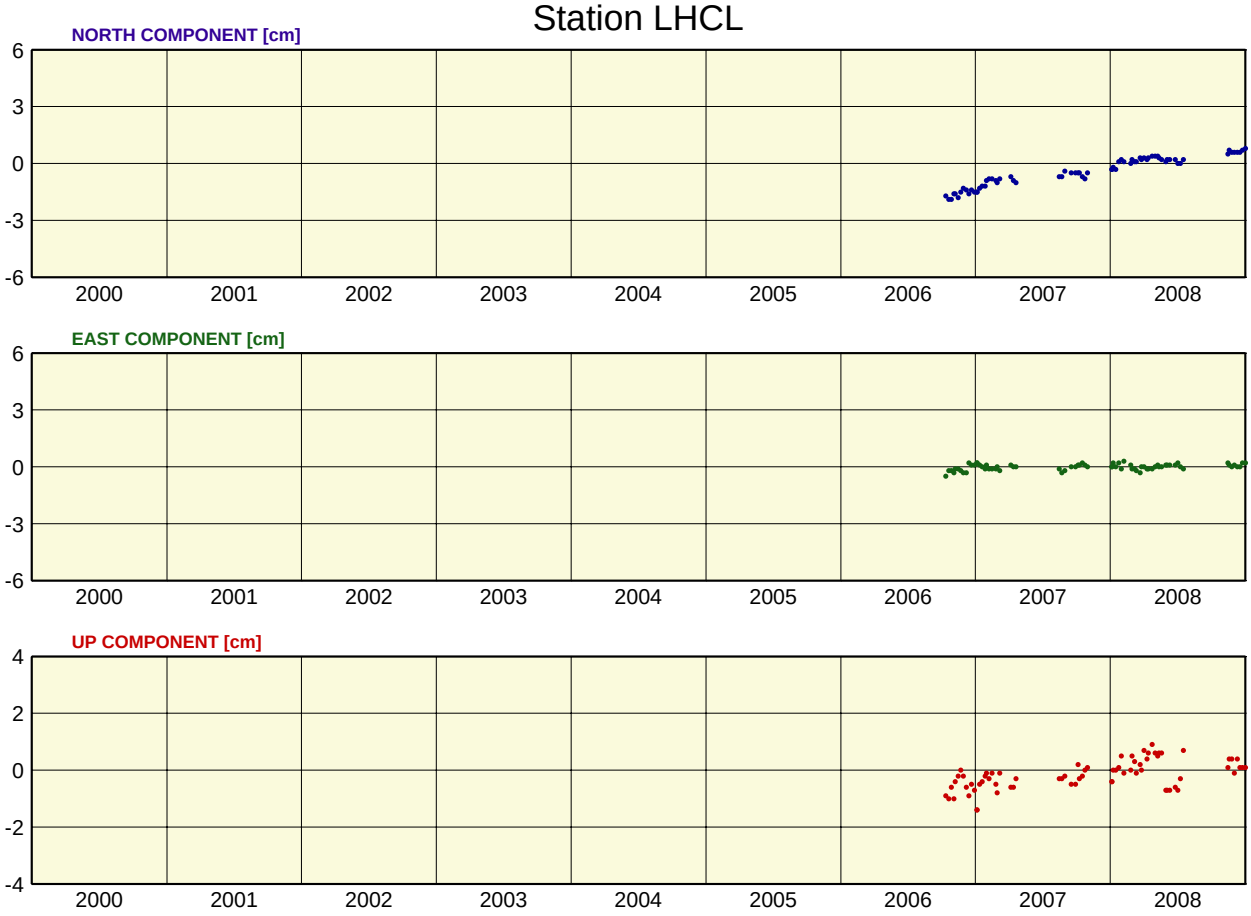

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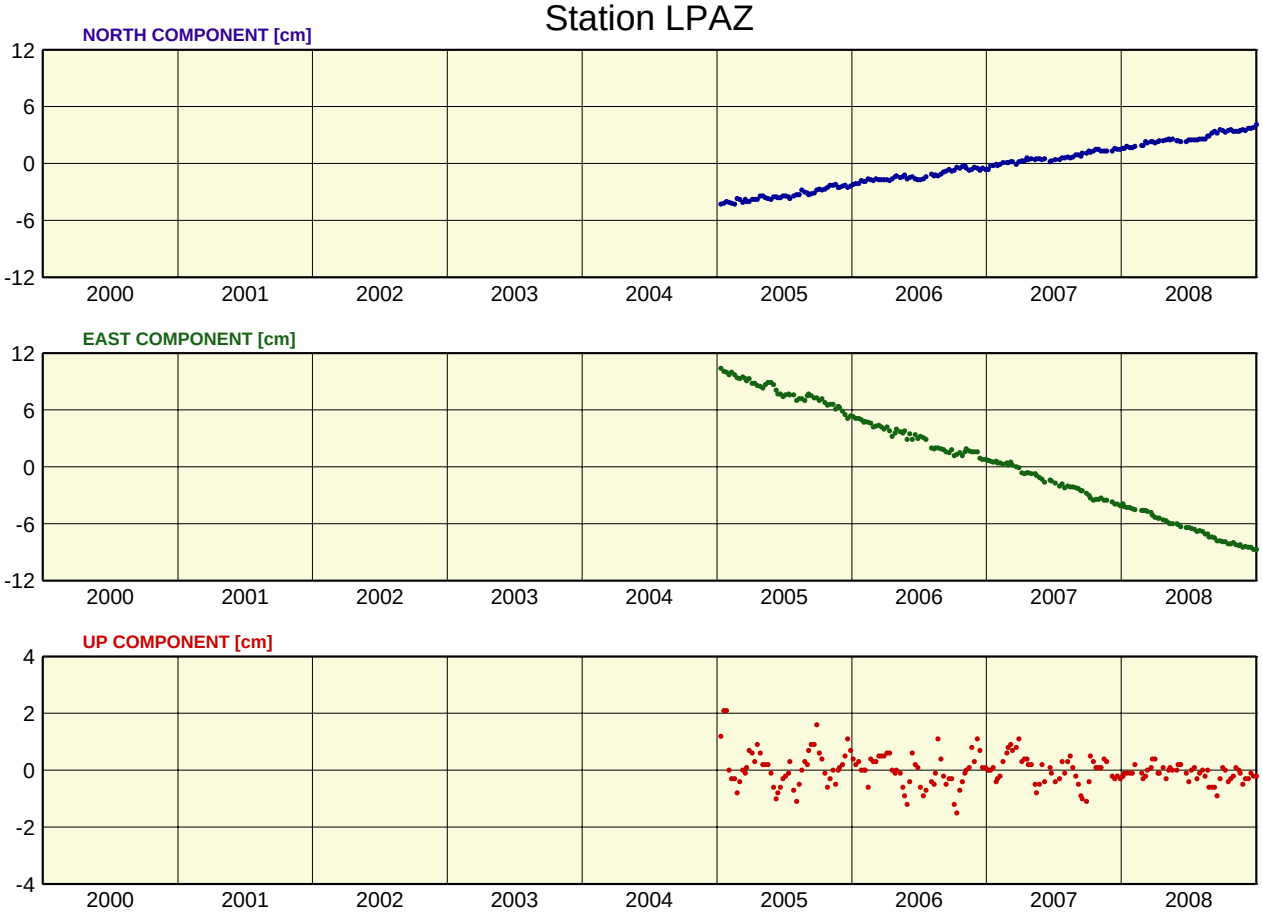

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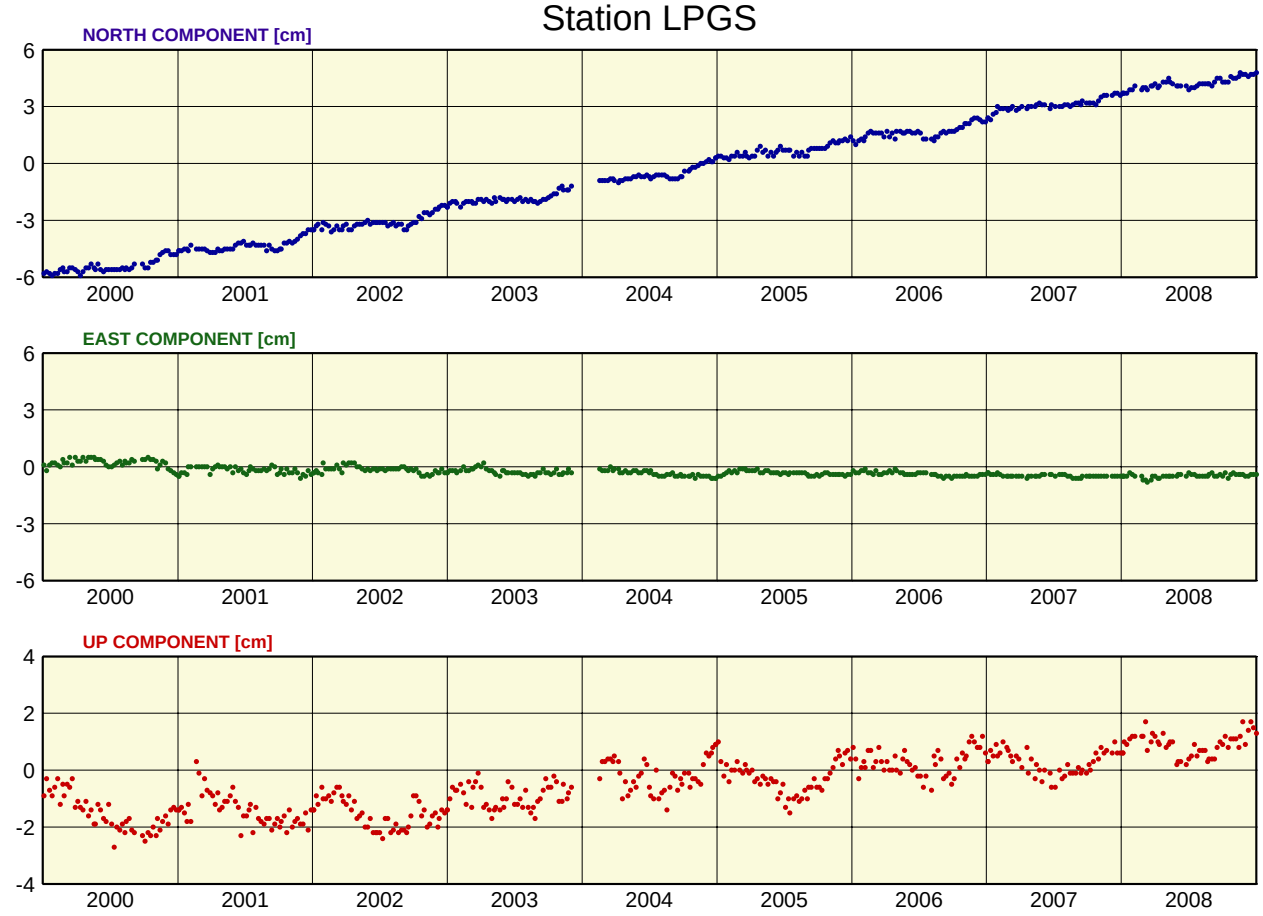

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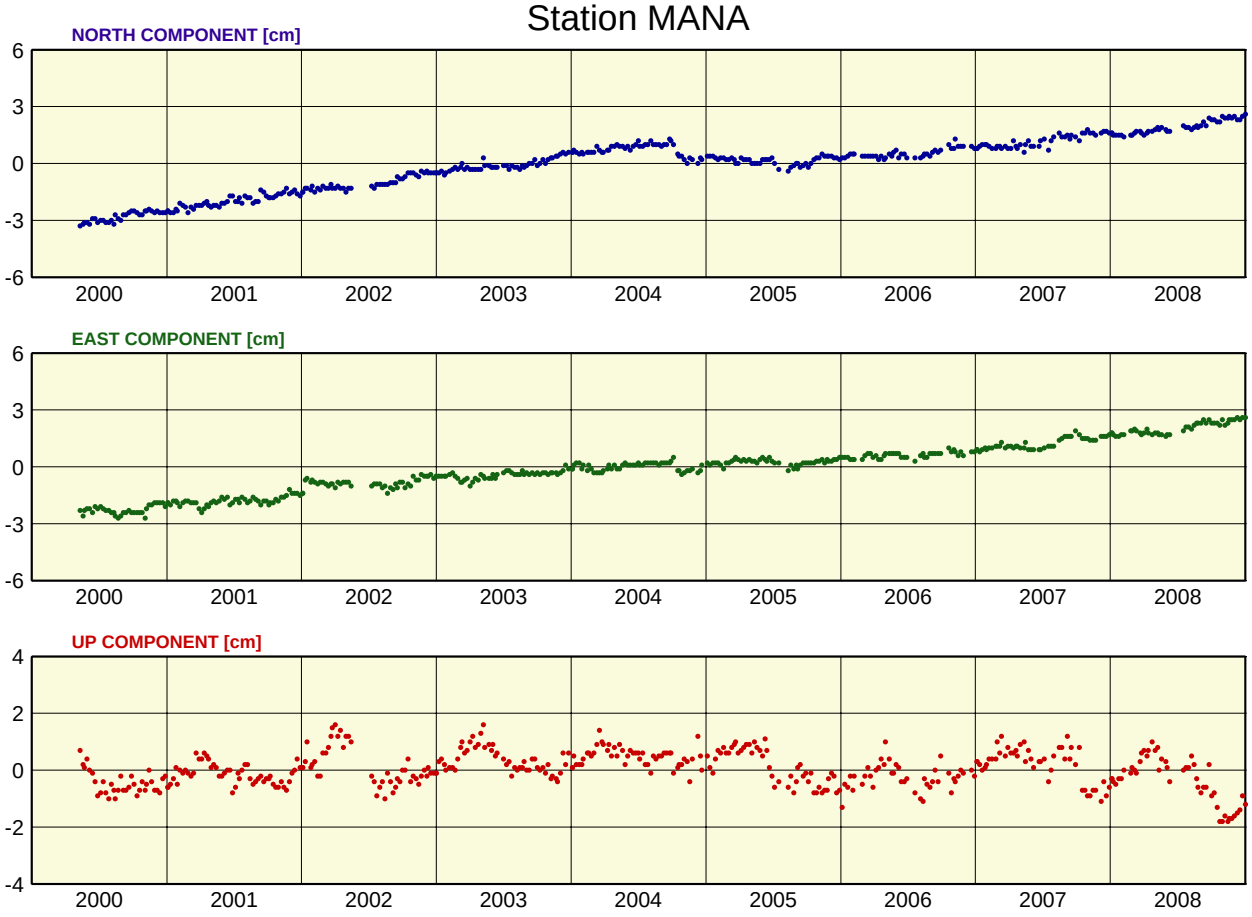

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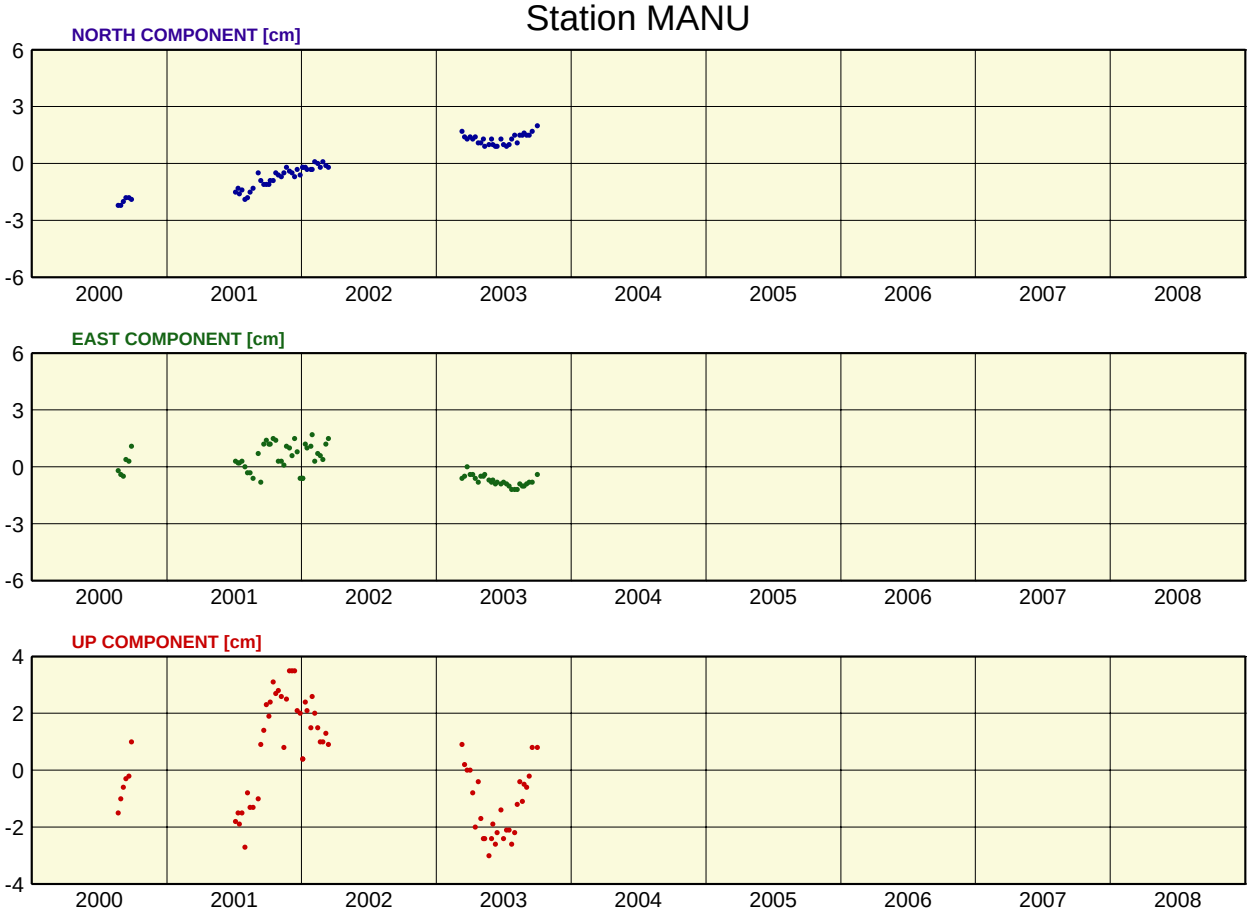

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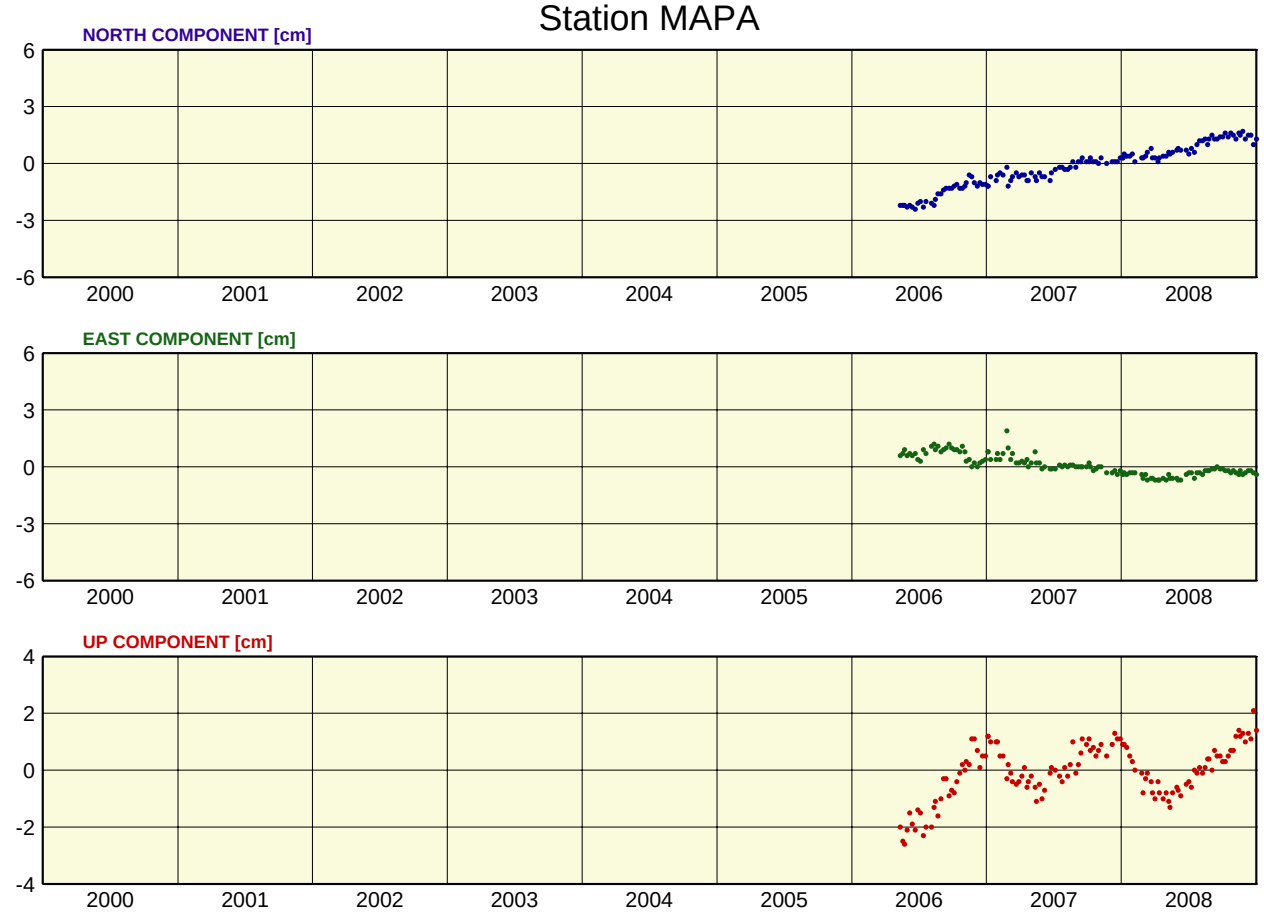

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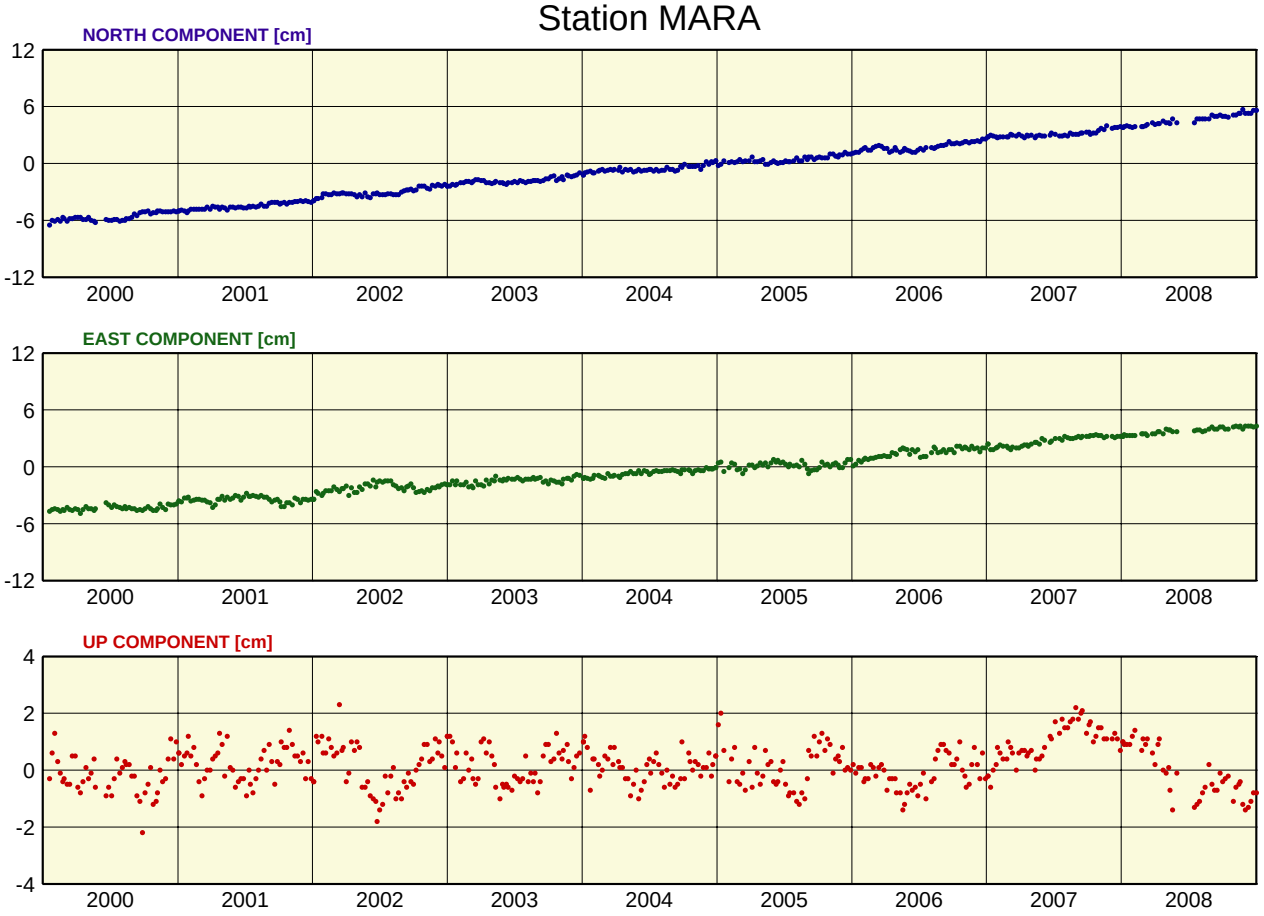

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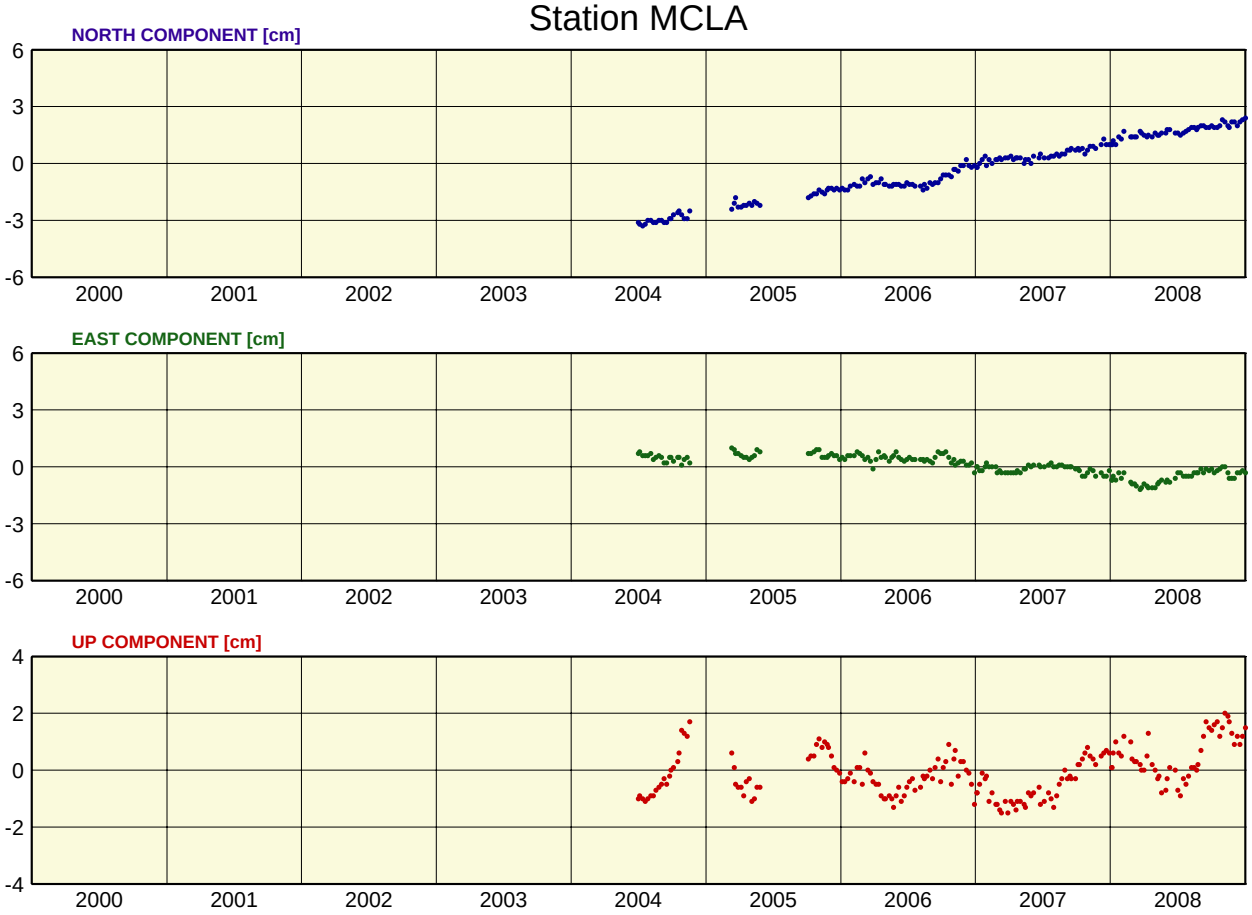

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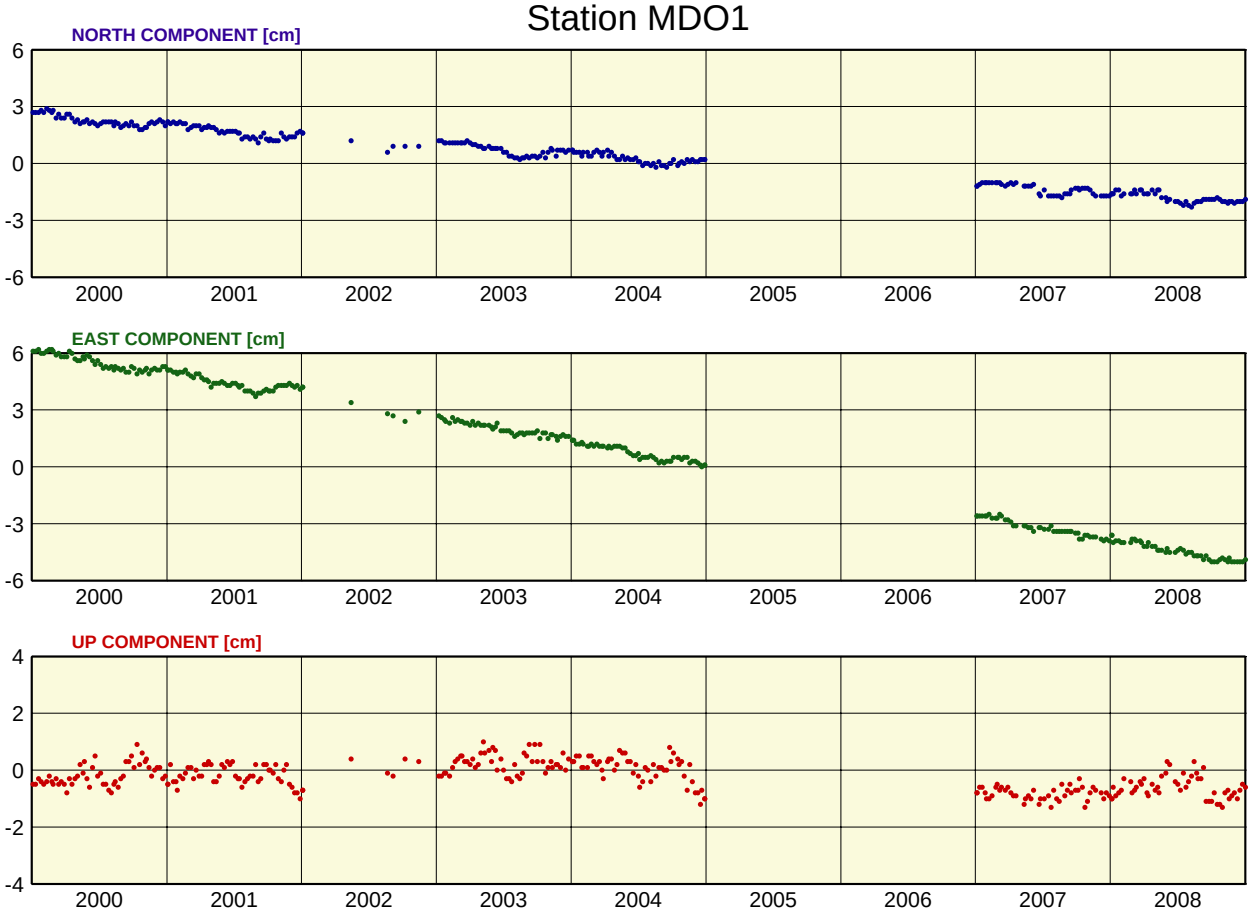

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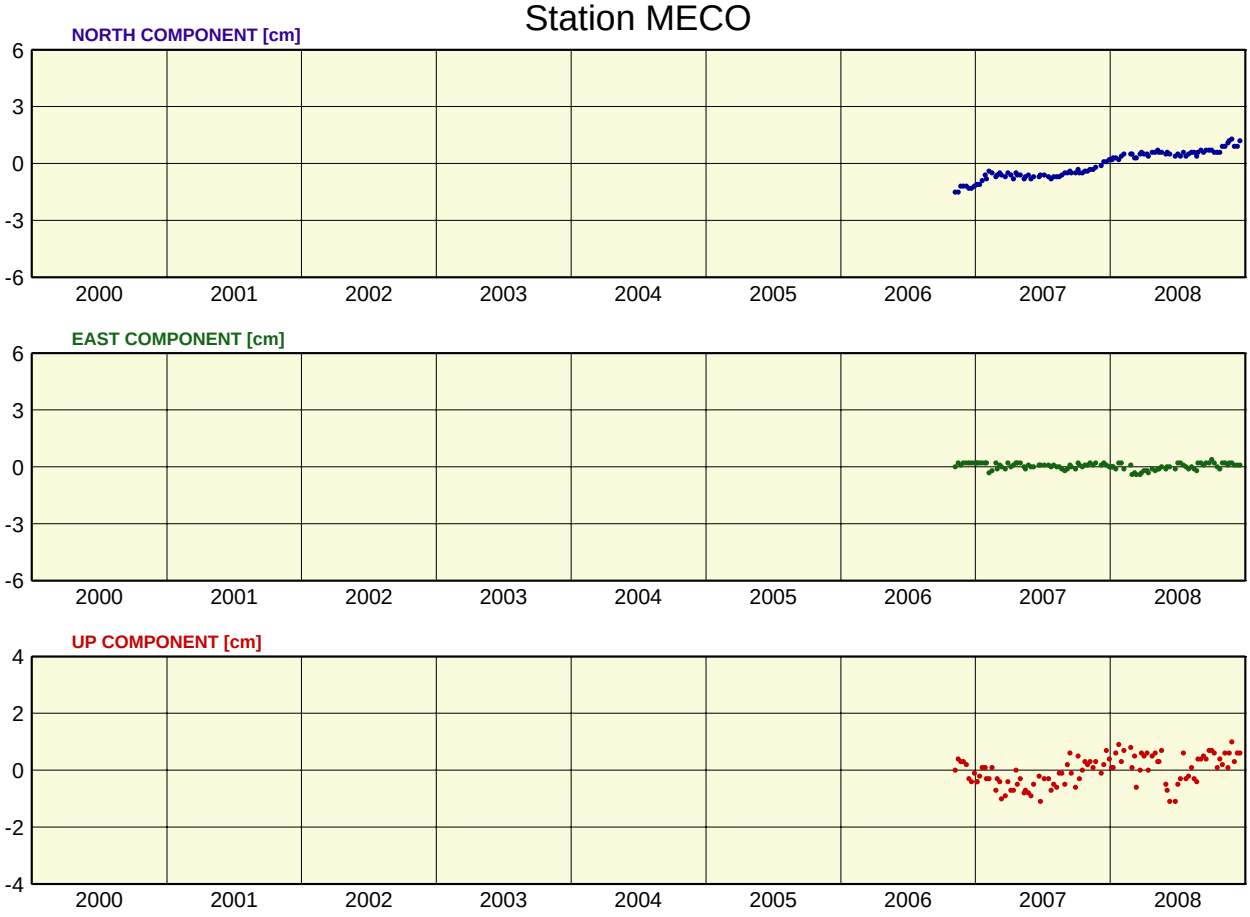

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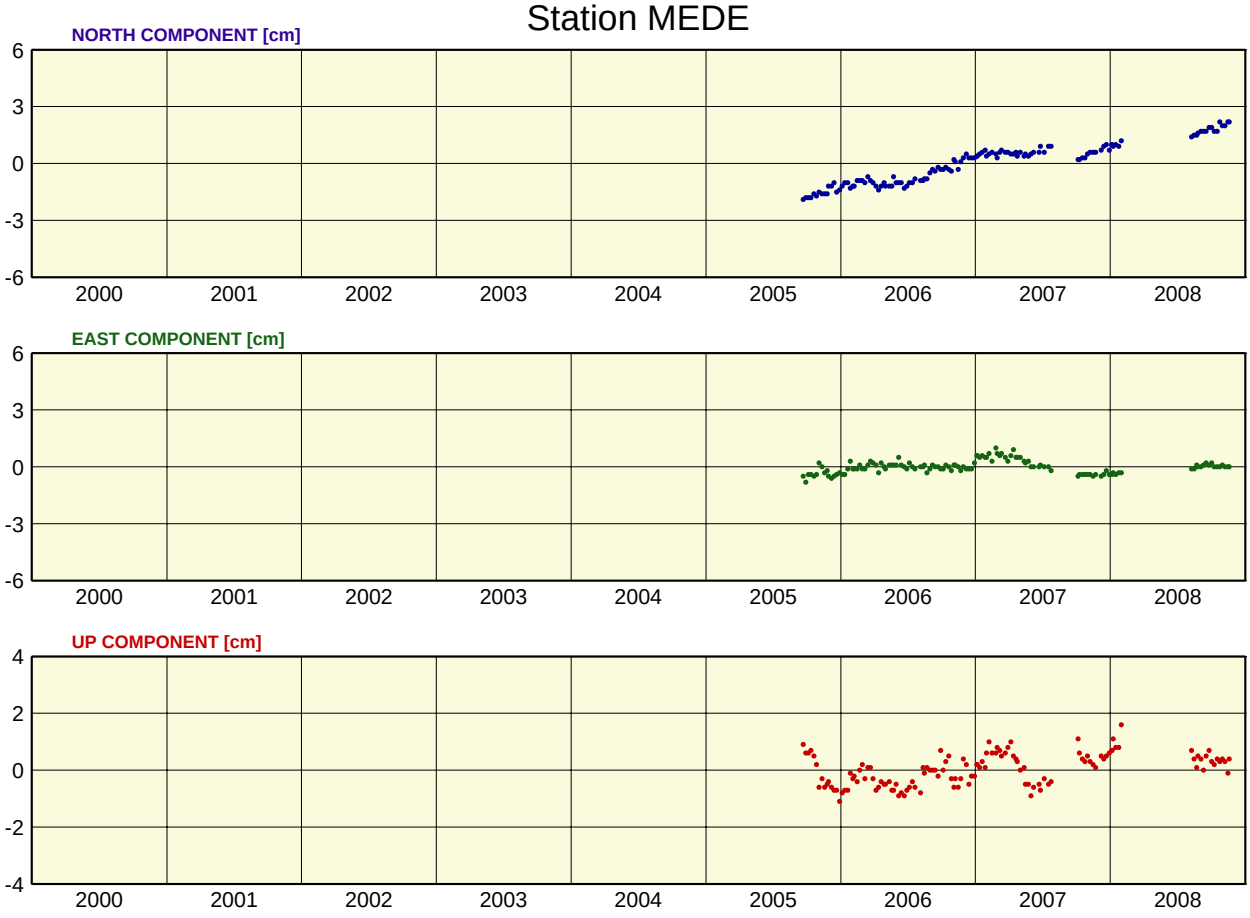

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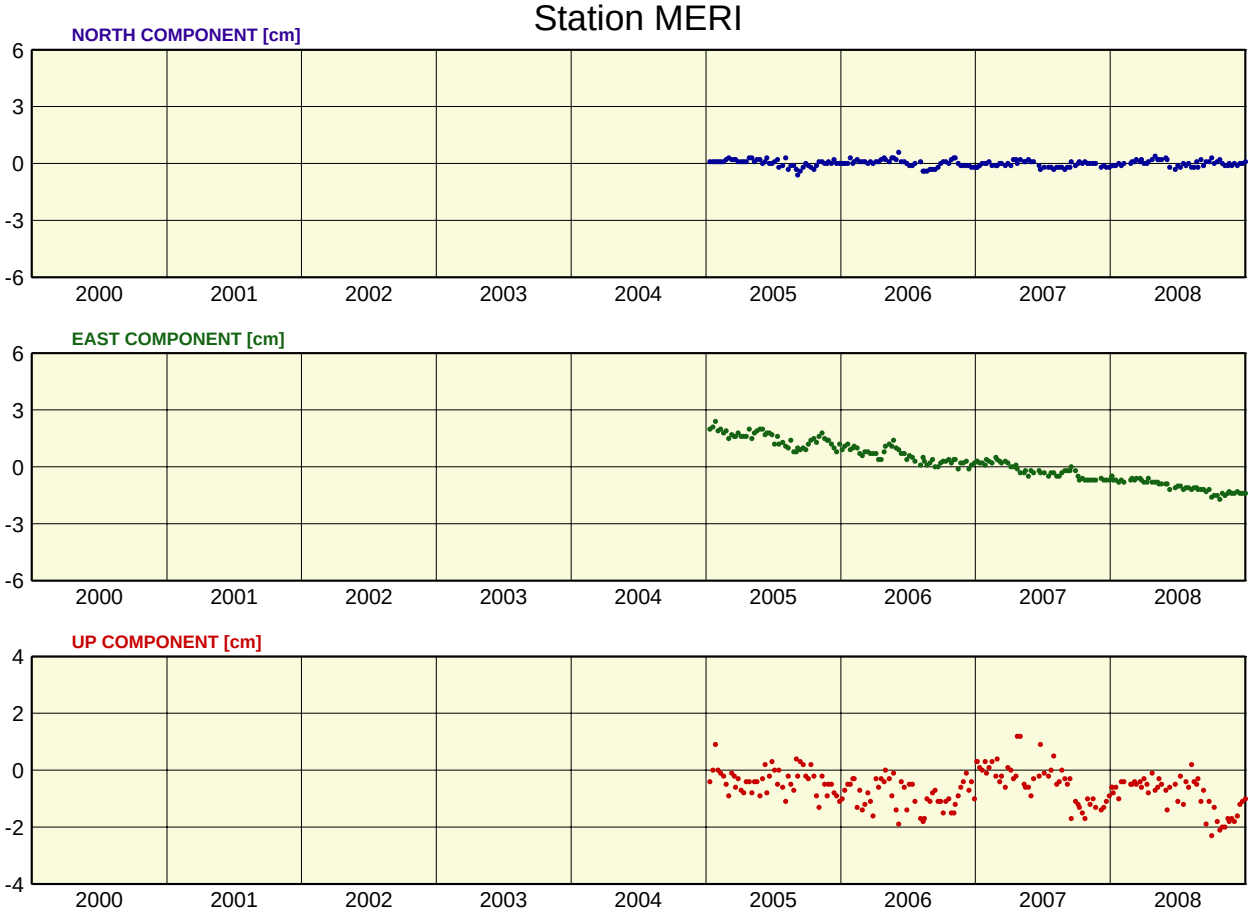

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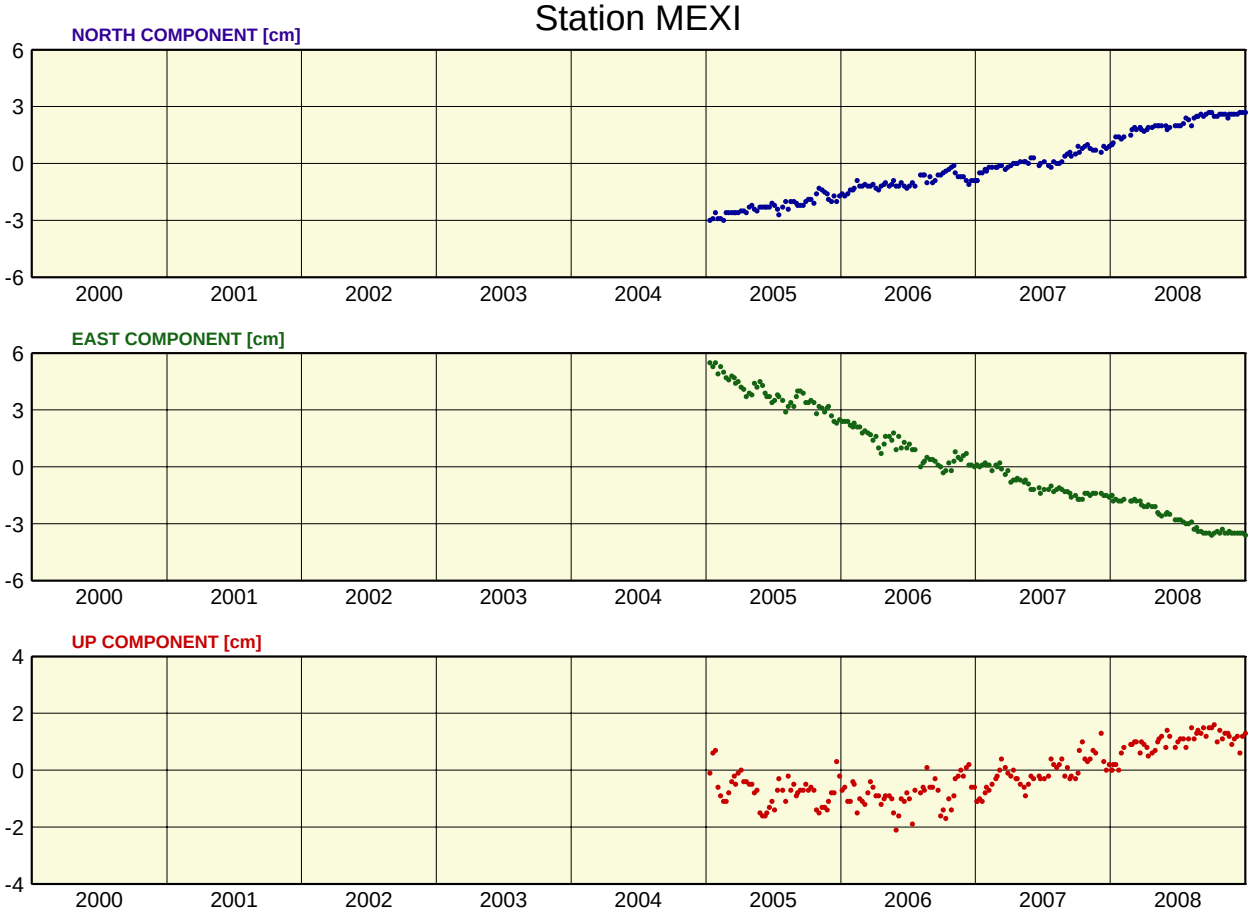

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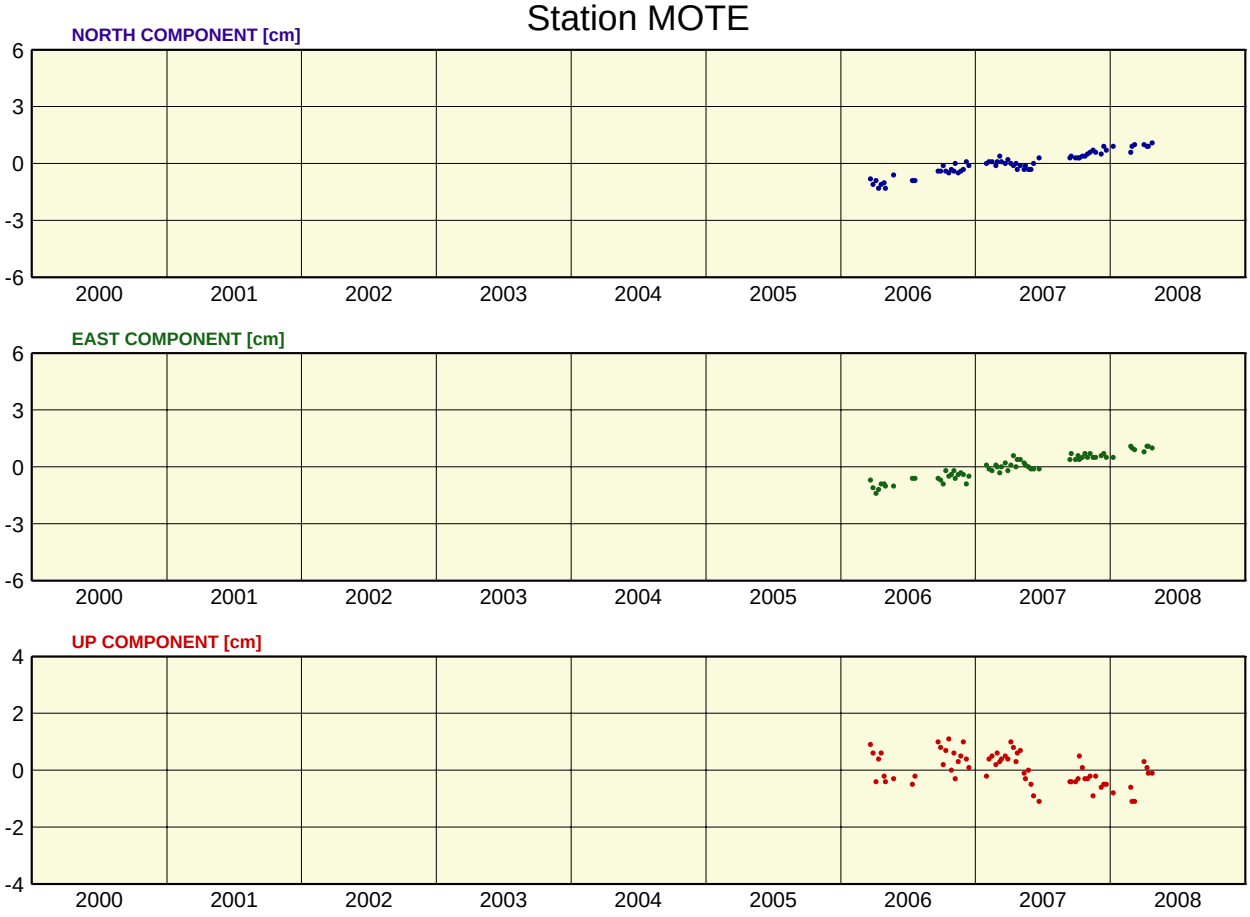

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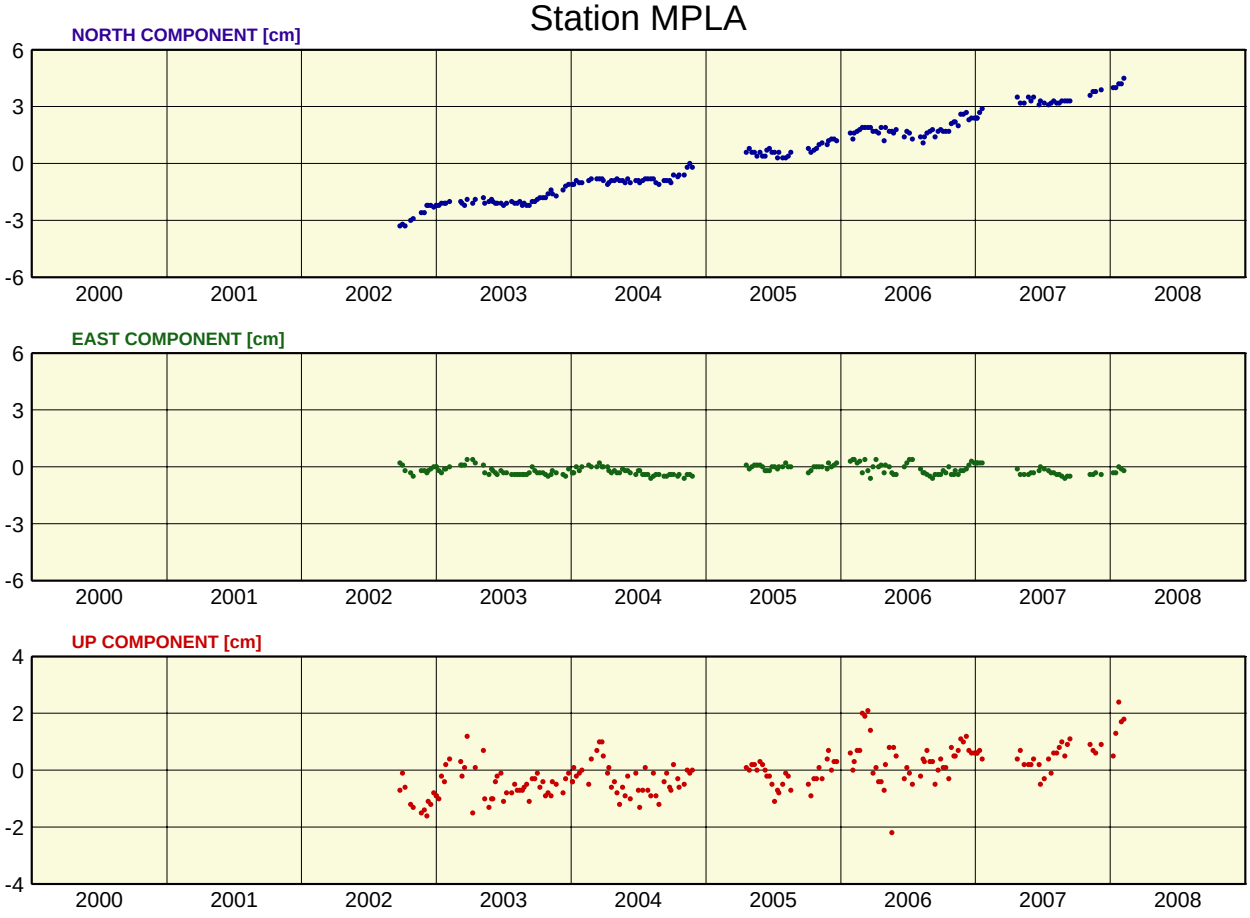

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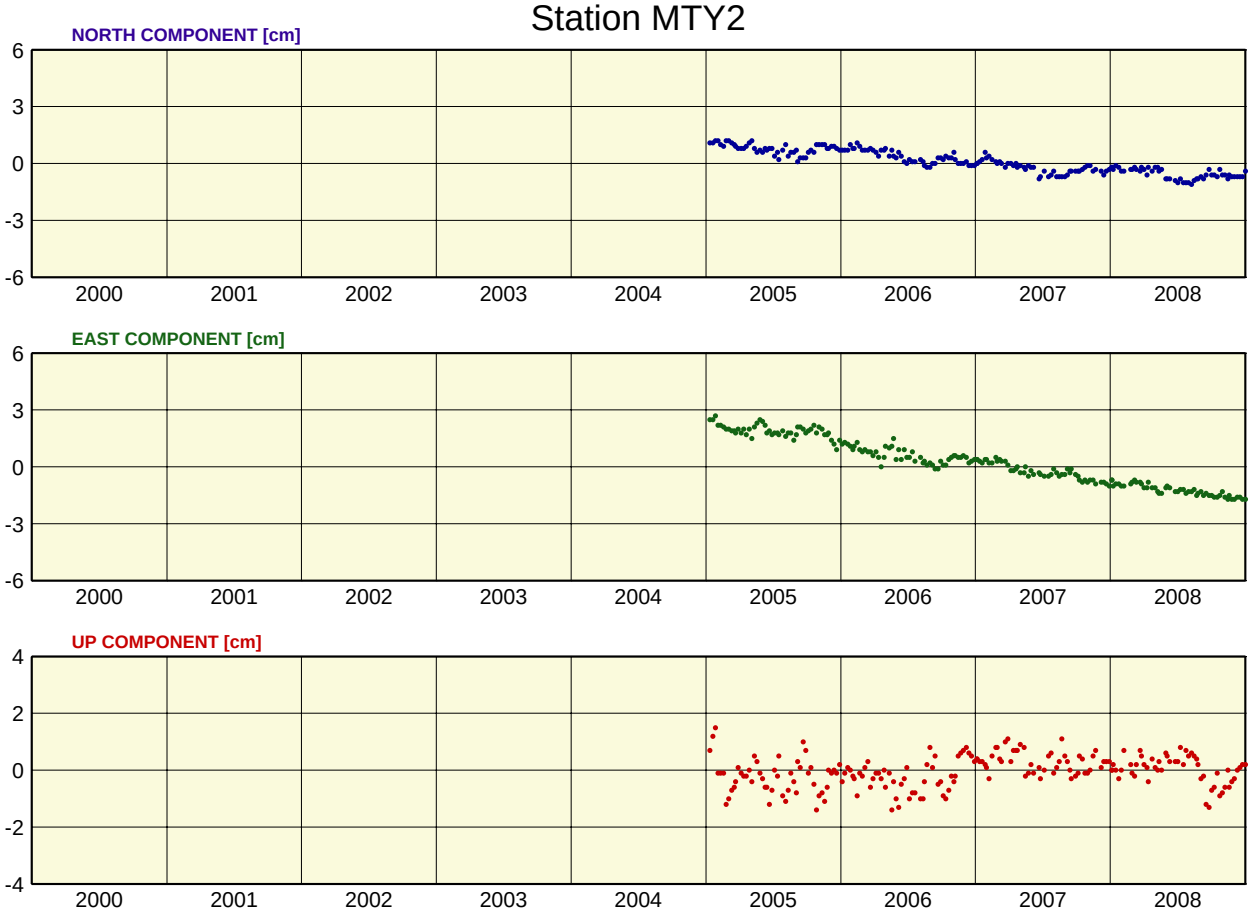

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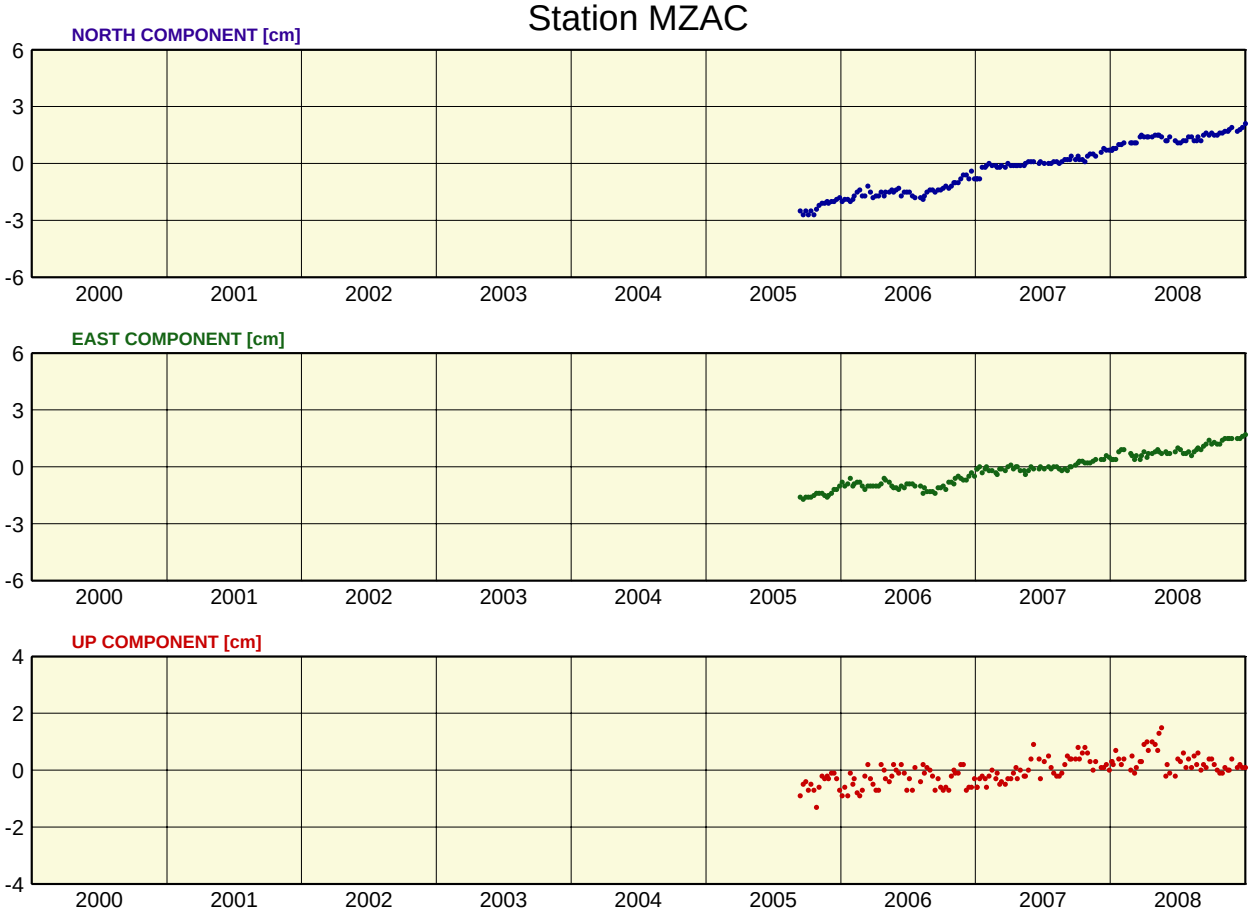

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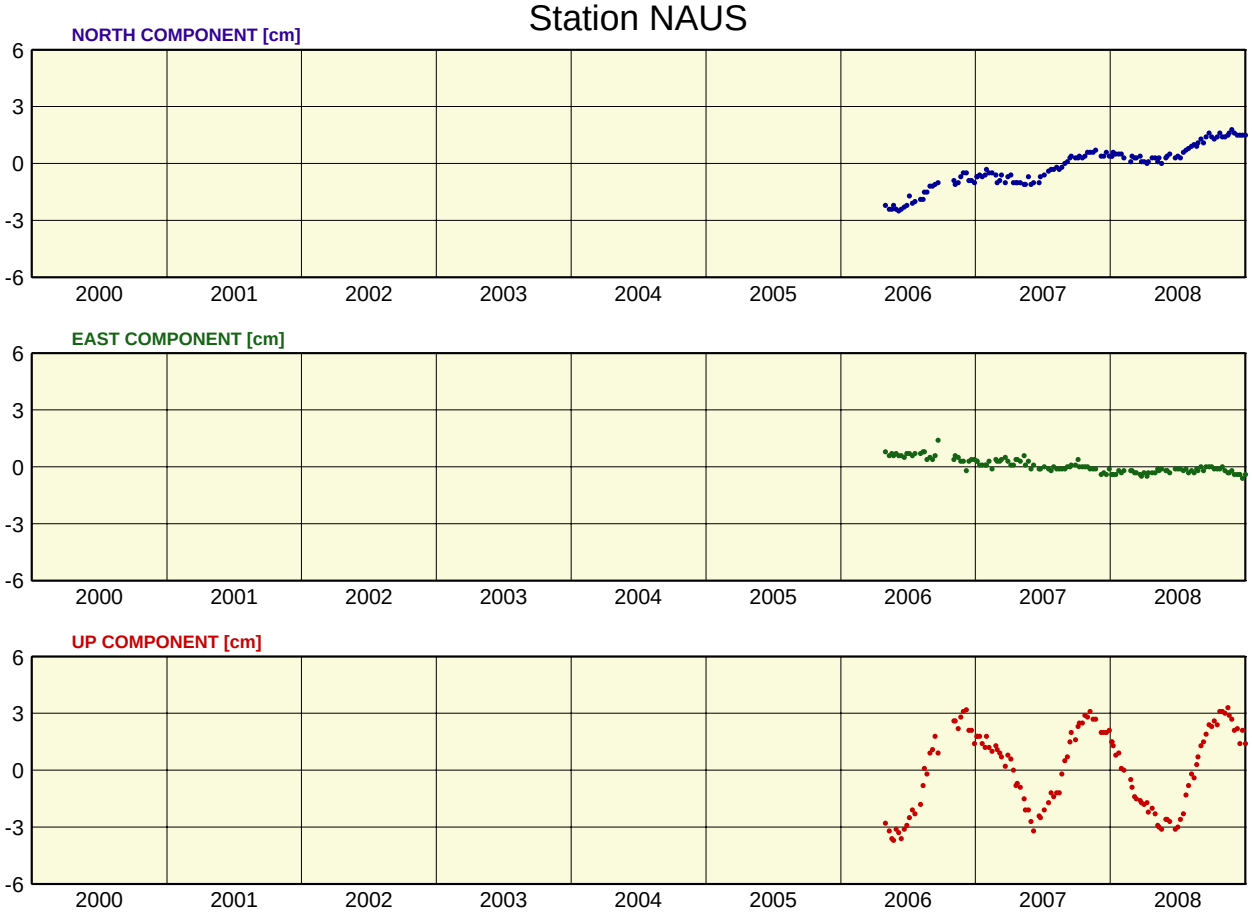

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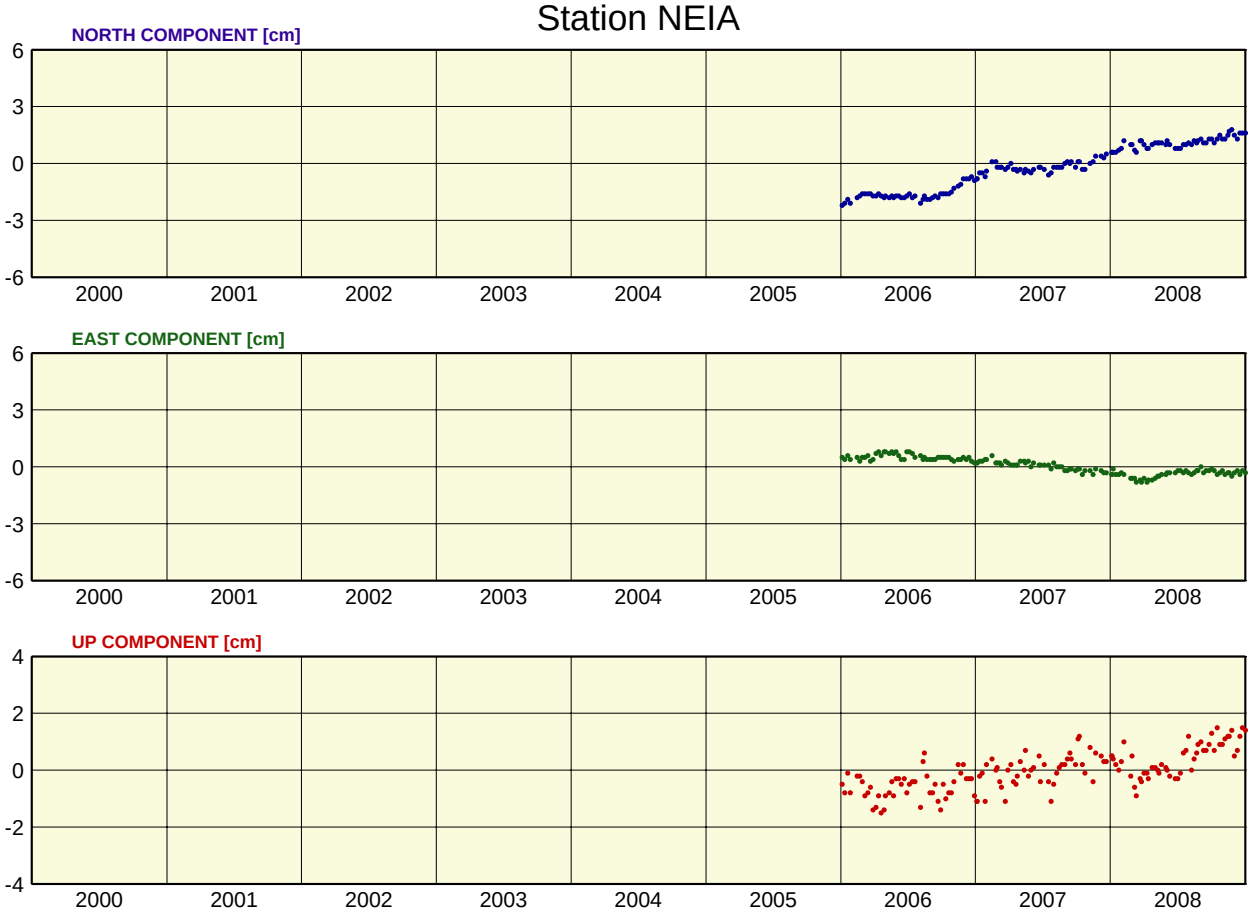

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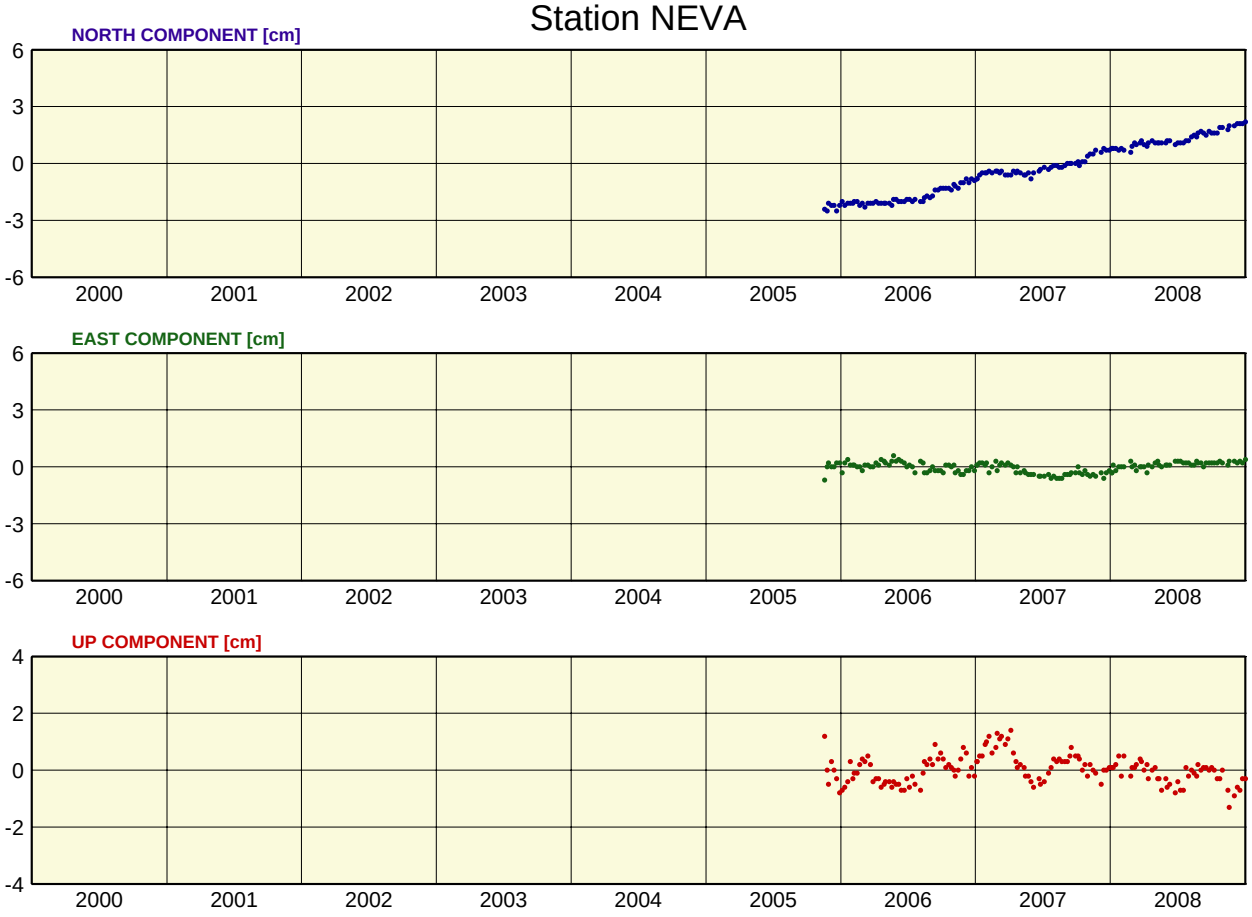

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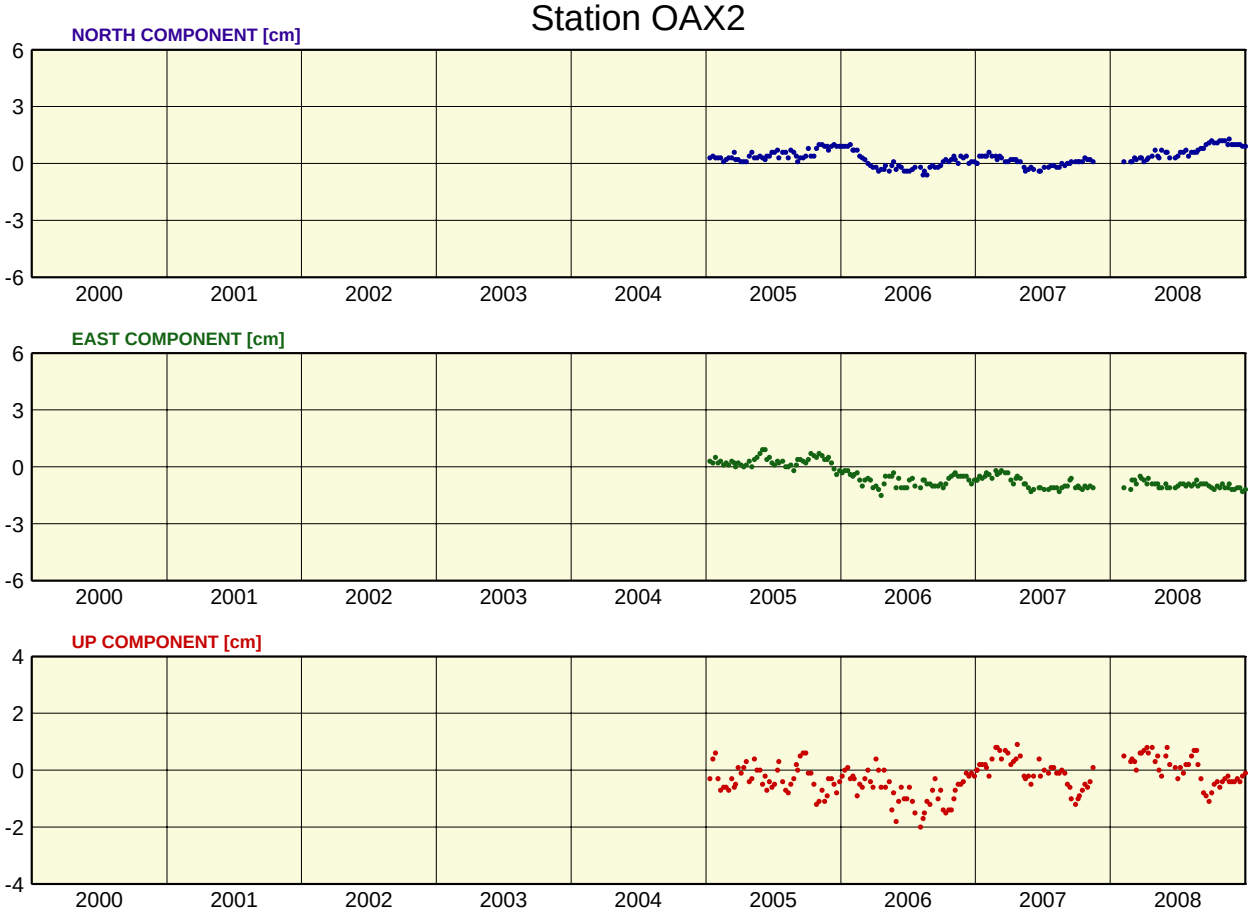

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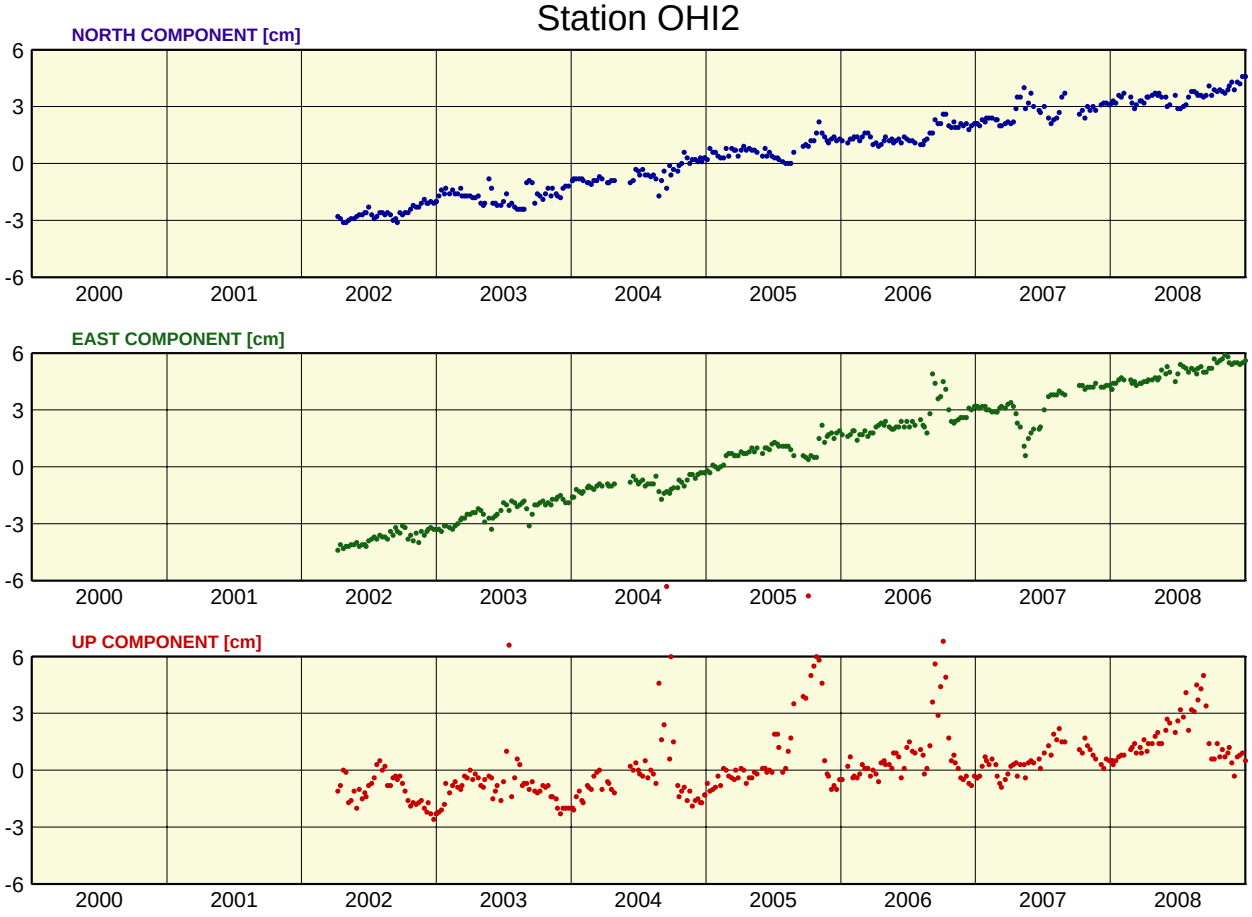

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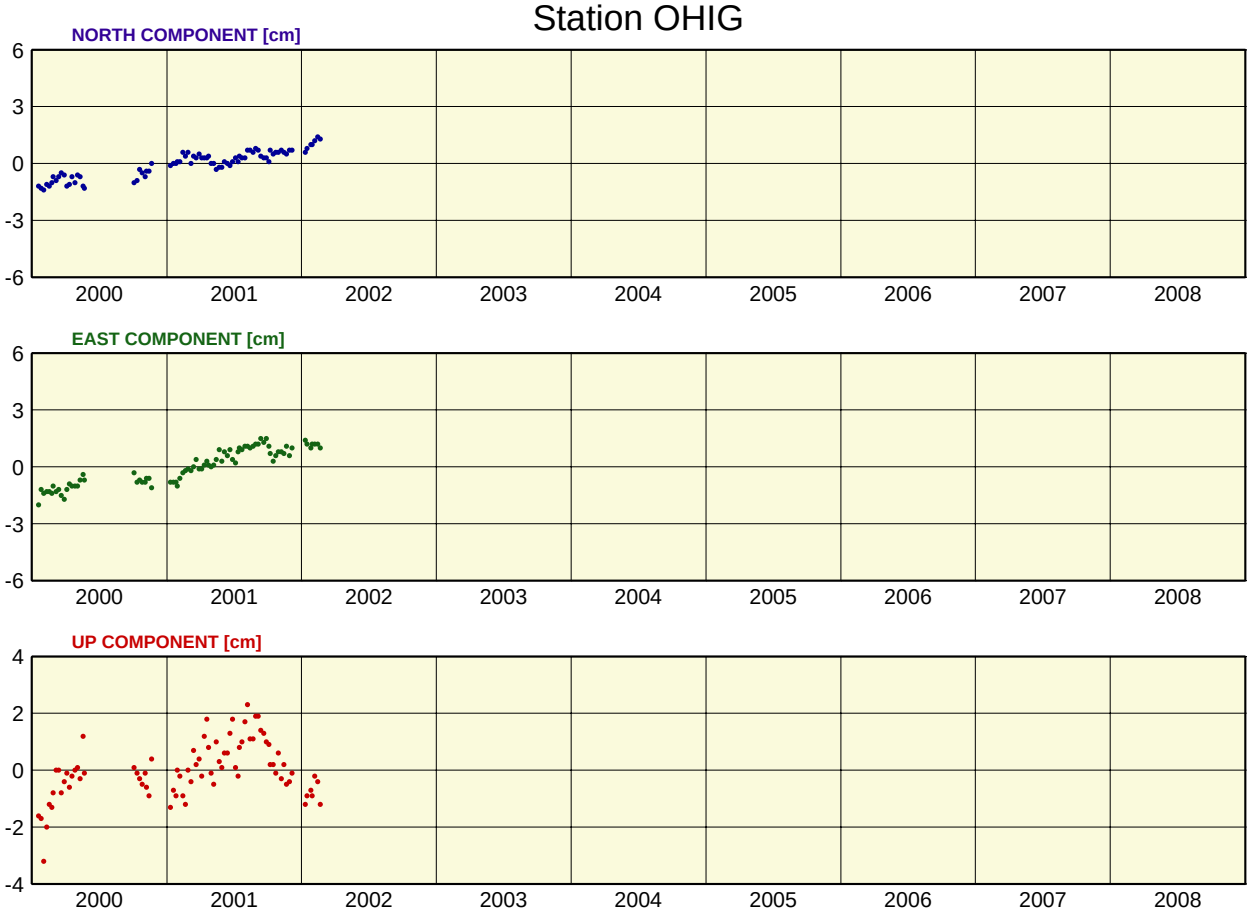

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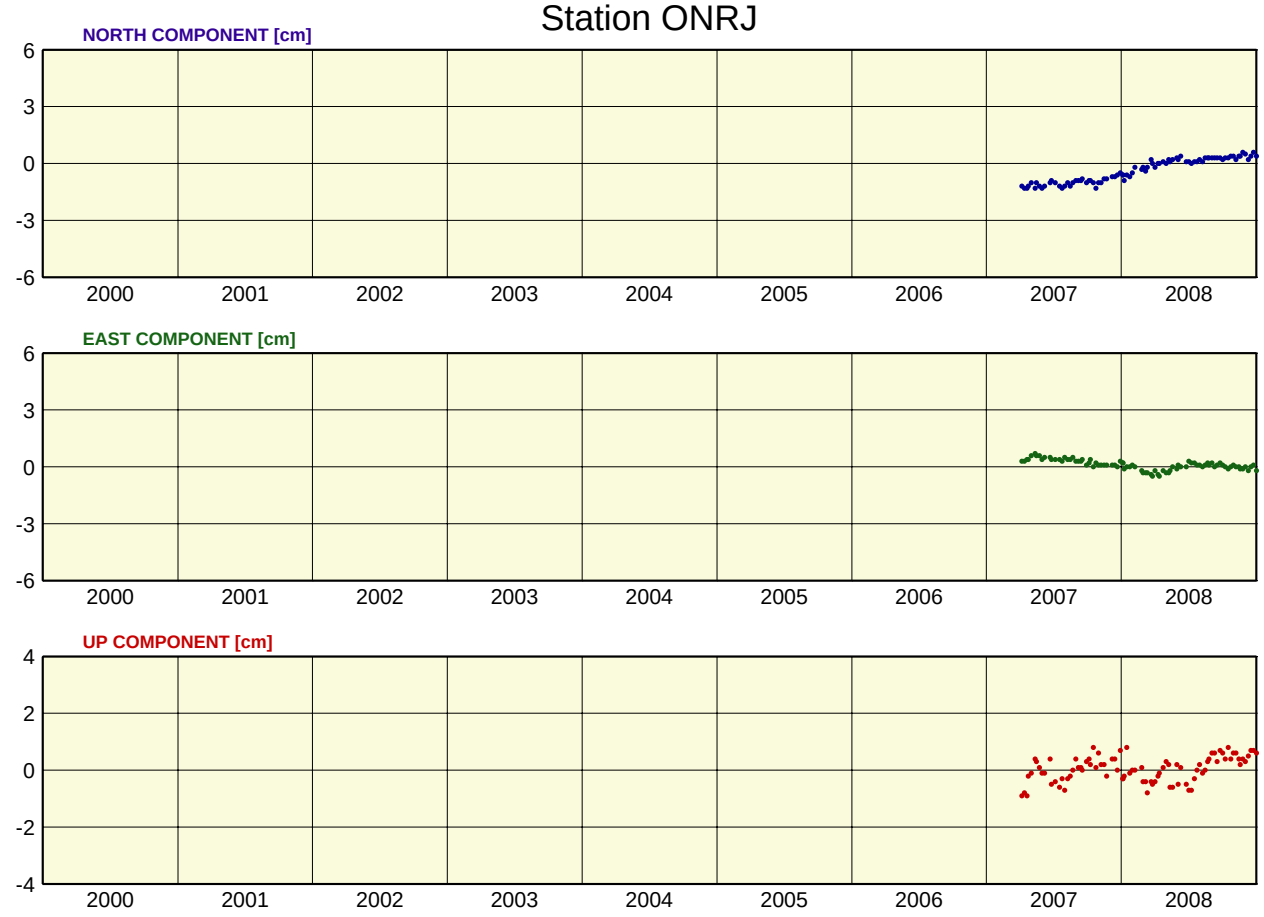

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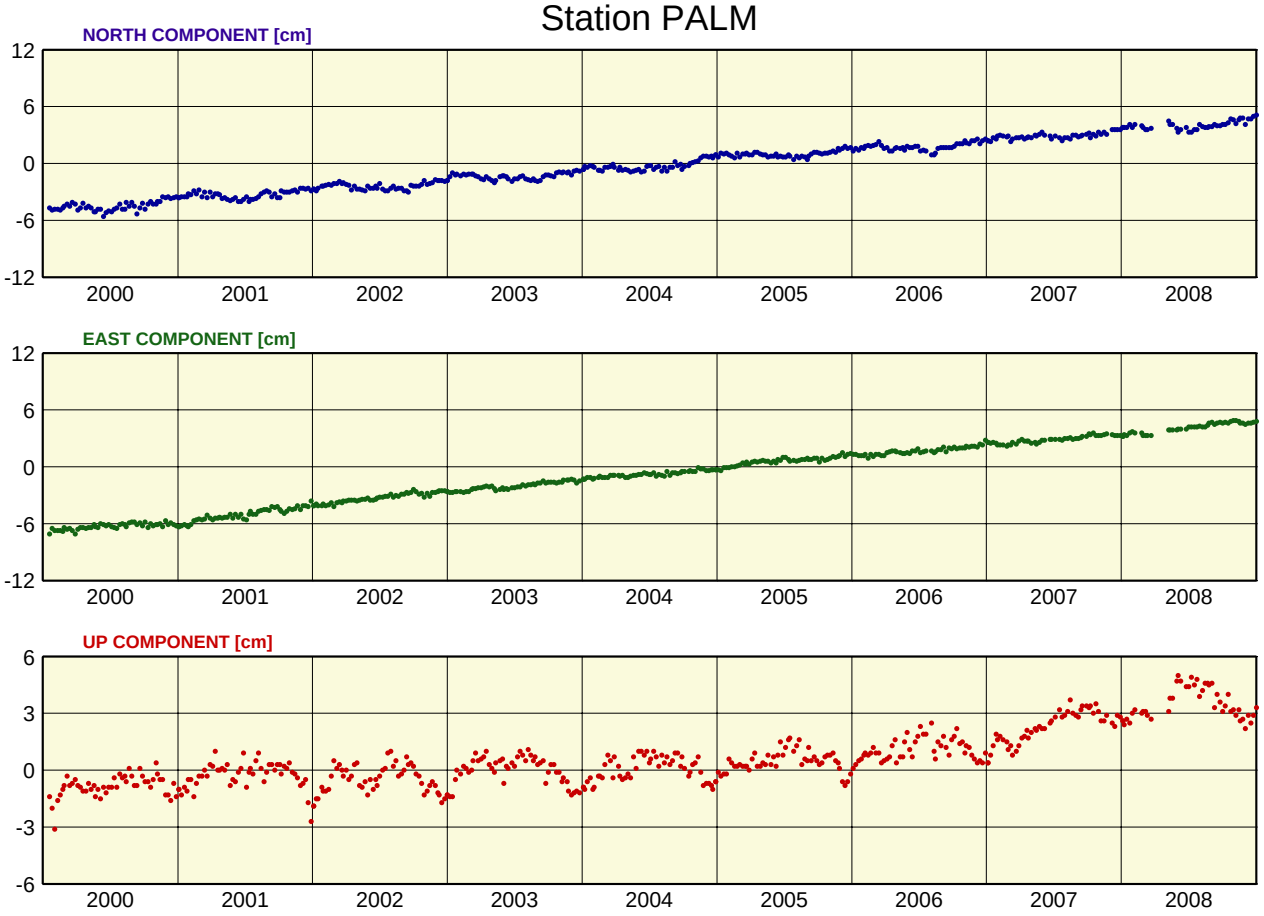

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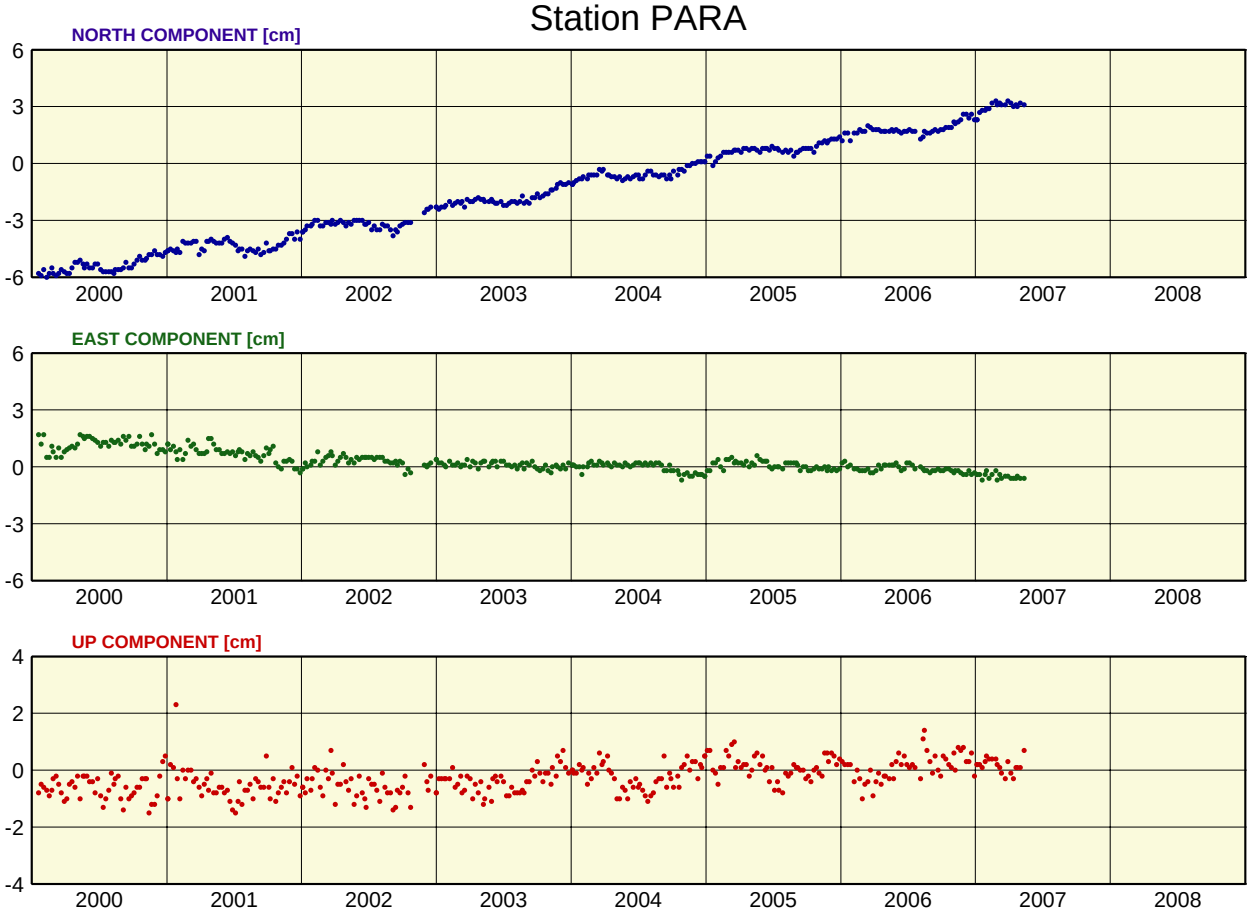

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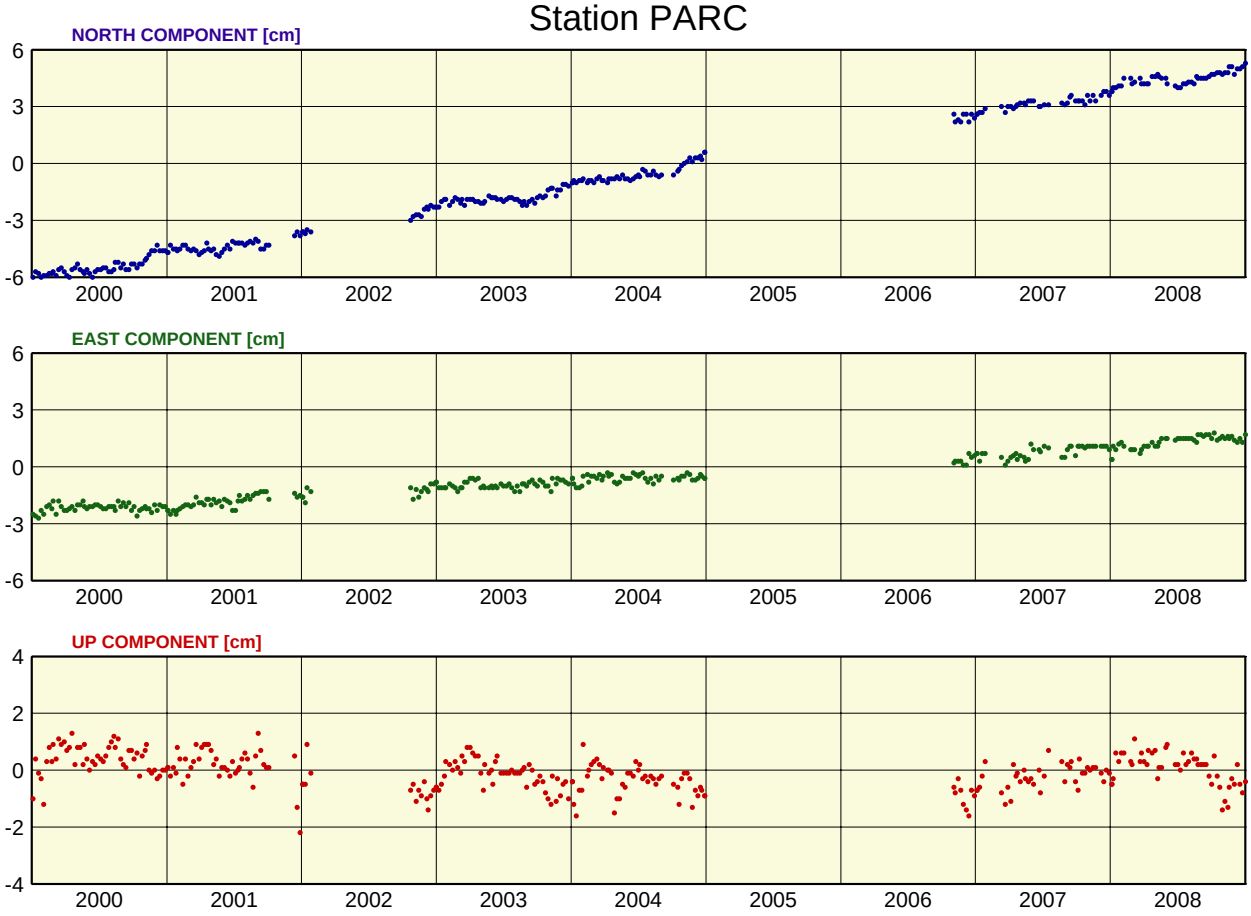

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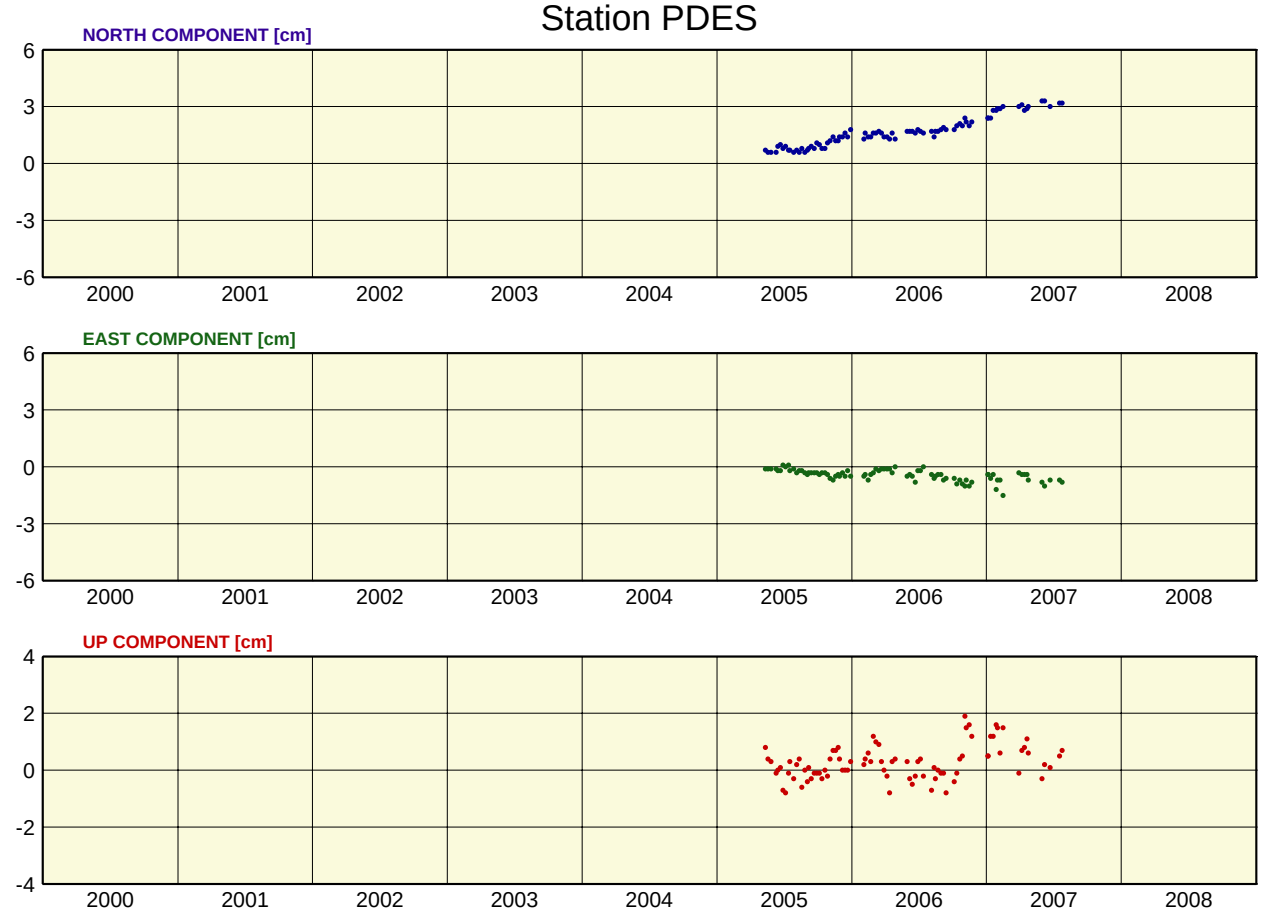

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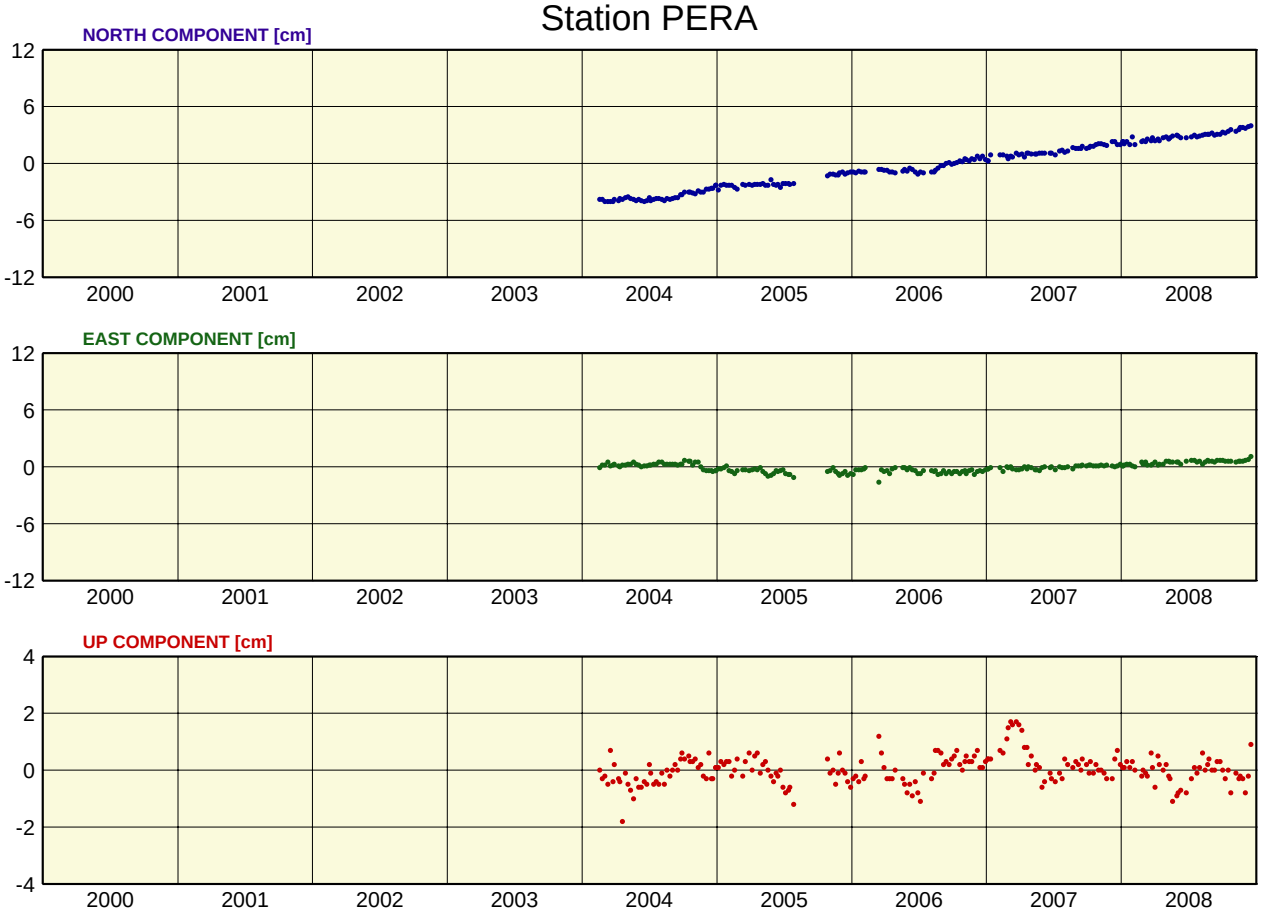

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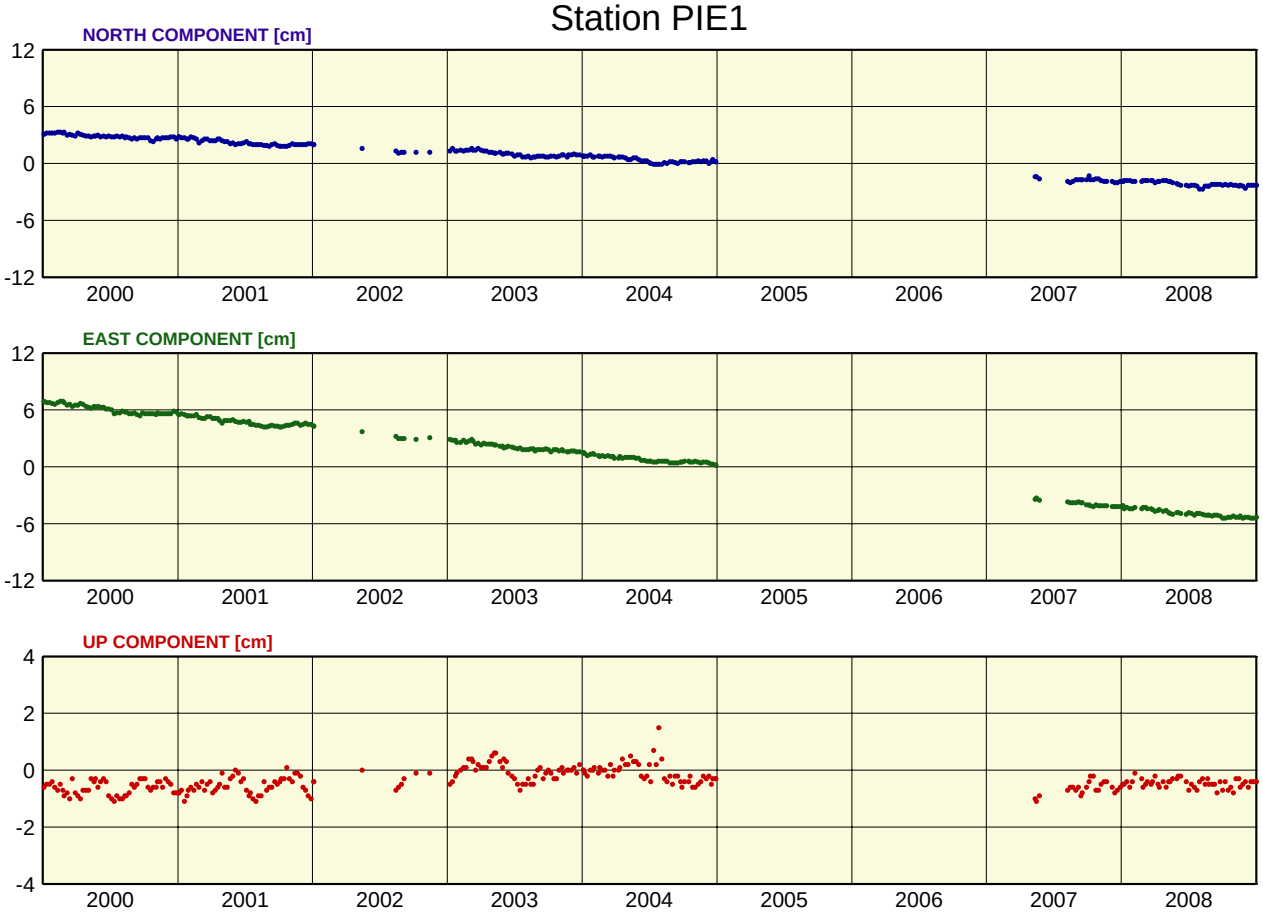

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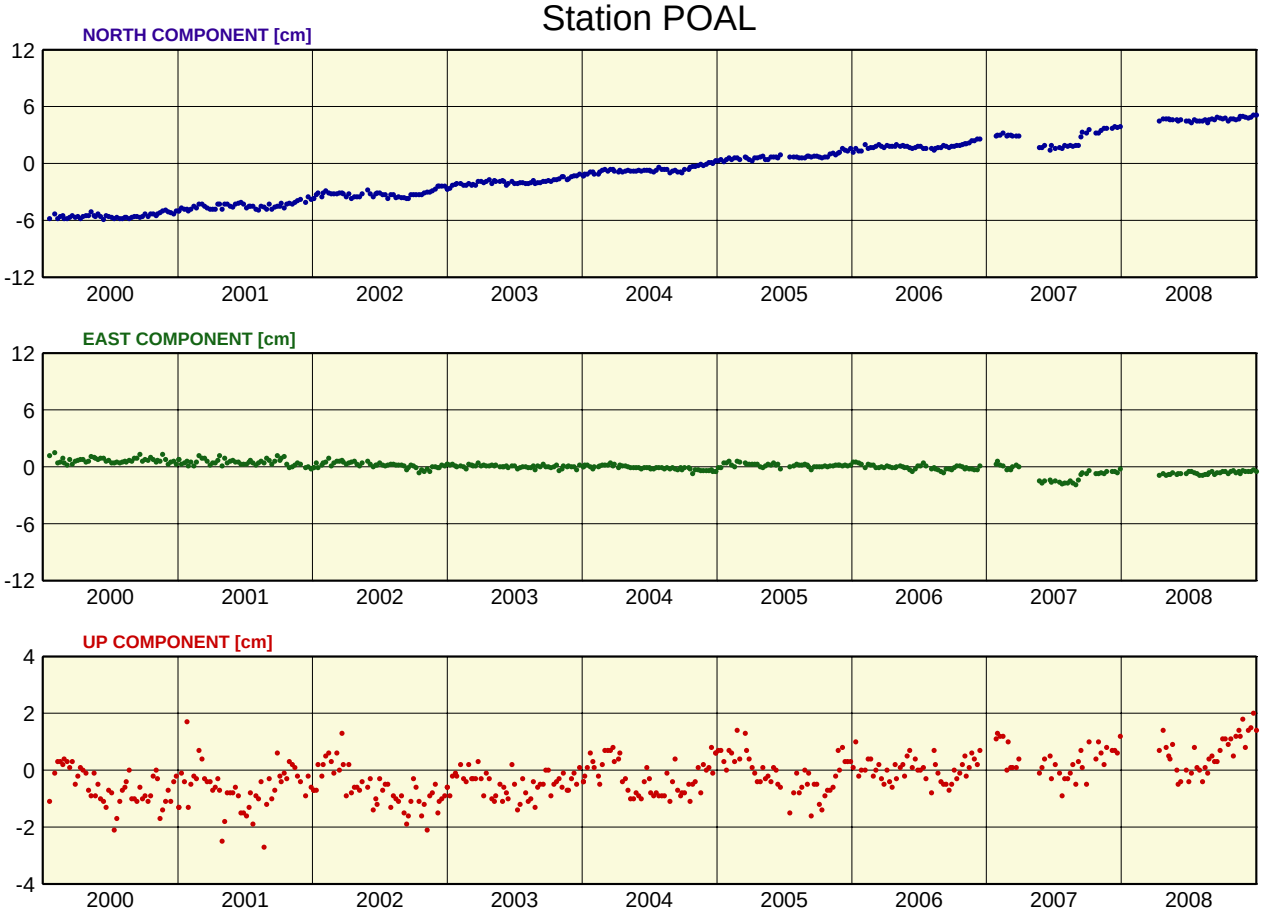

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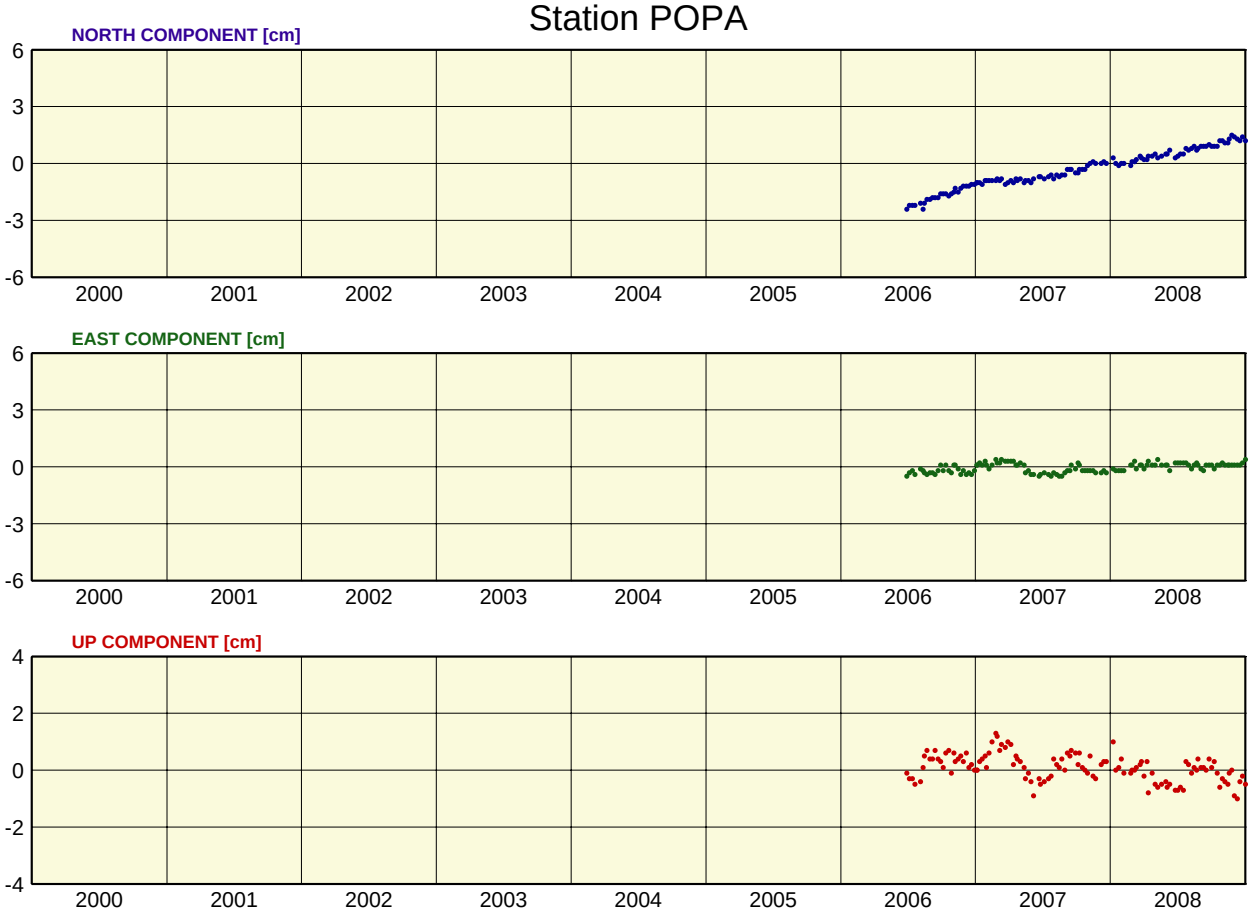

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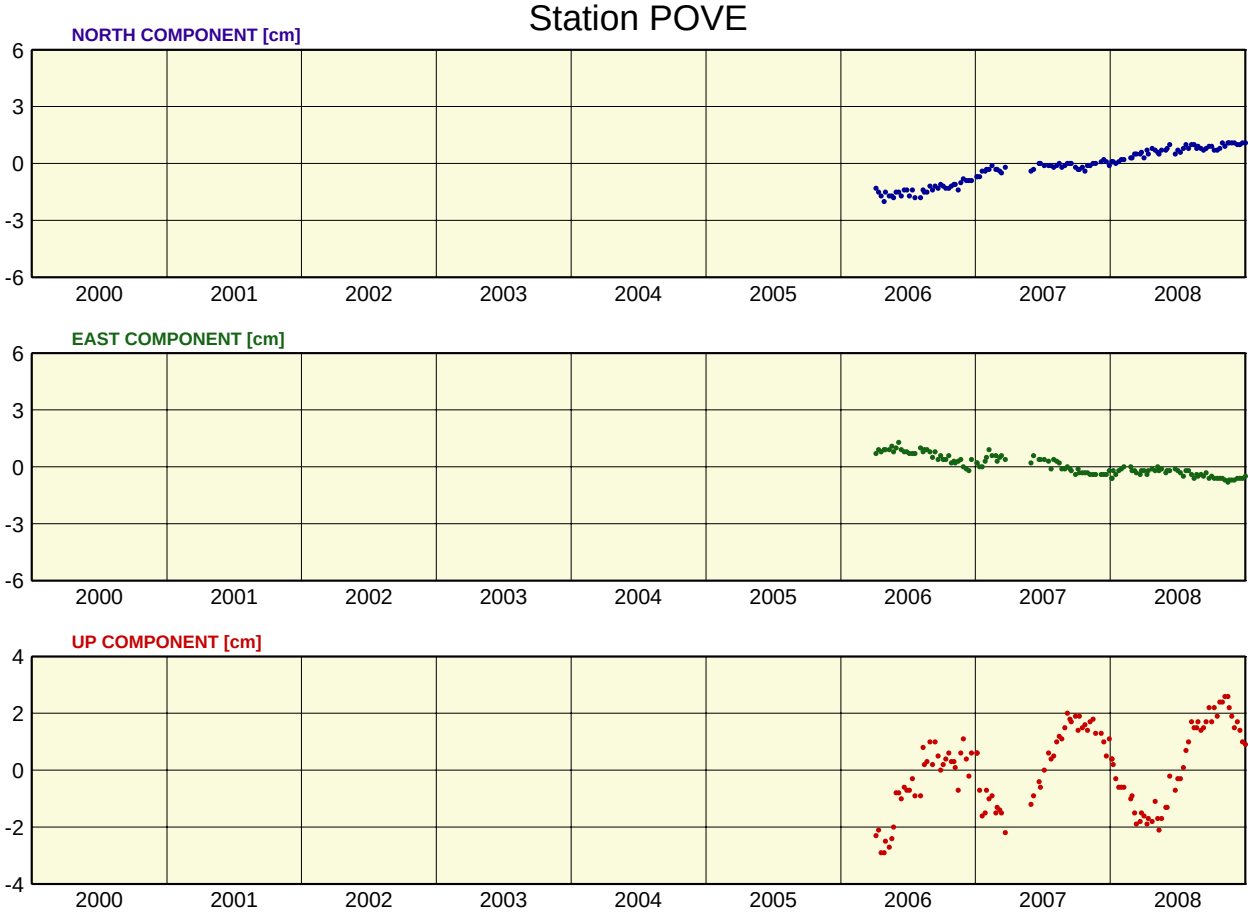

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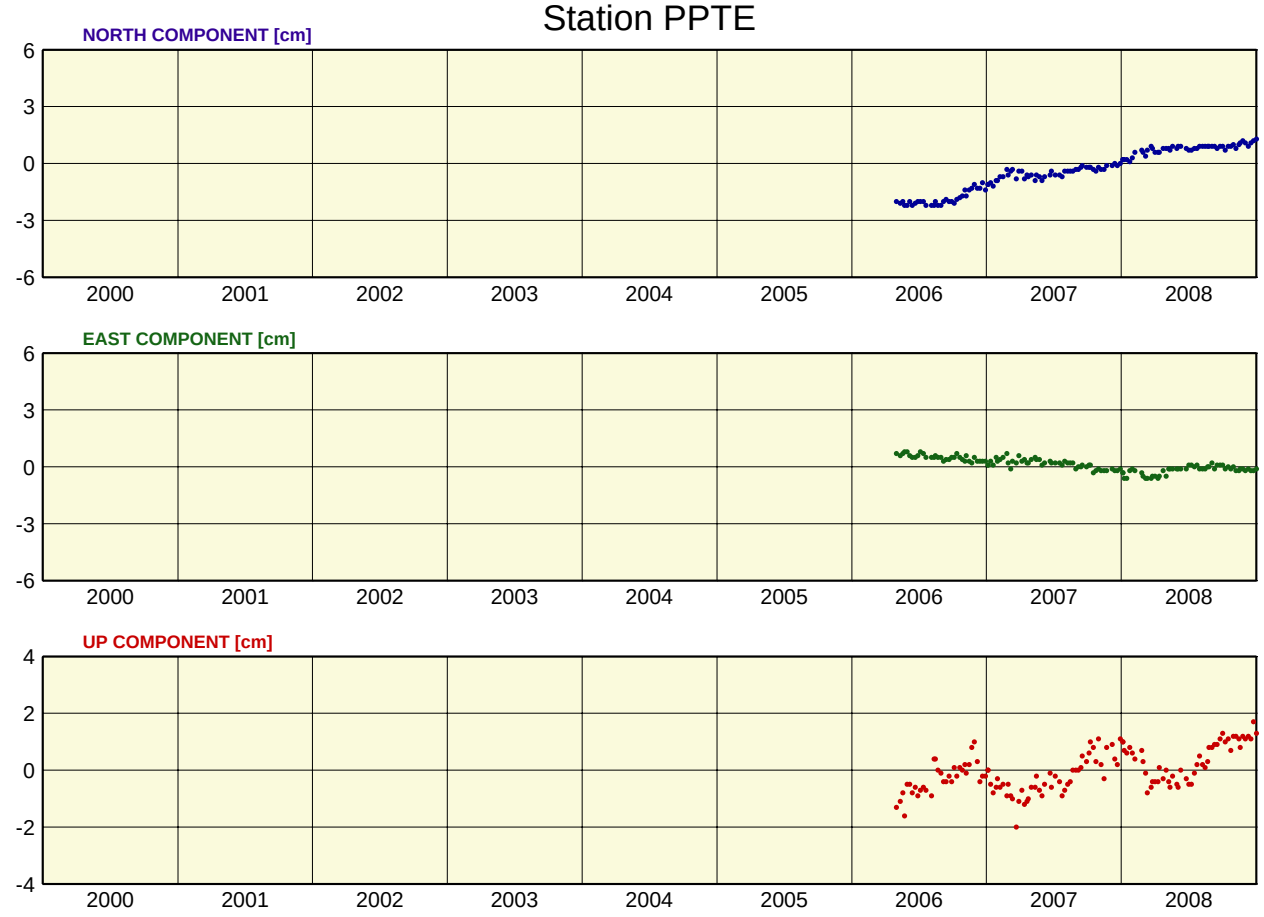

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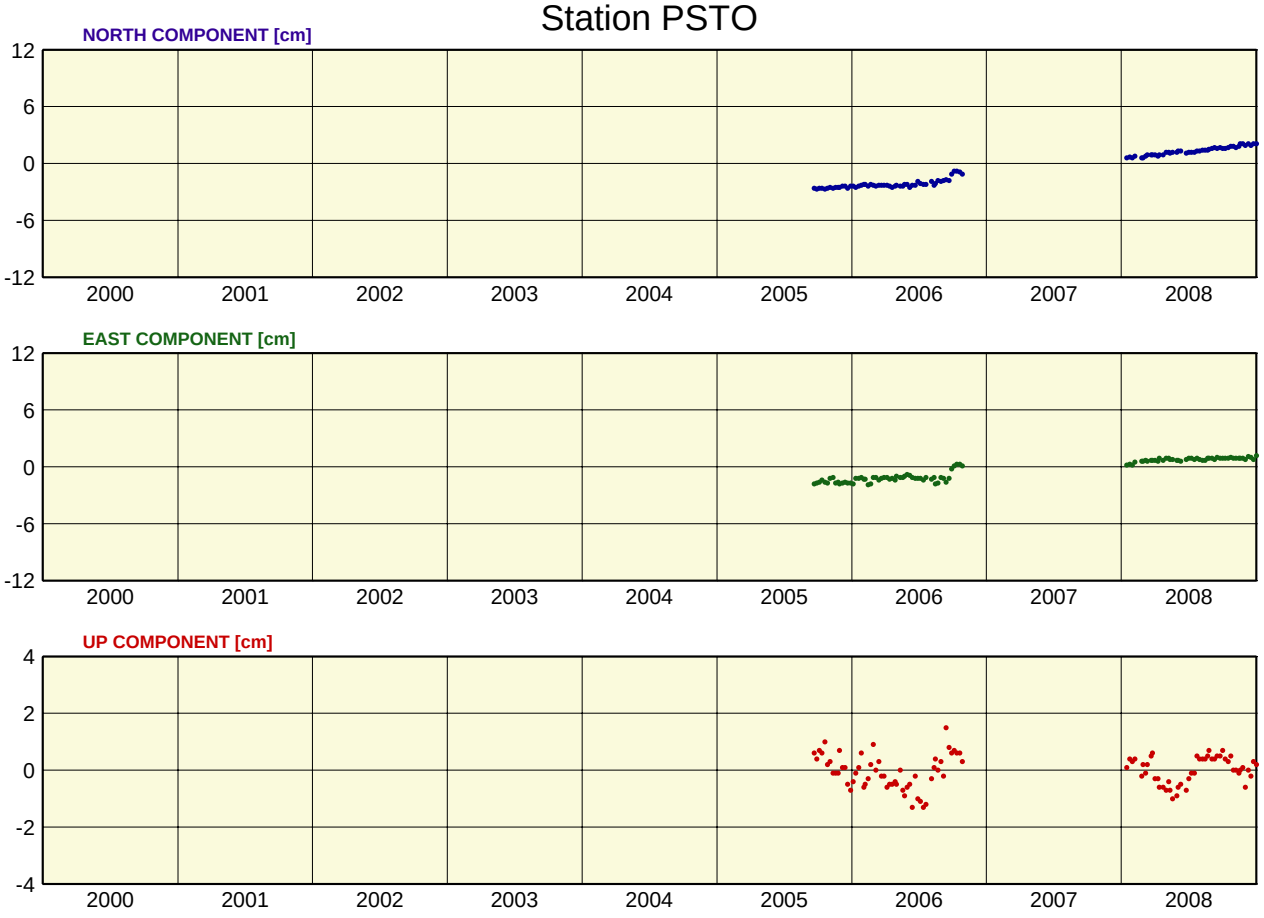

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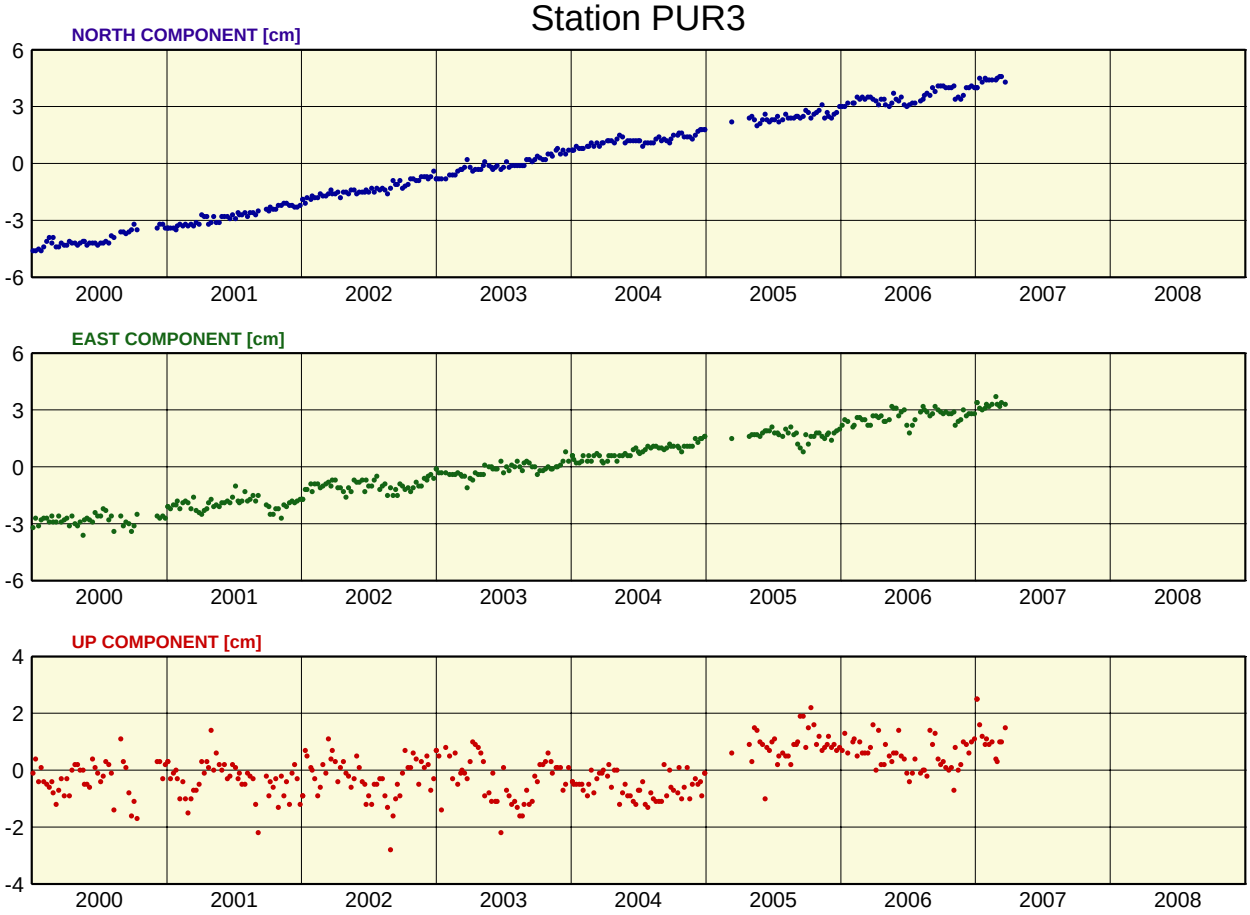

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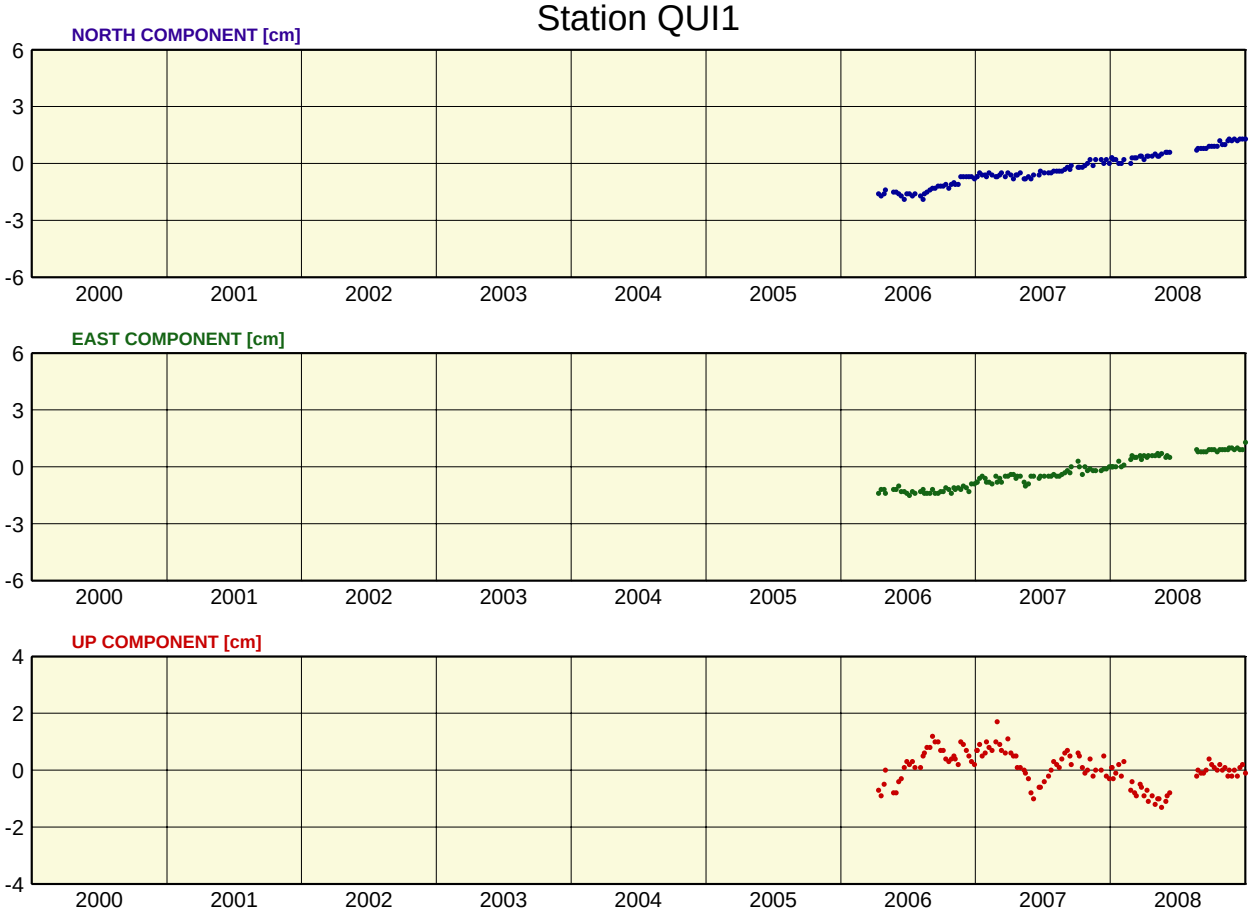

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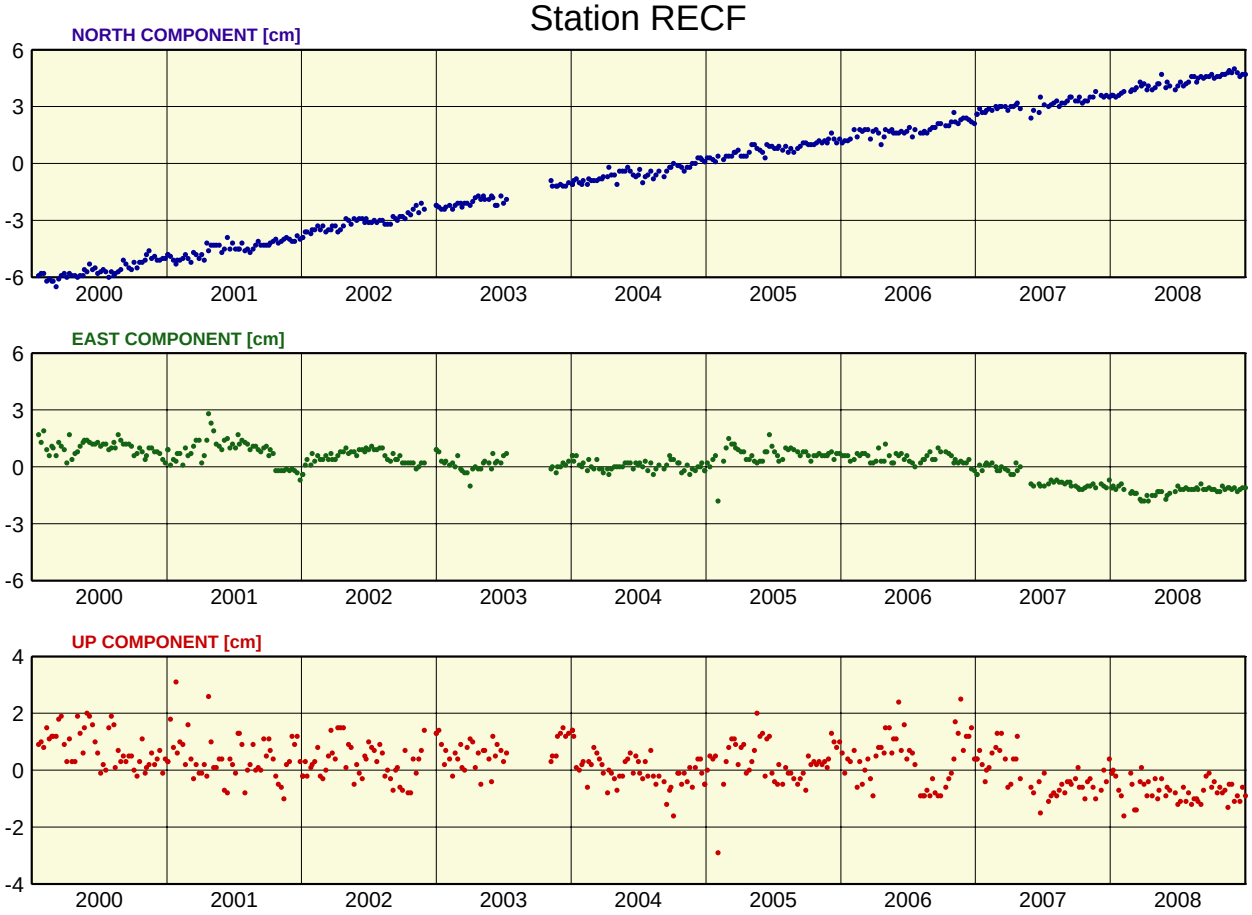

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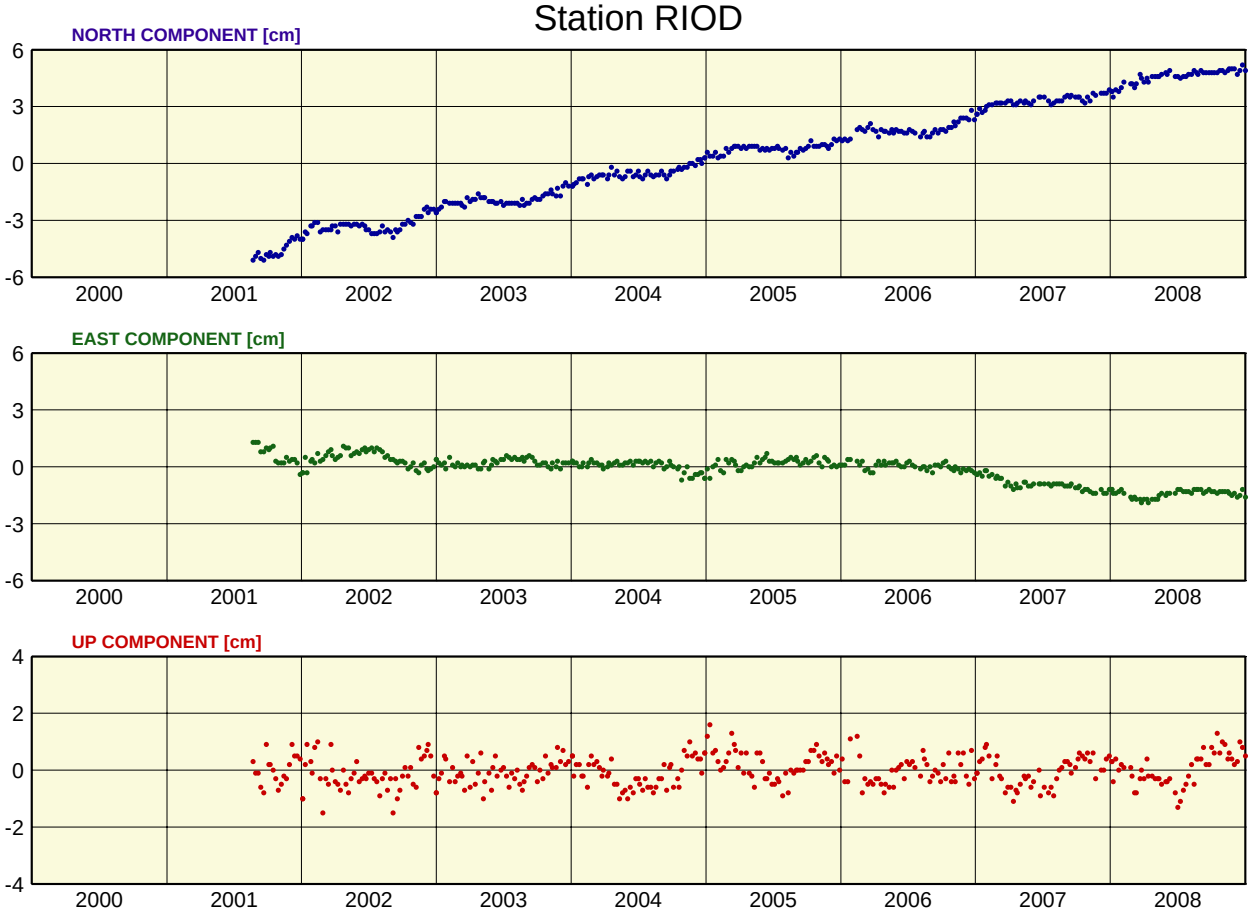

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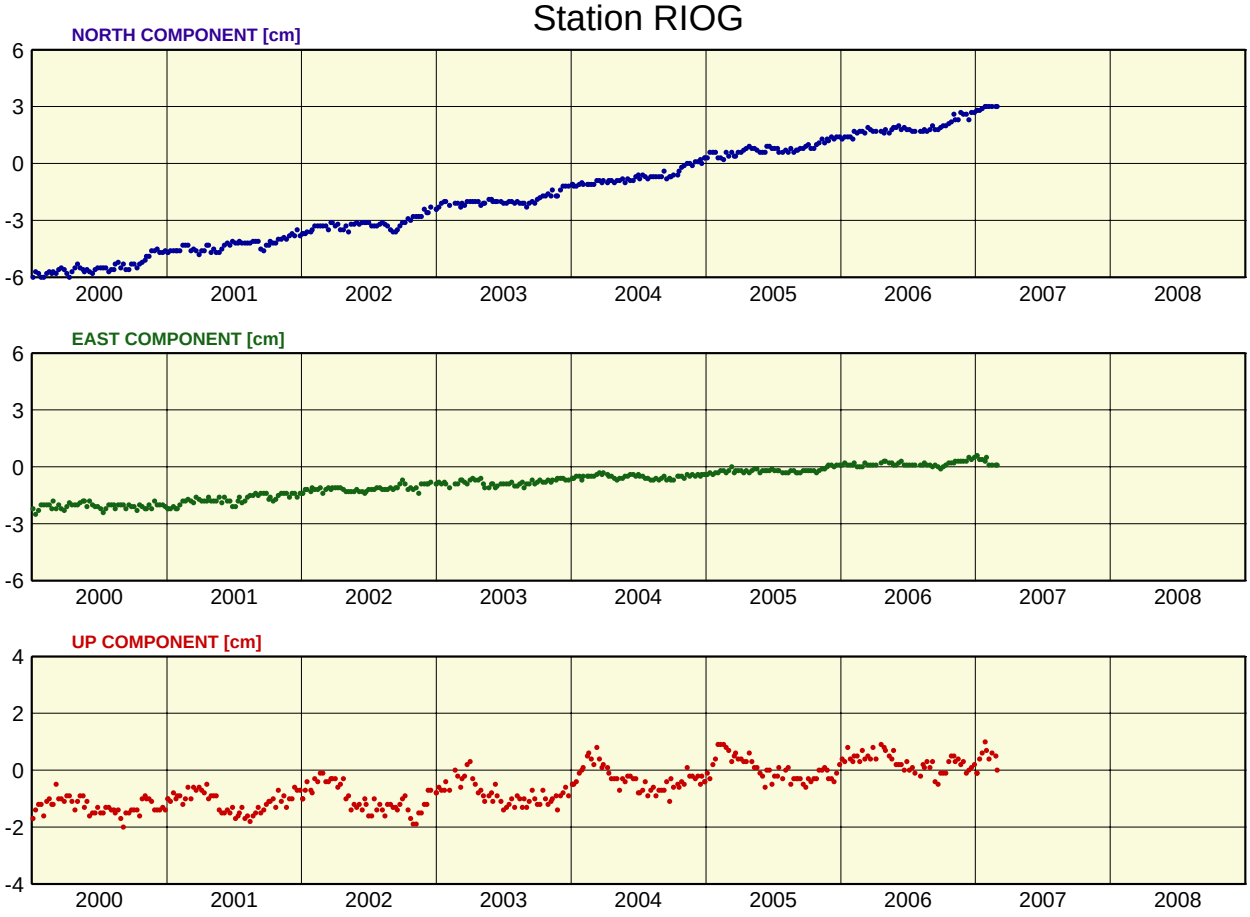

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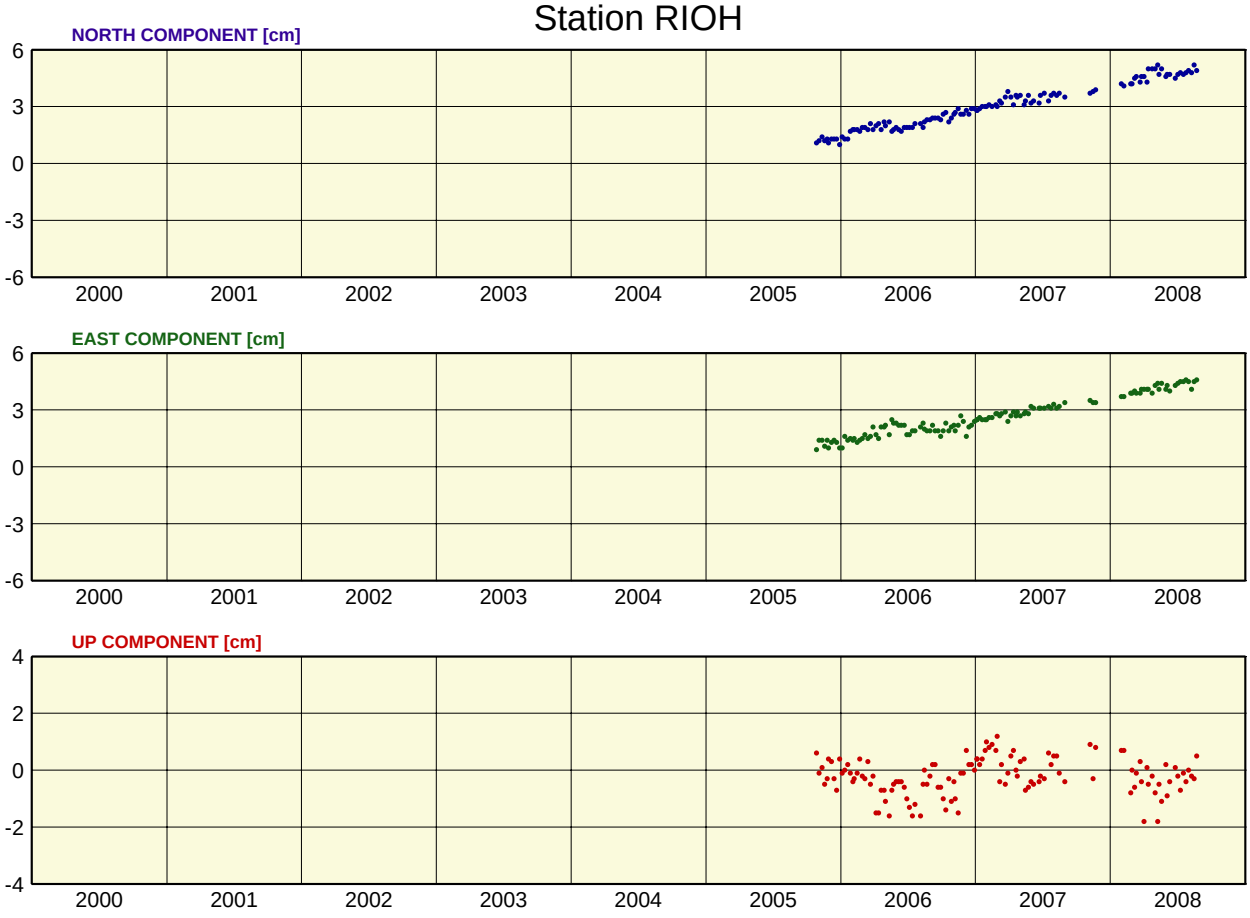

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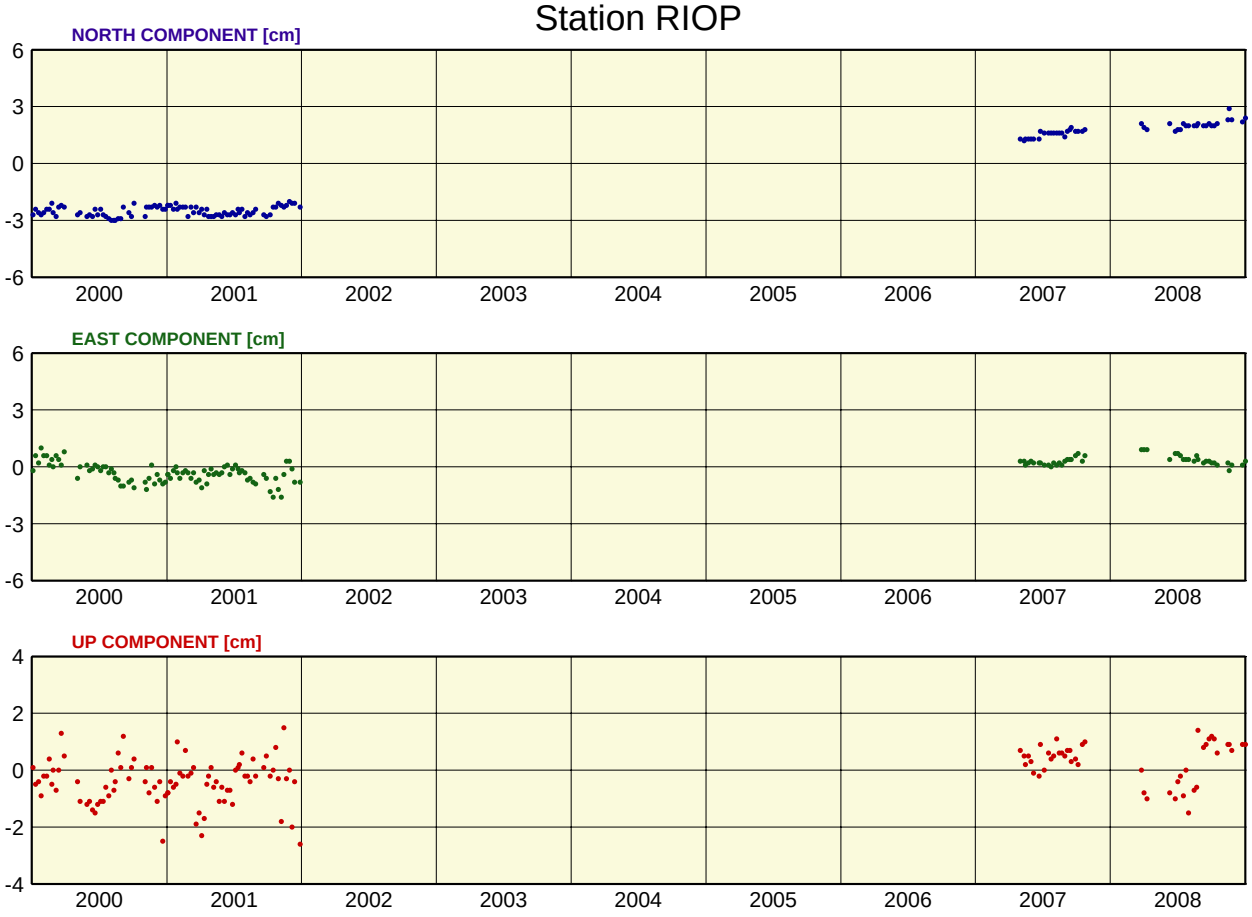

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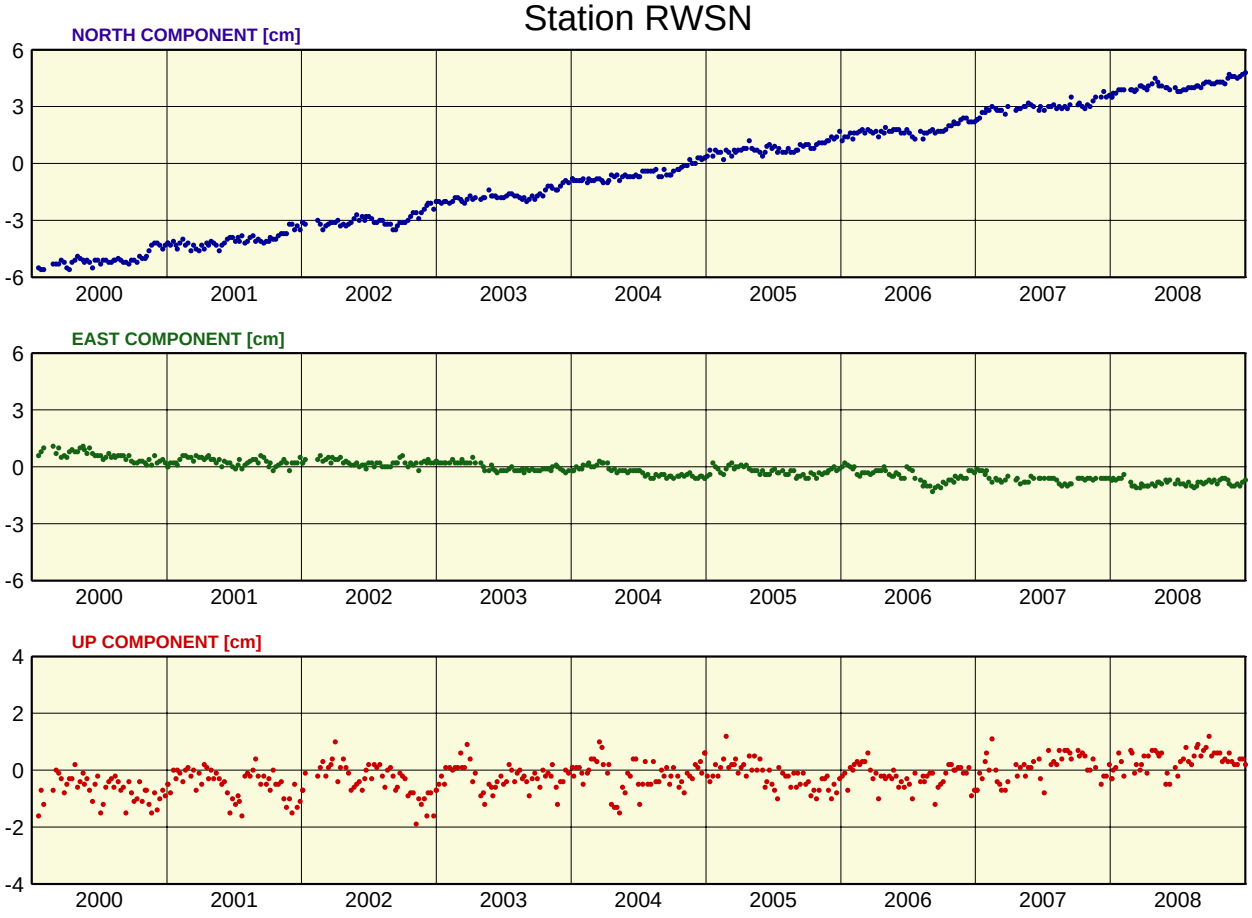

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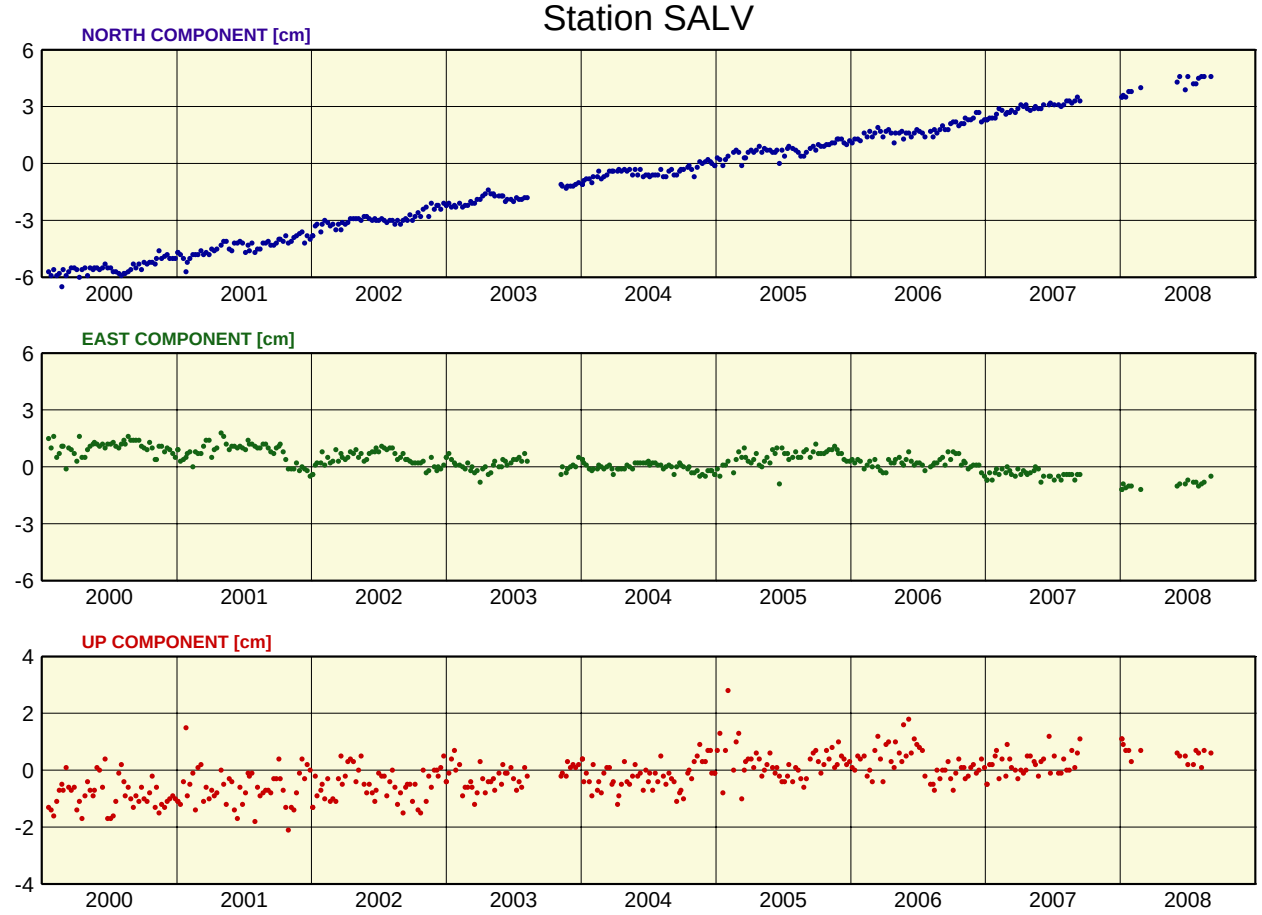

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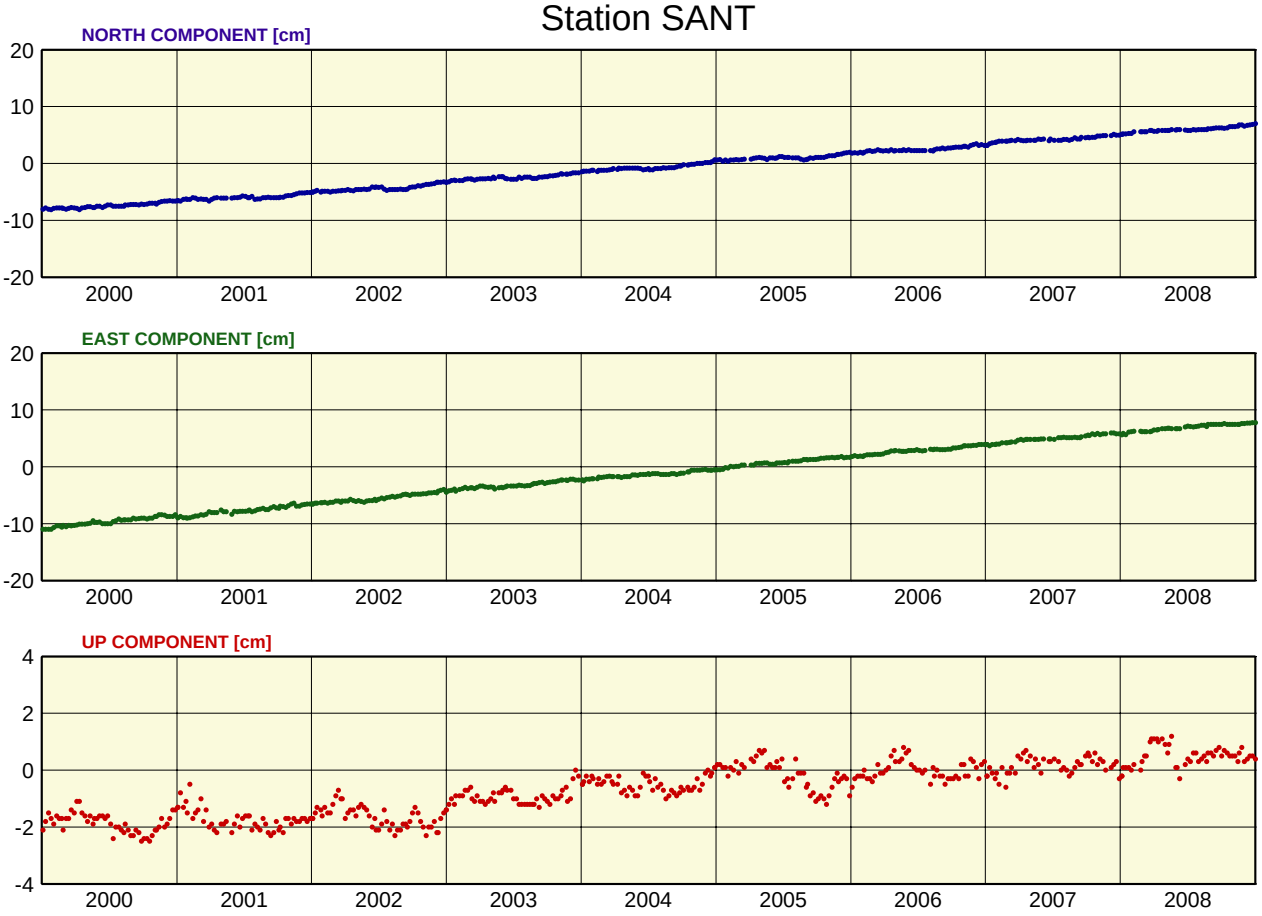

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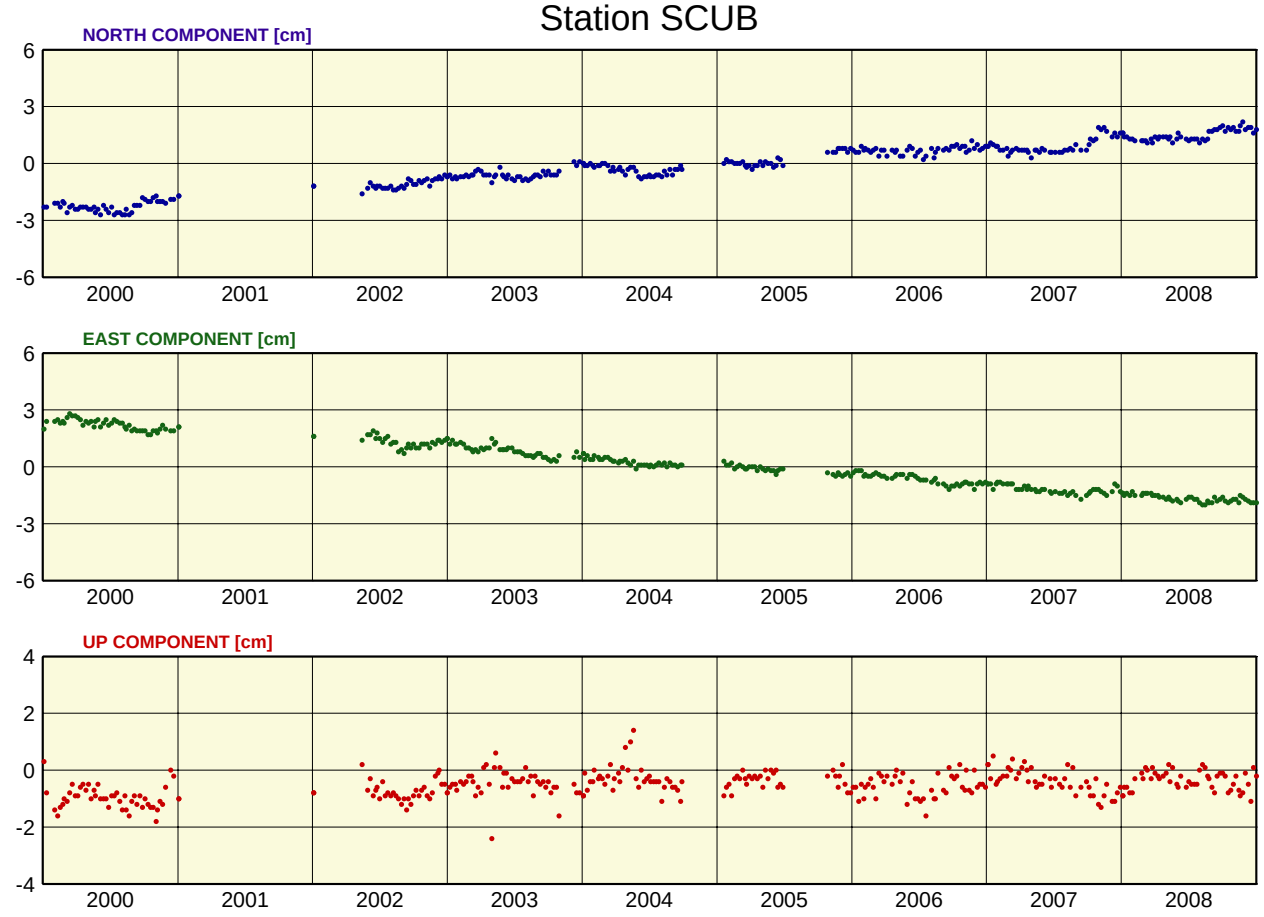

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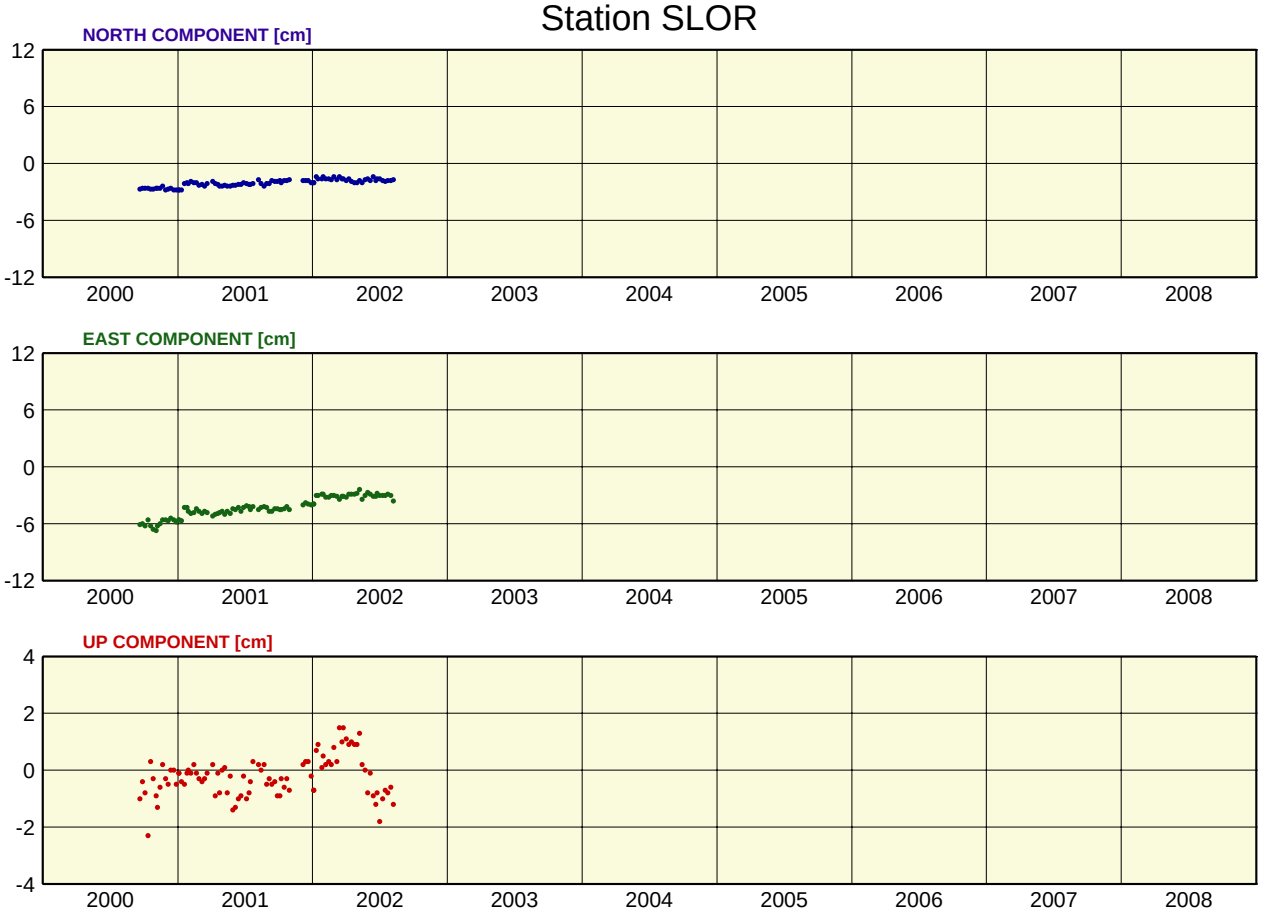

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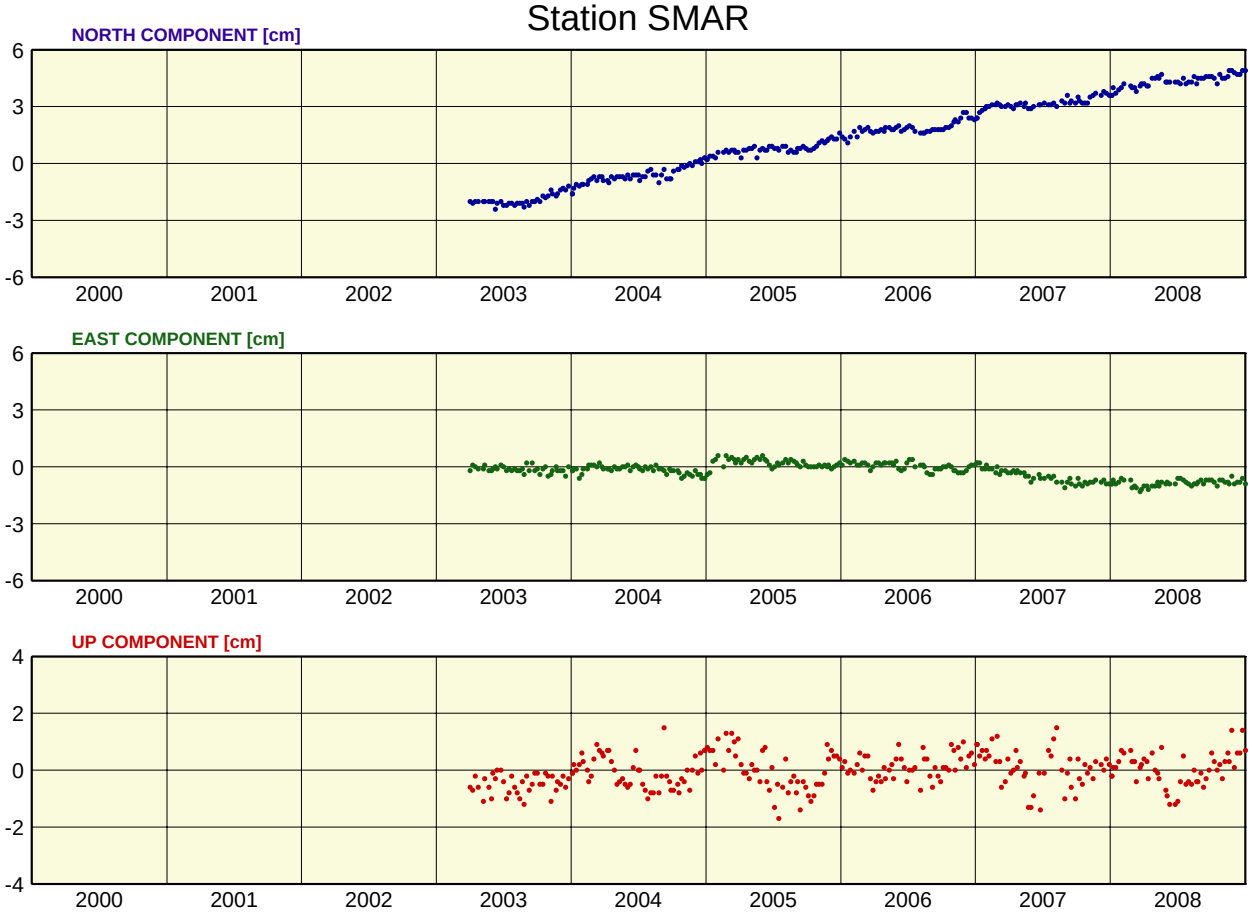

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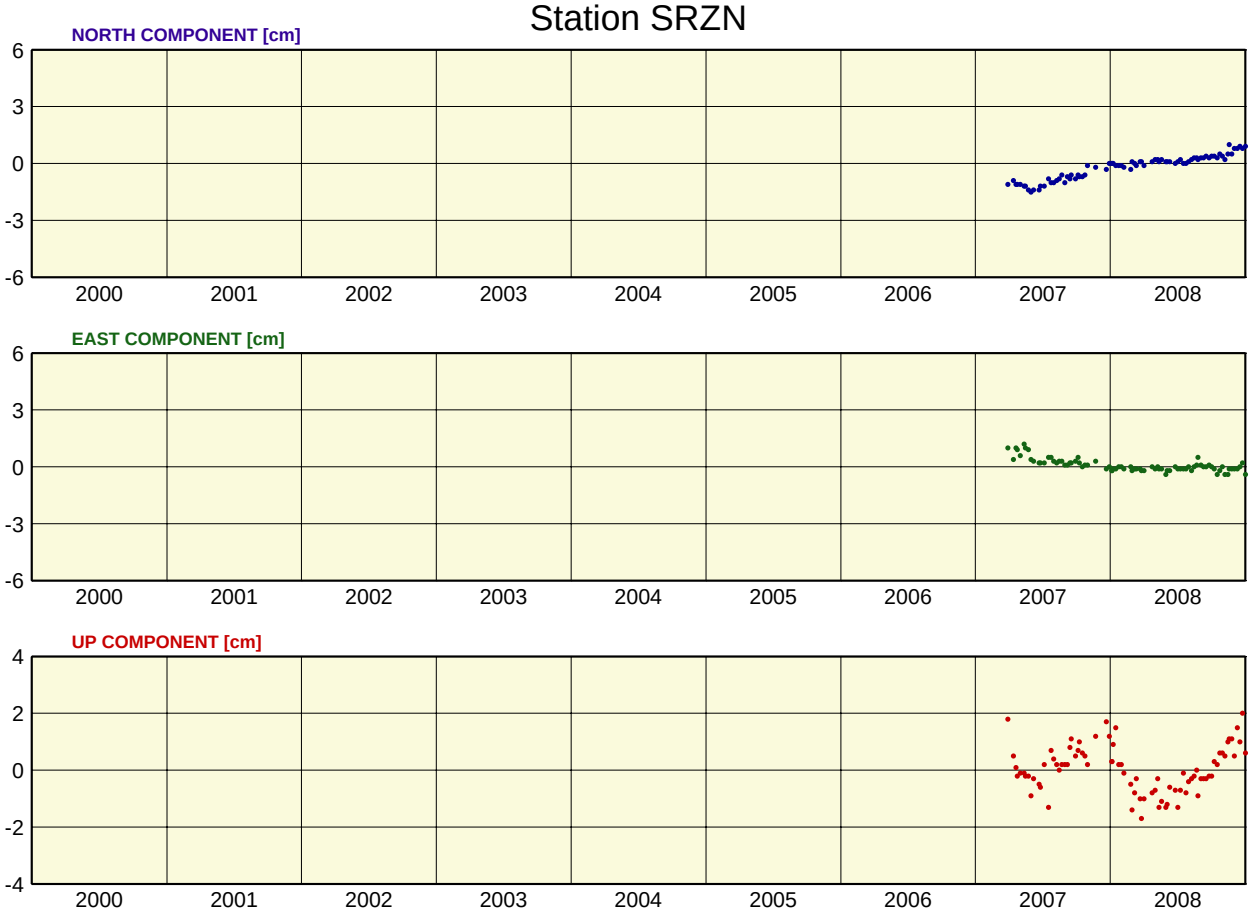

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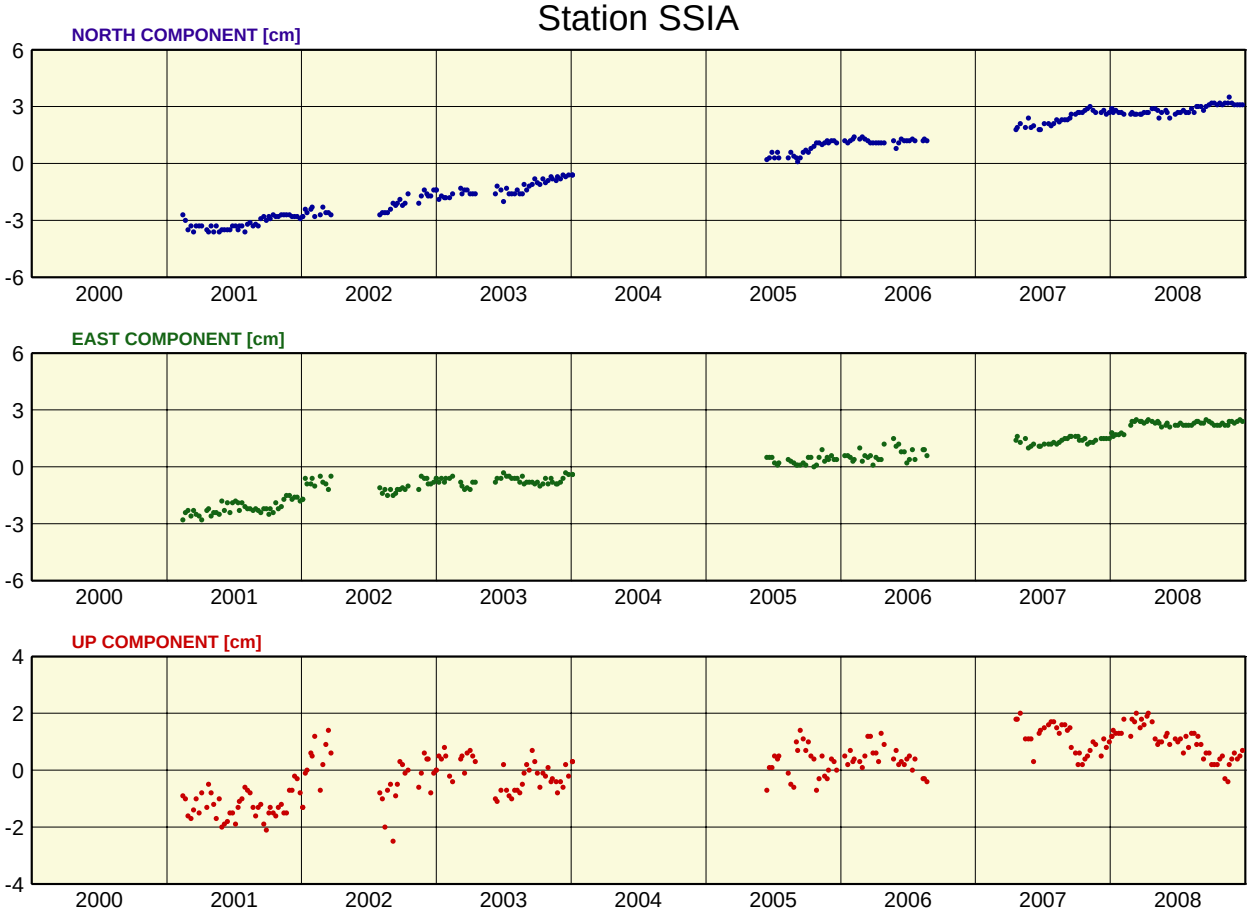
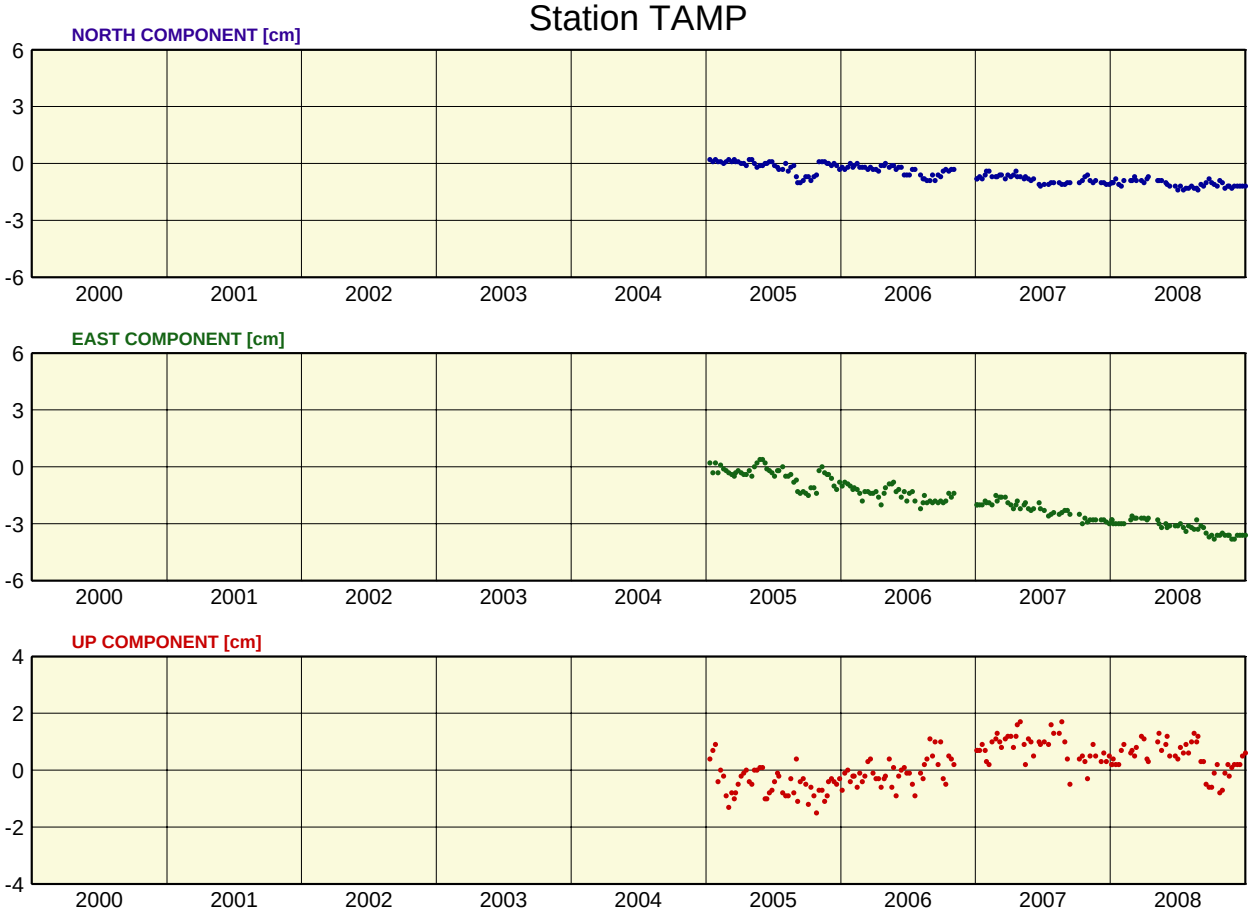
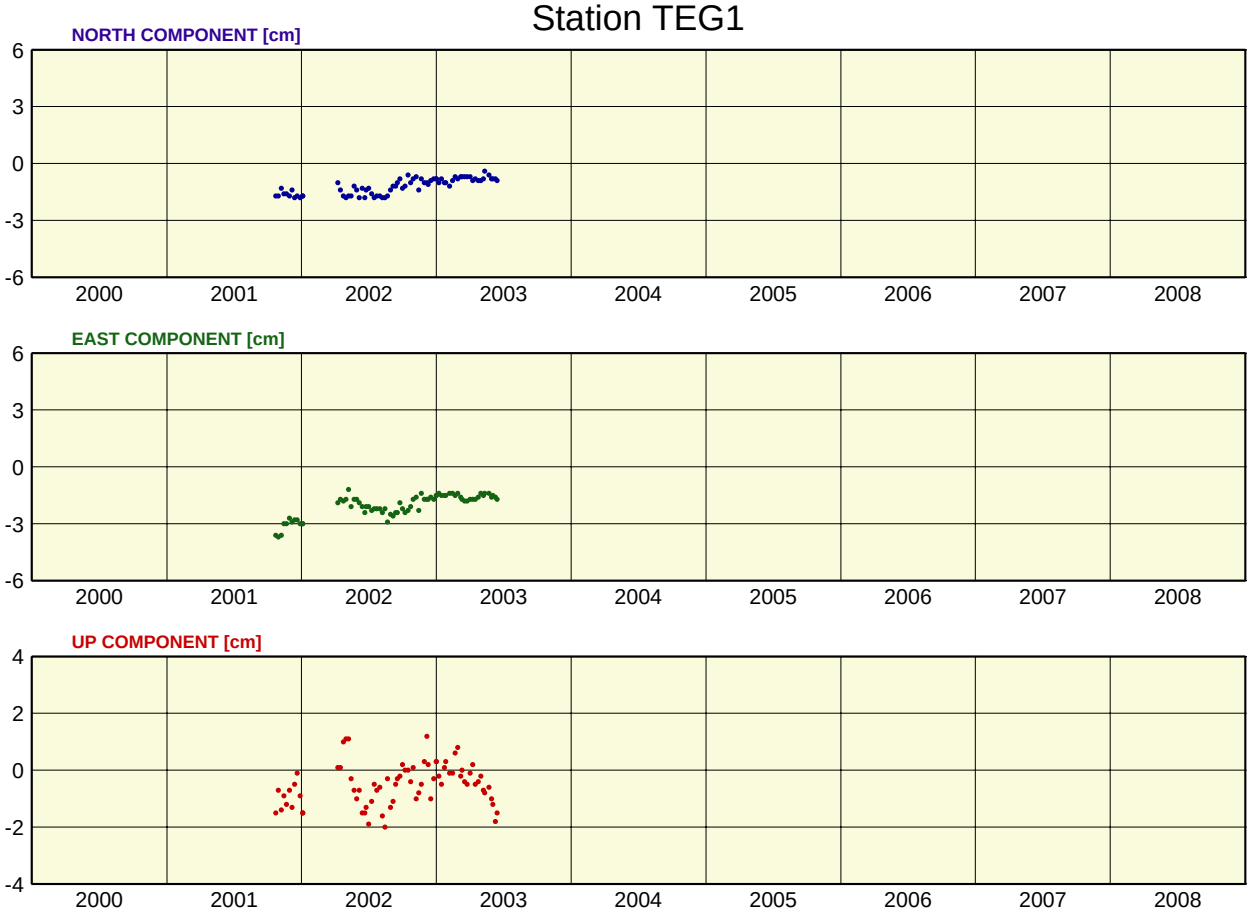


Station TAMP



Station TEG1



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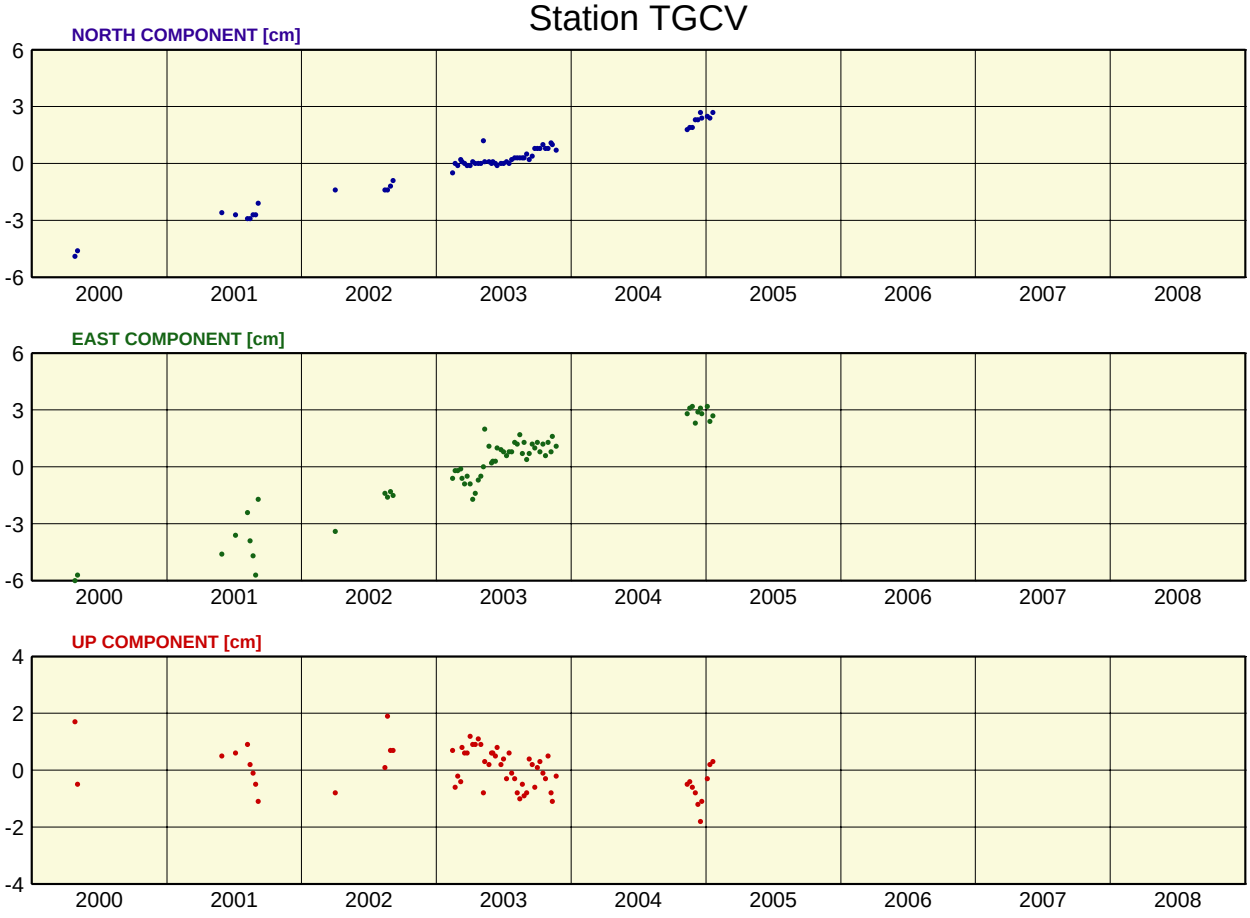

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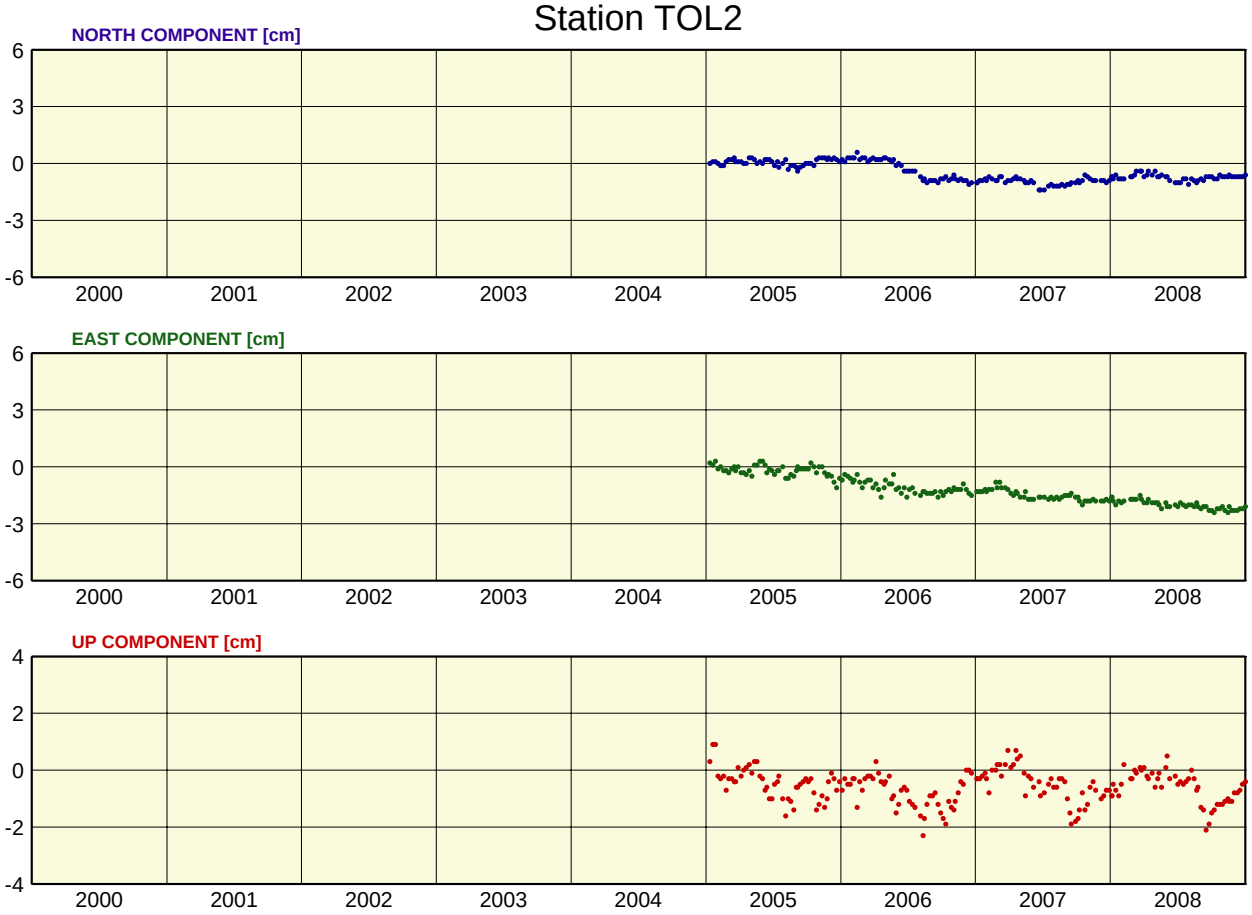

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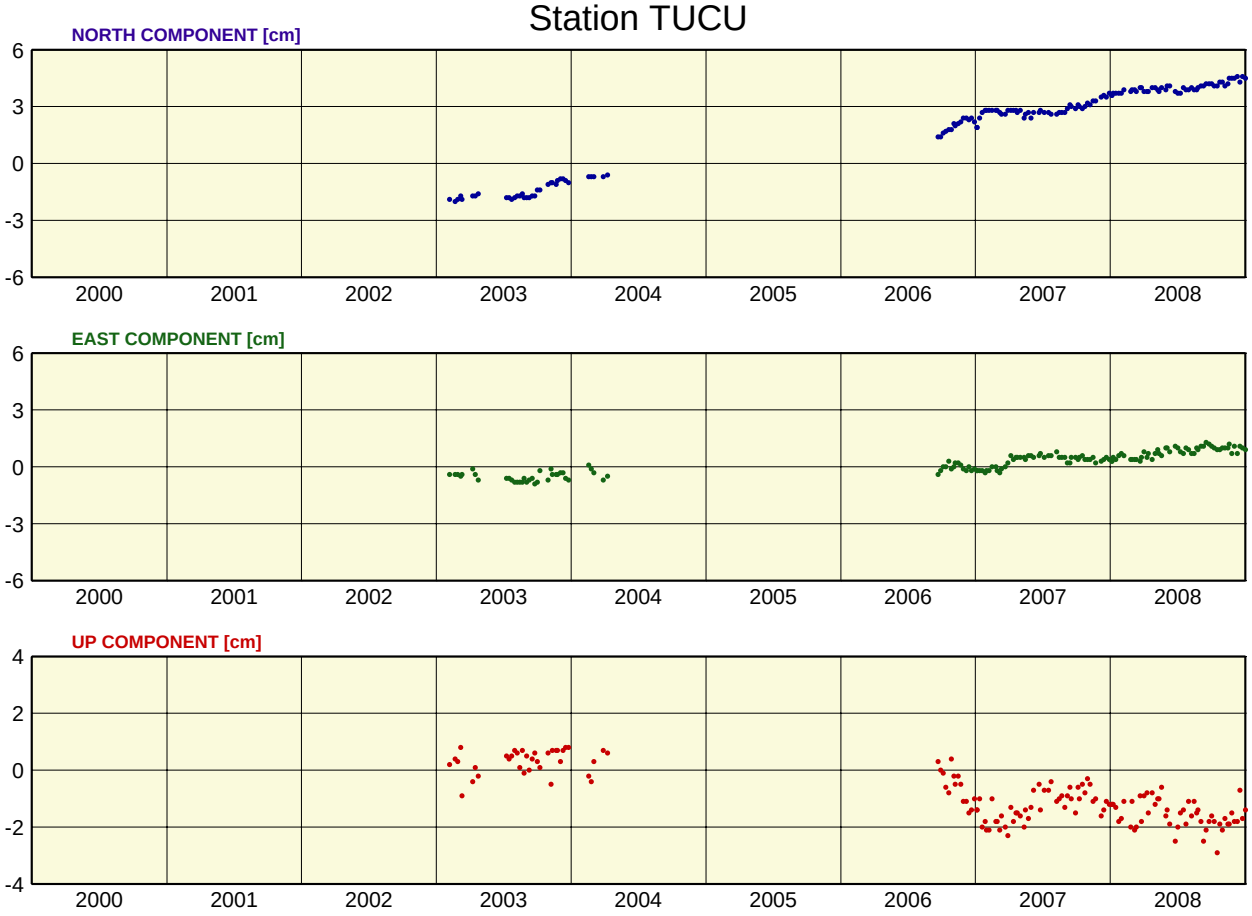

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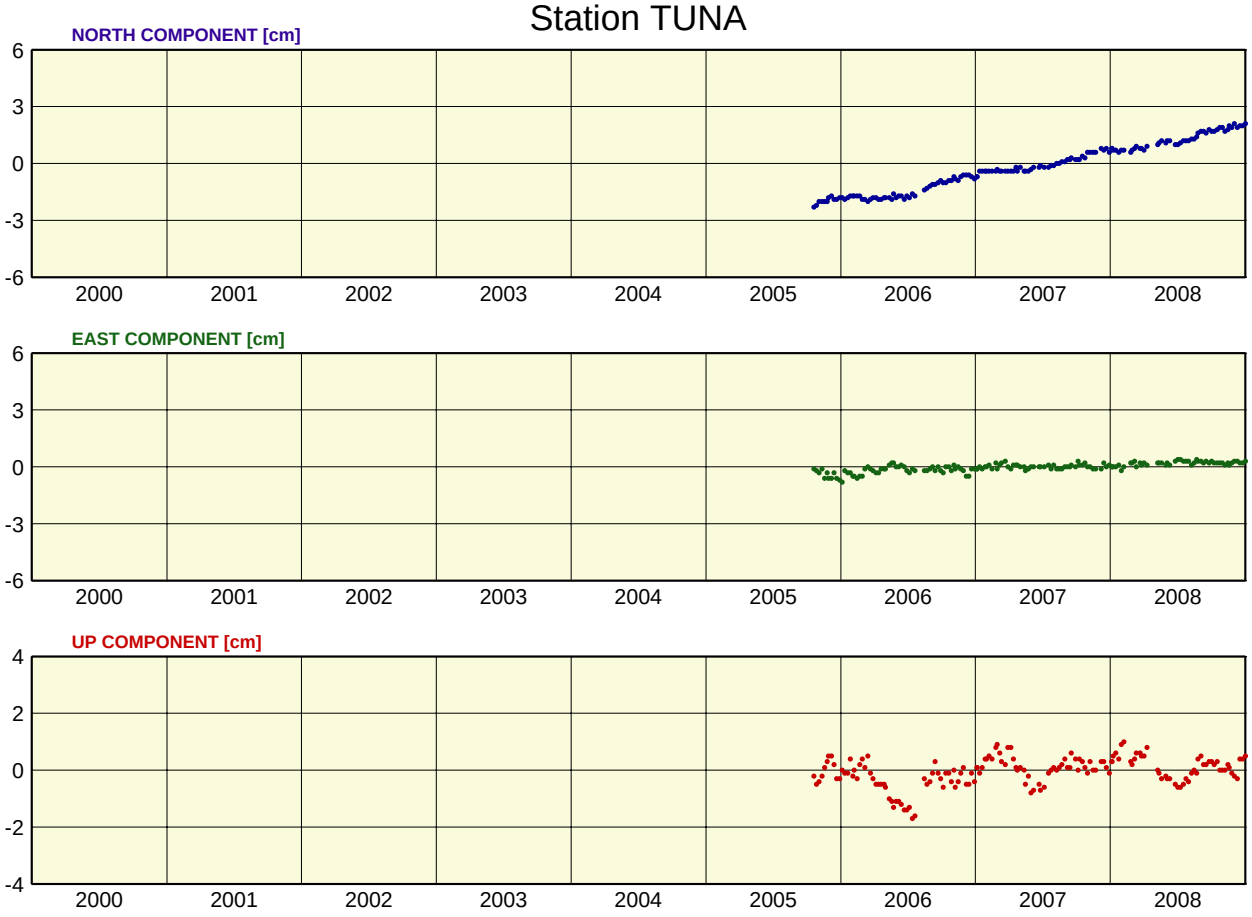

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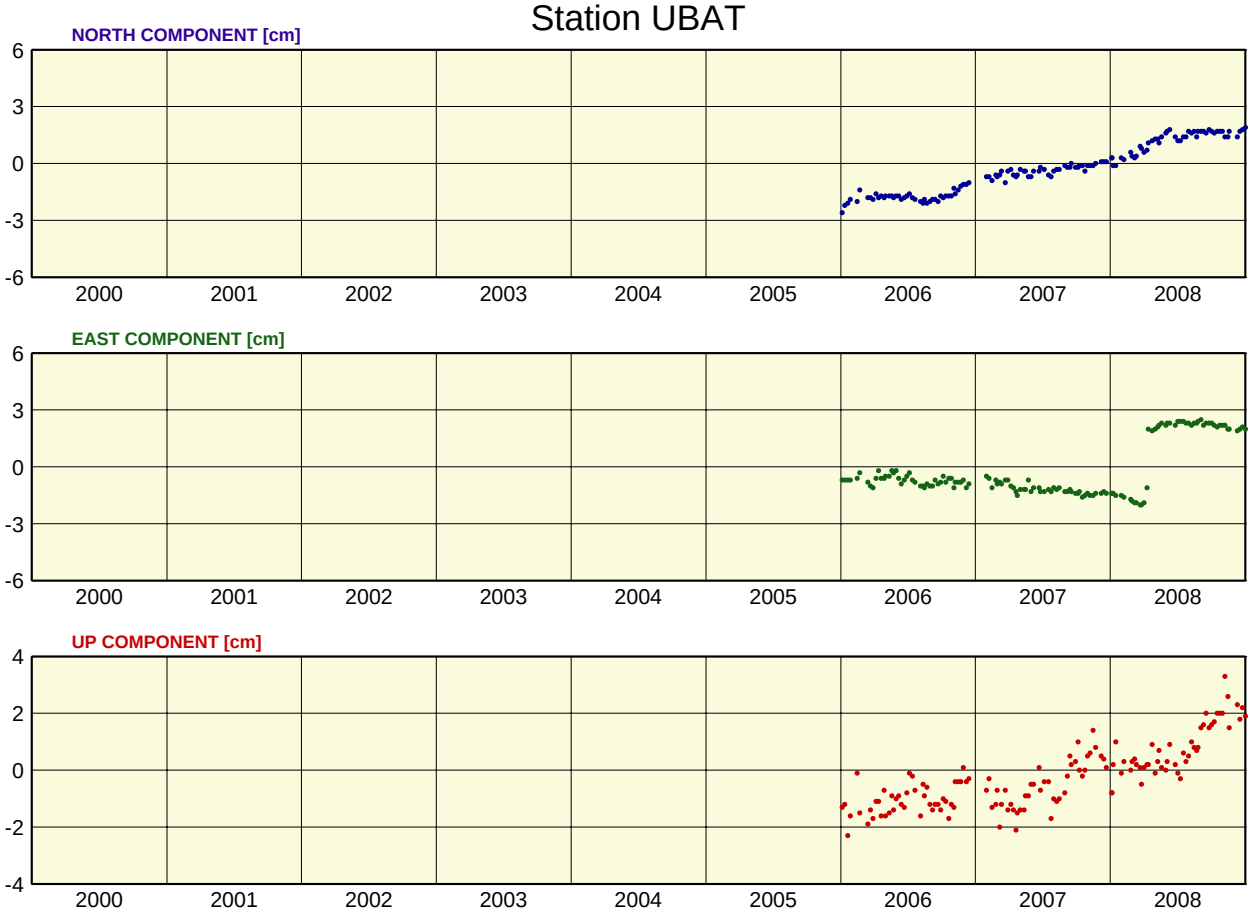

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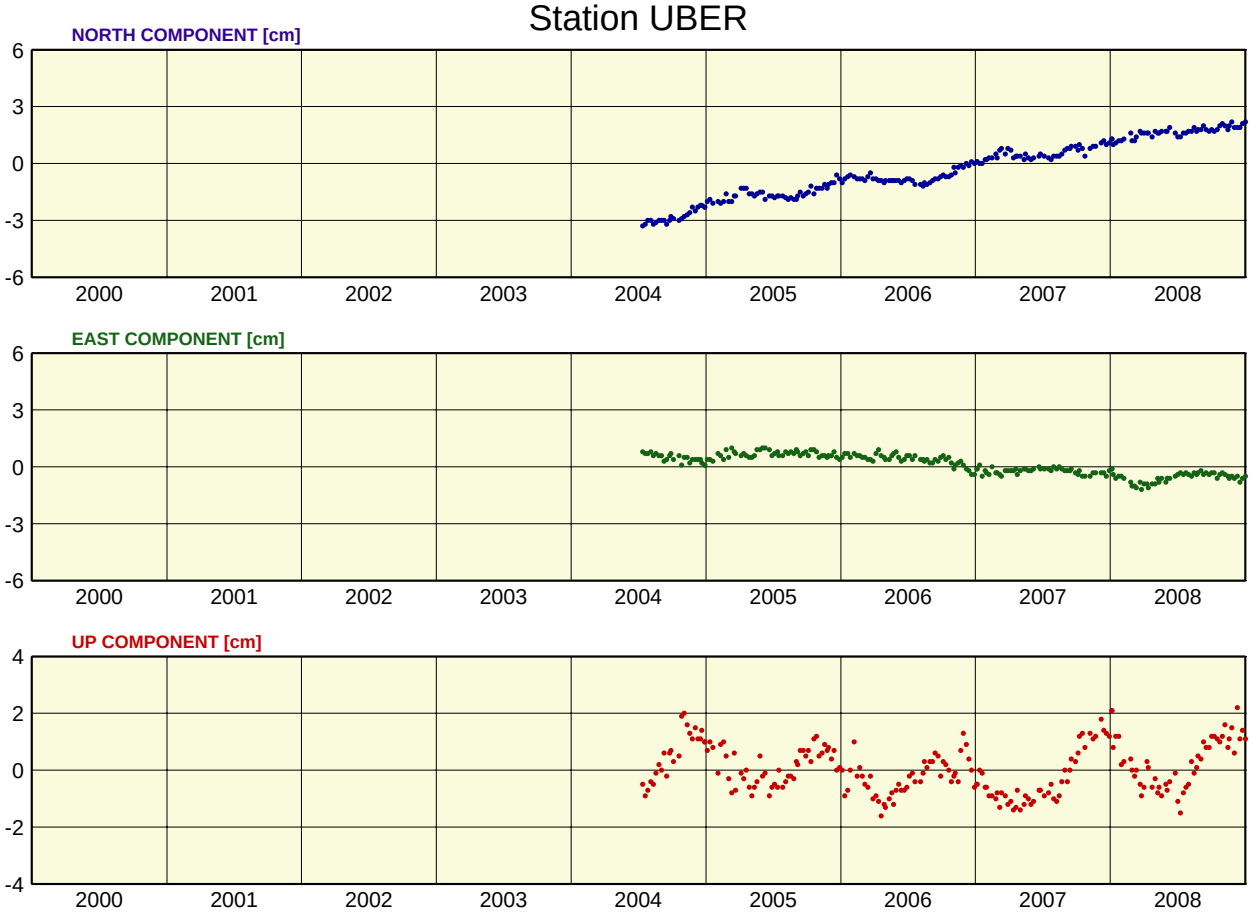

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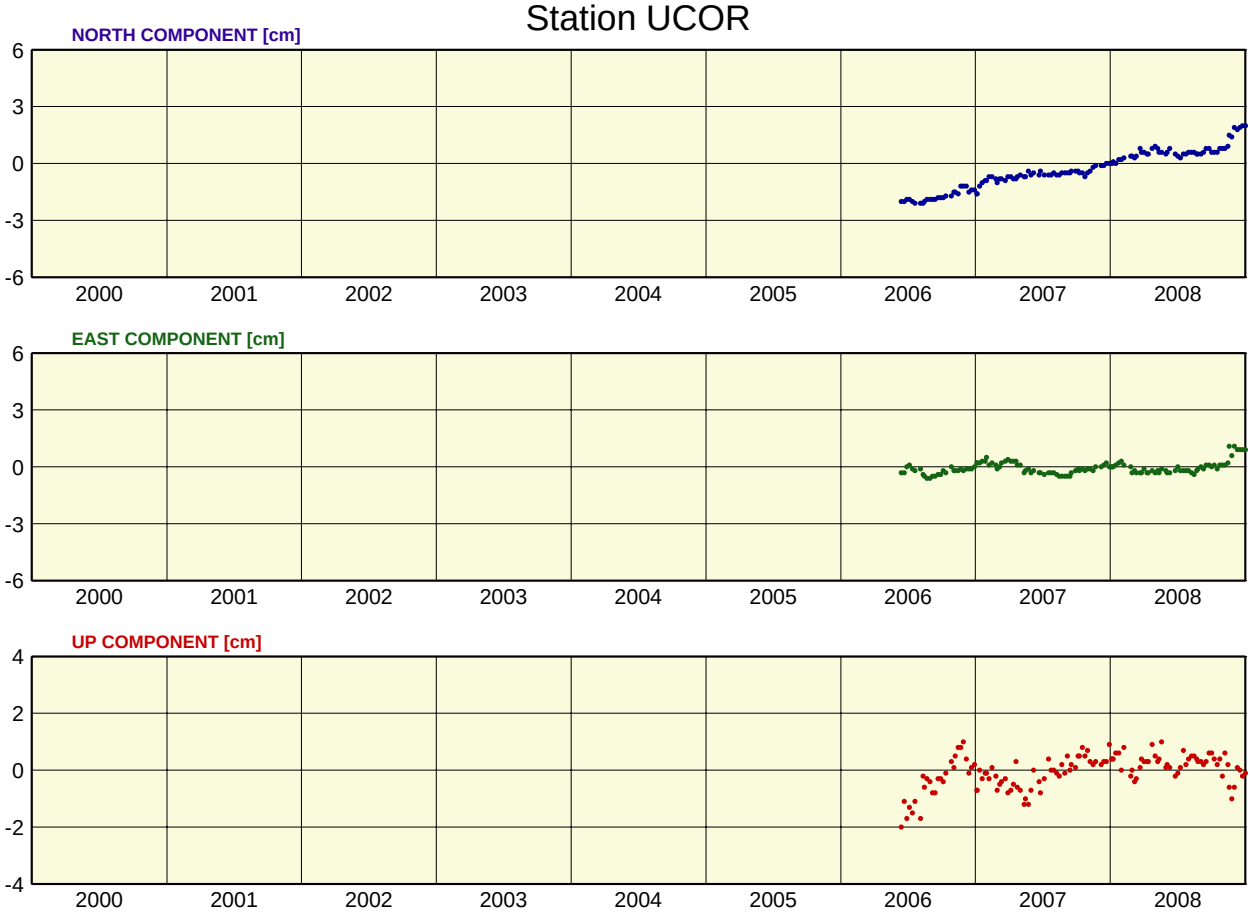

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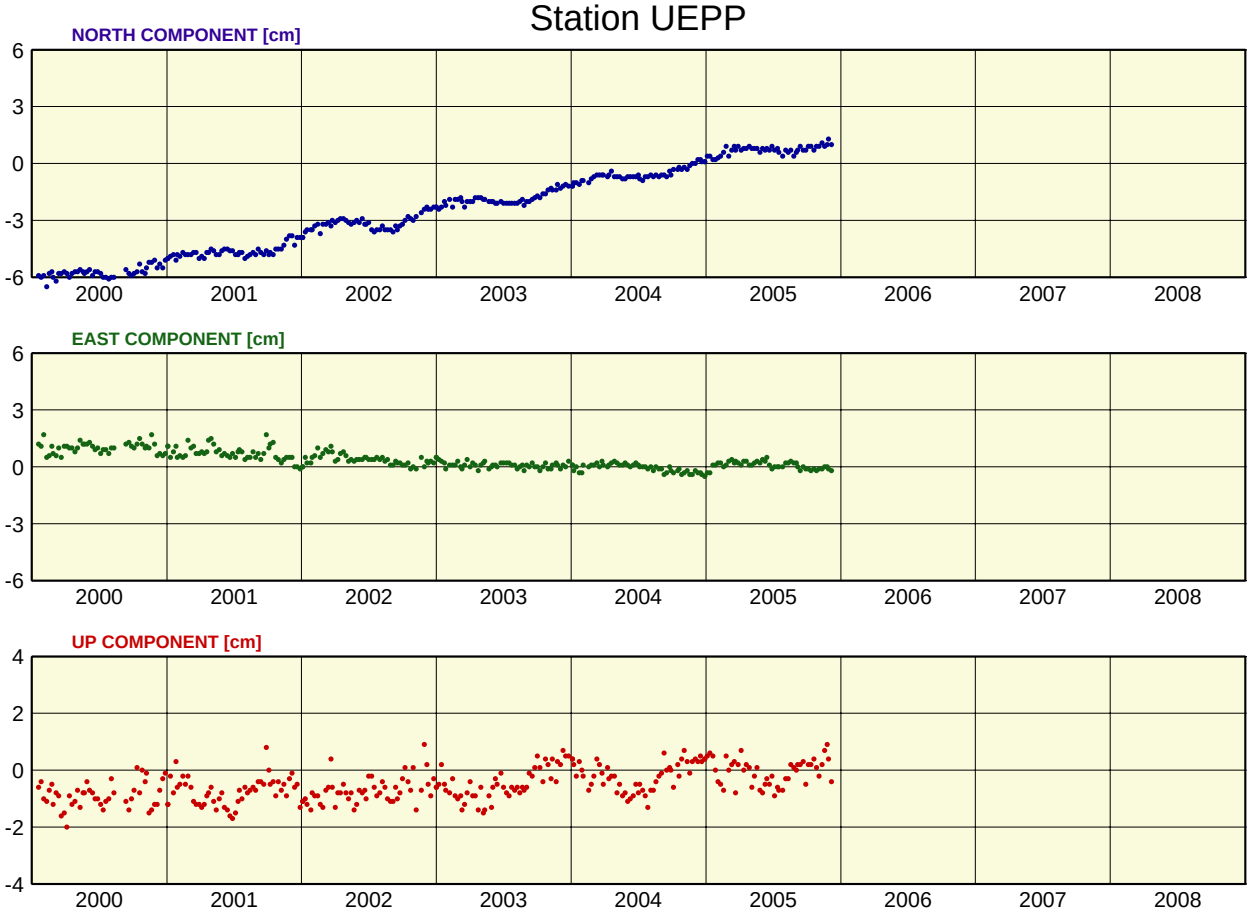

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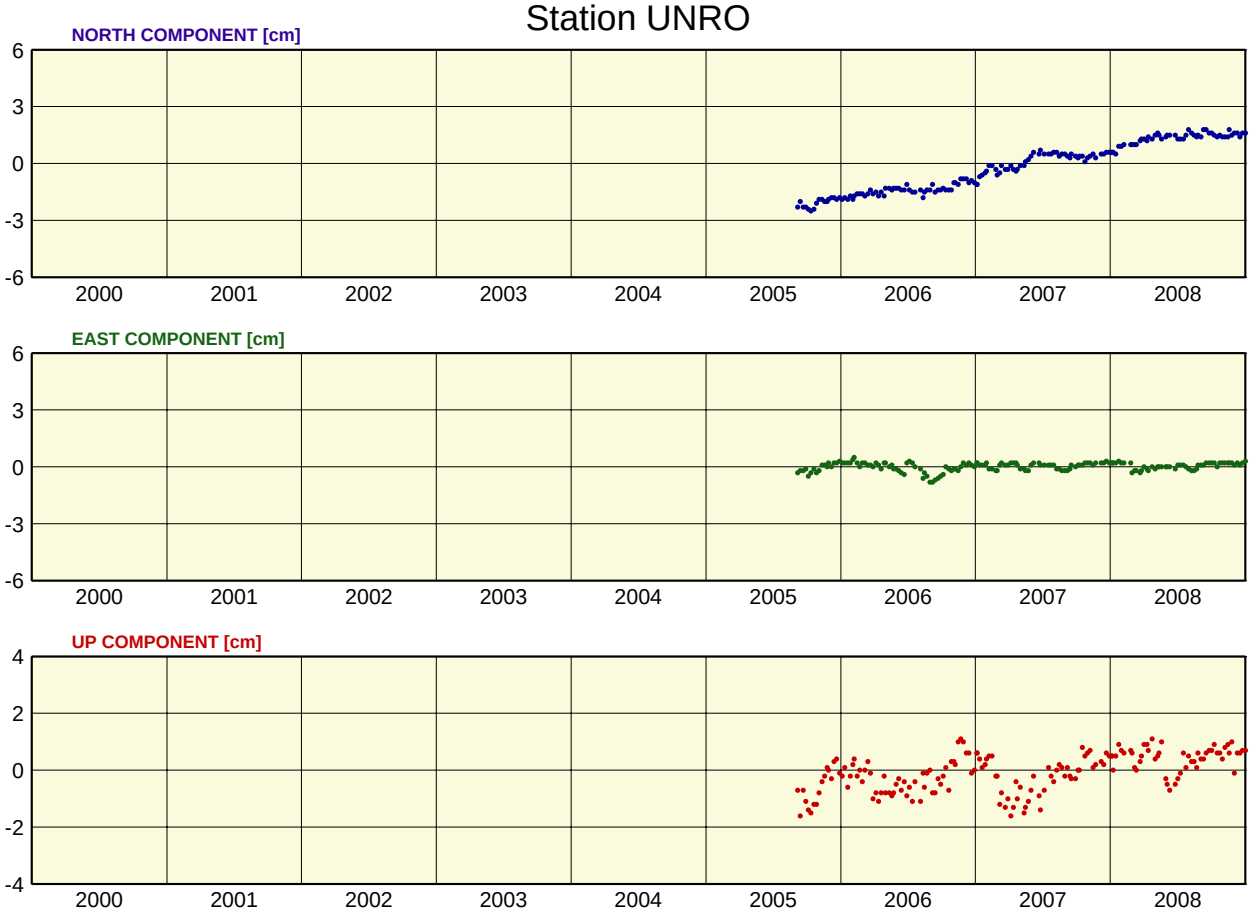

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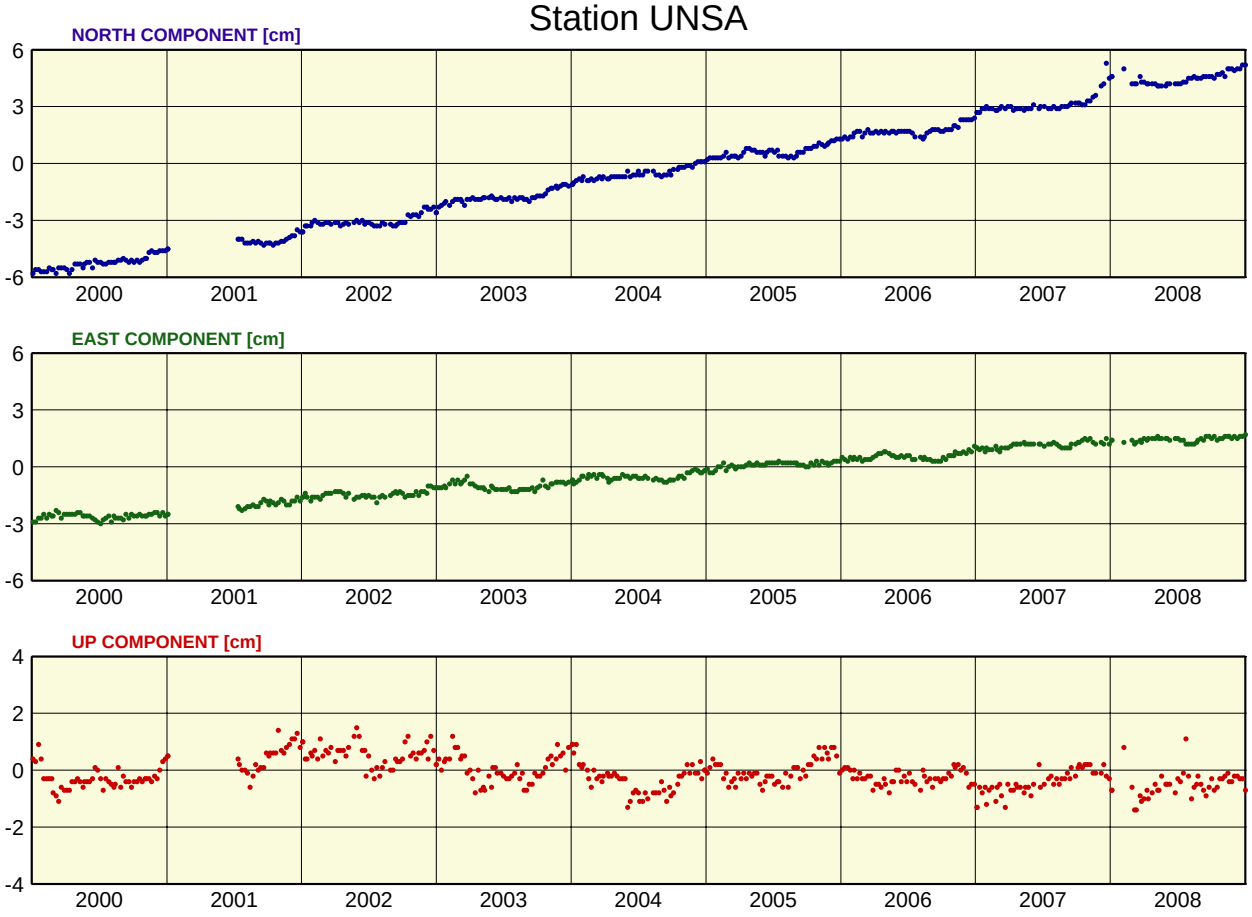

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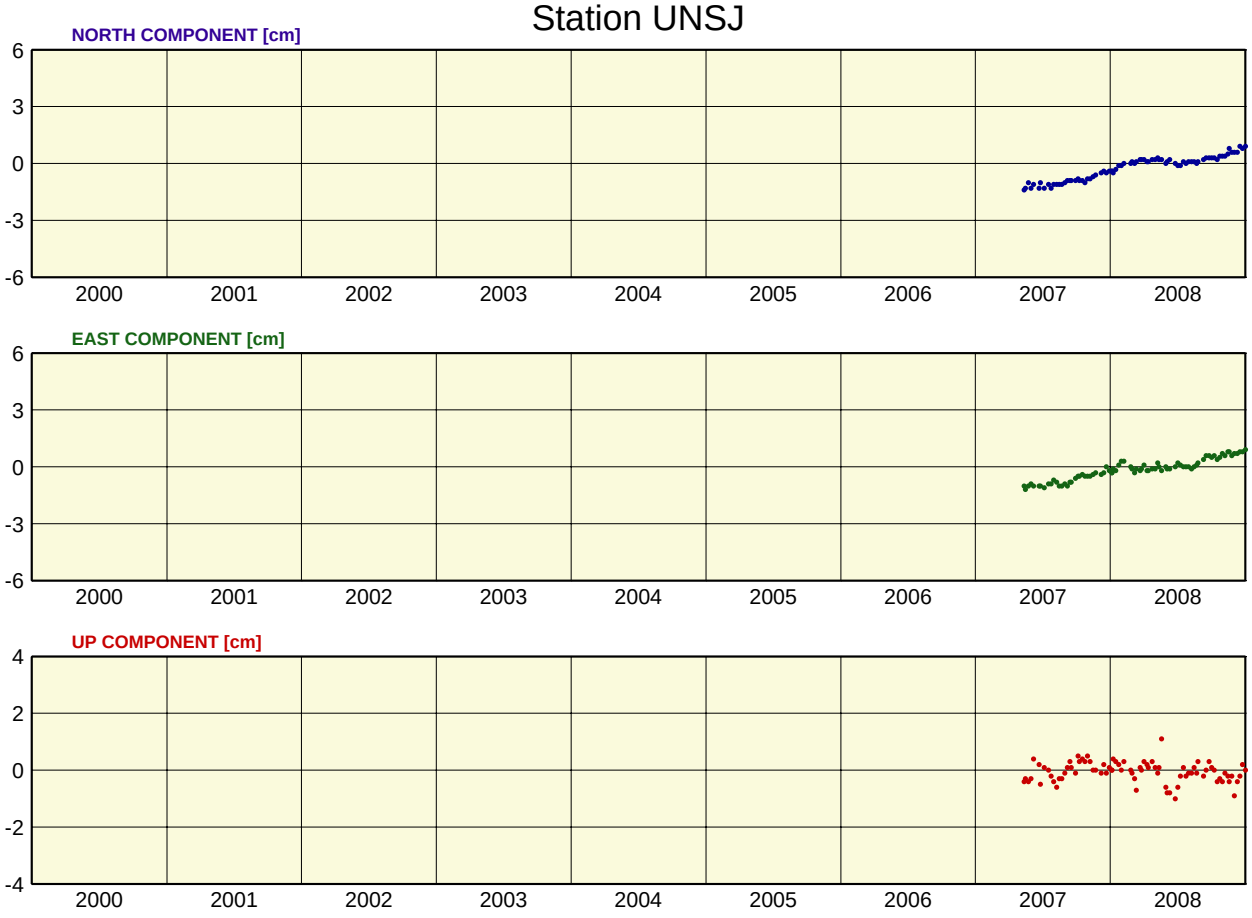

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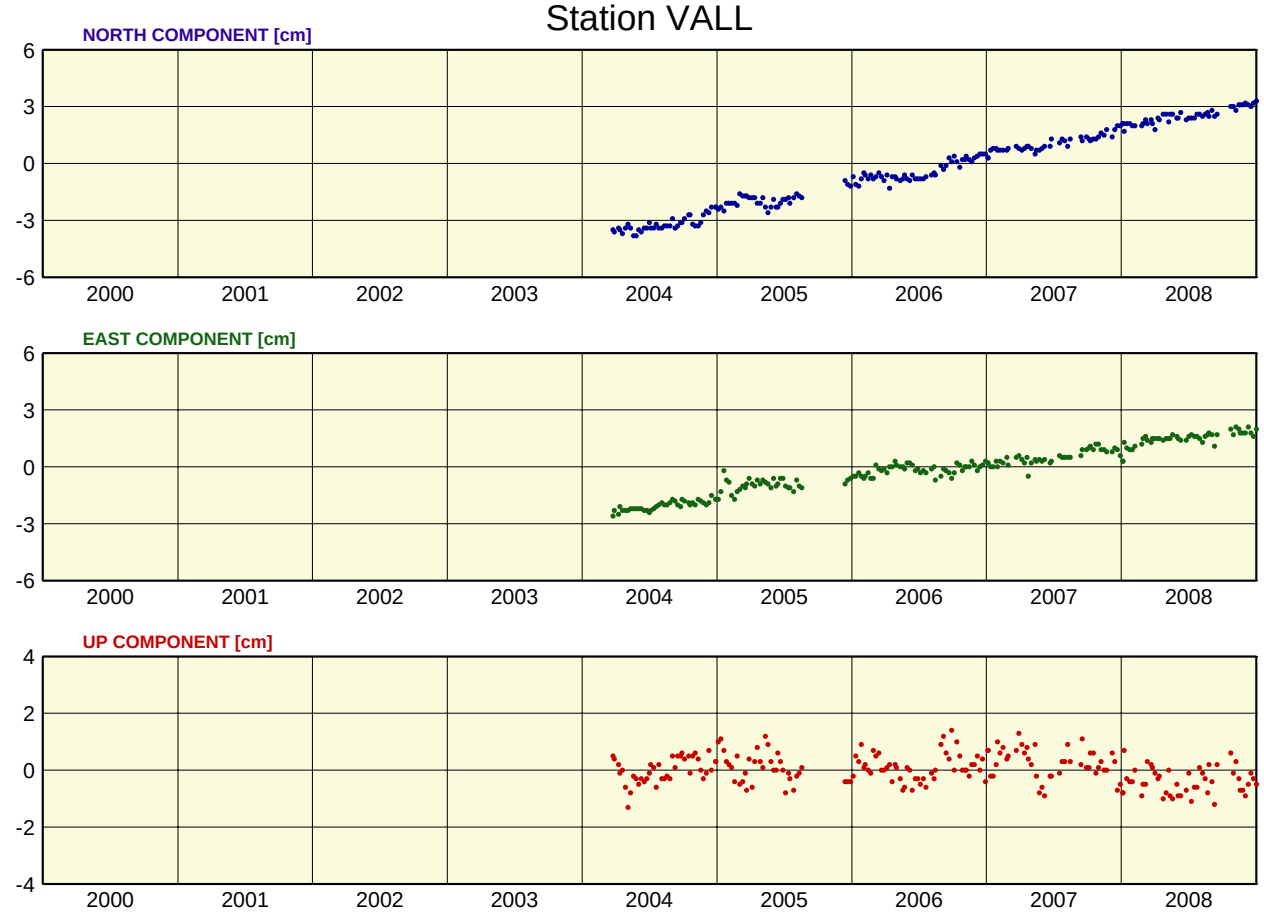

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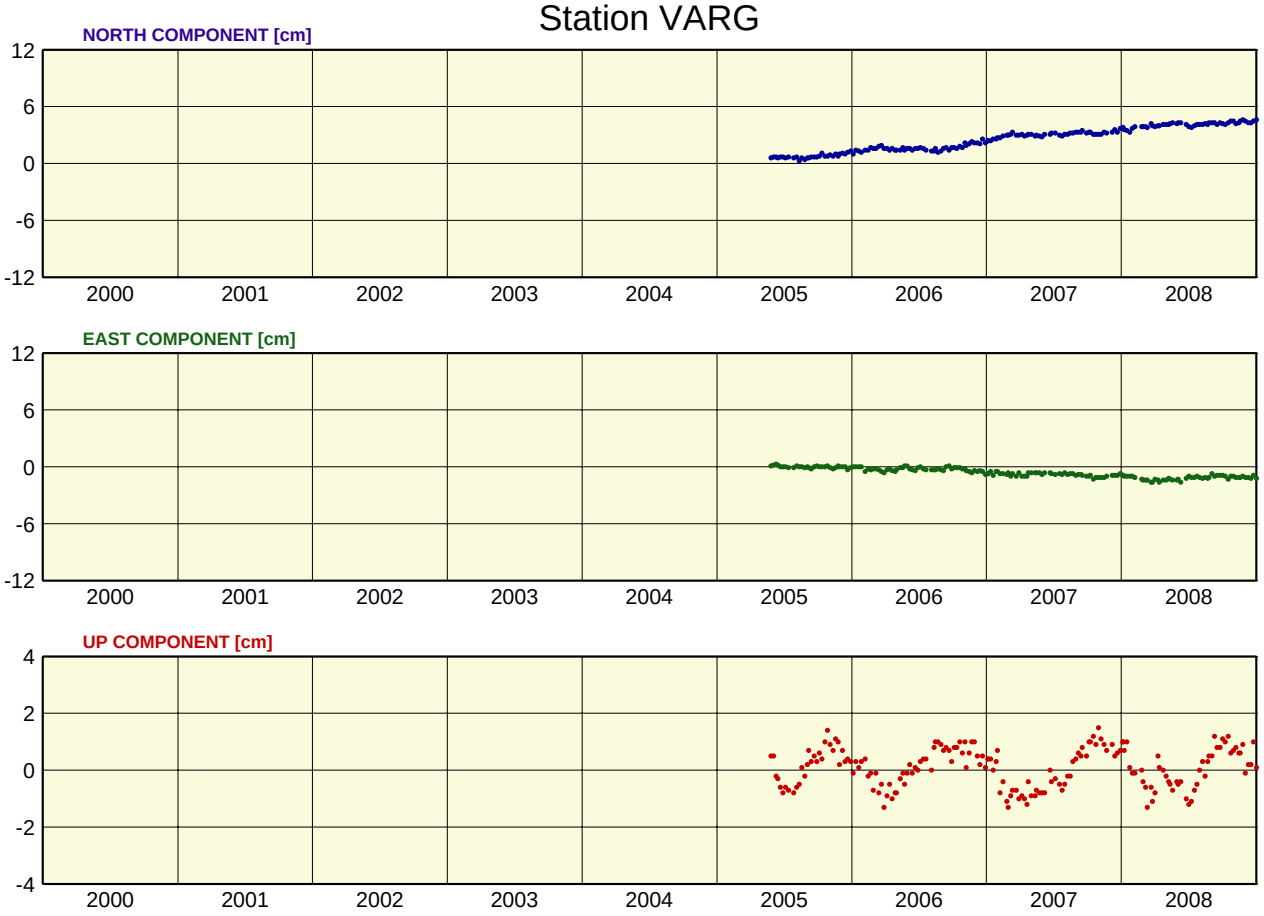

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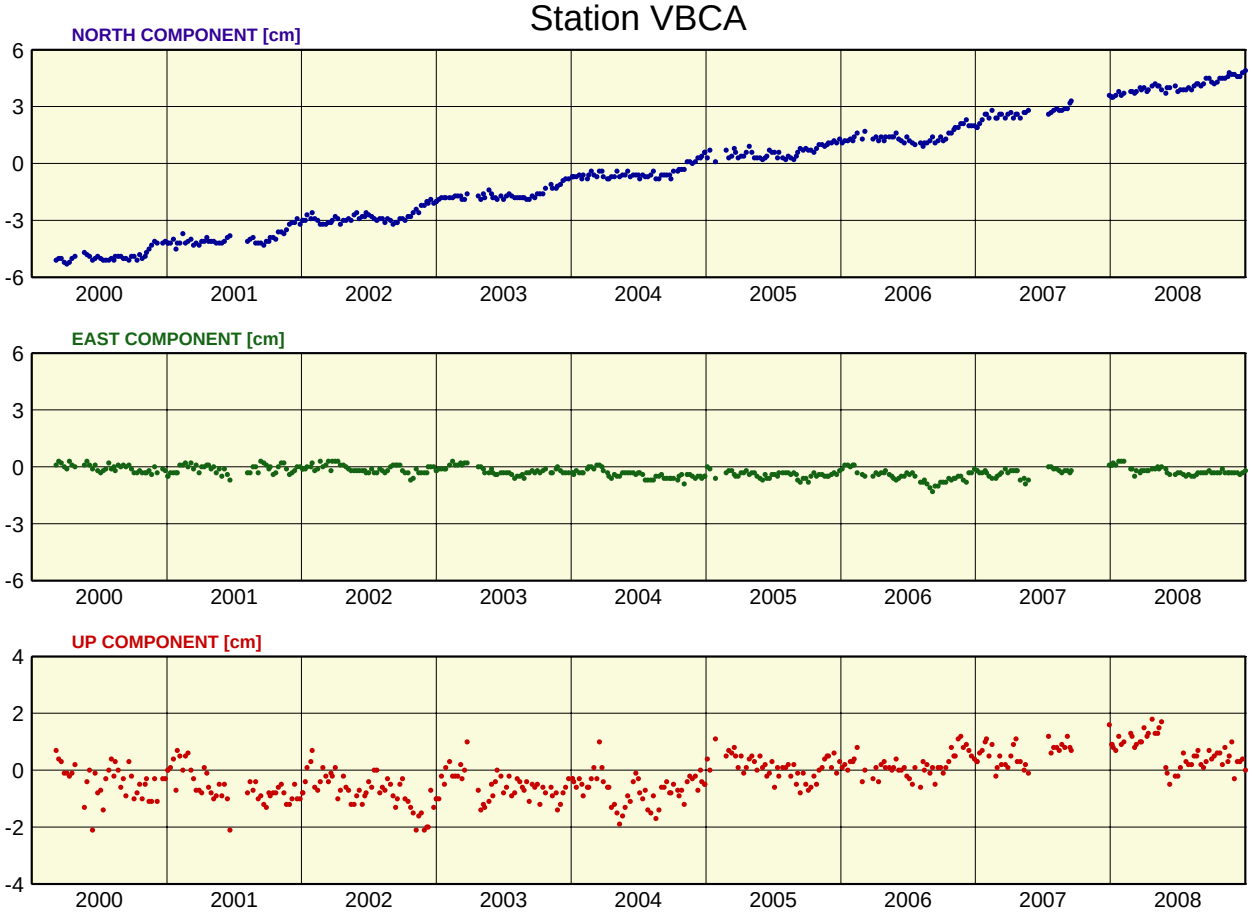

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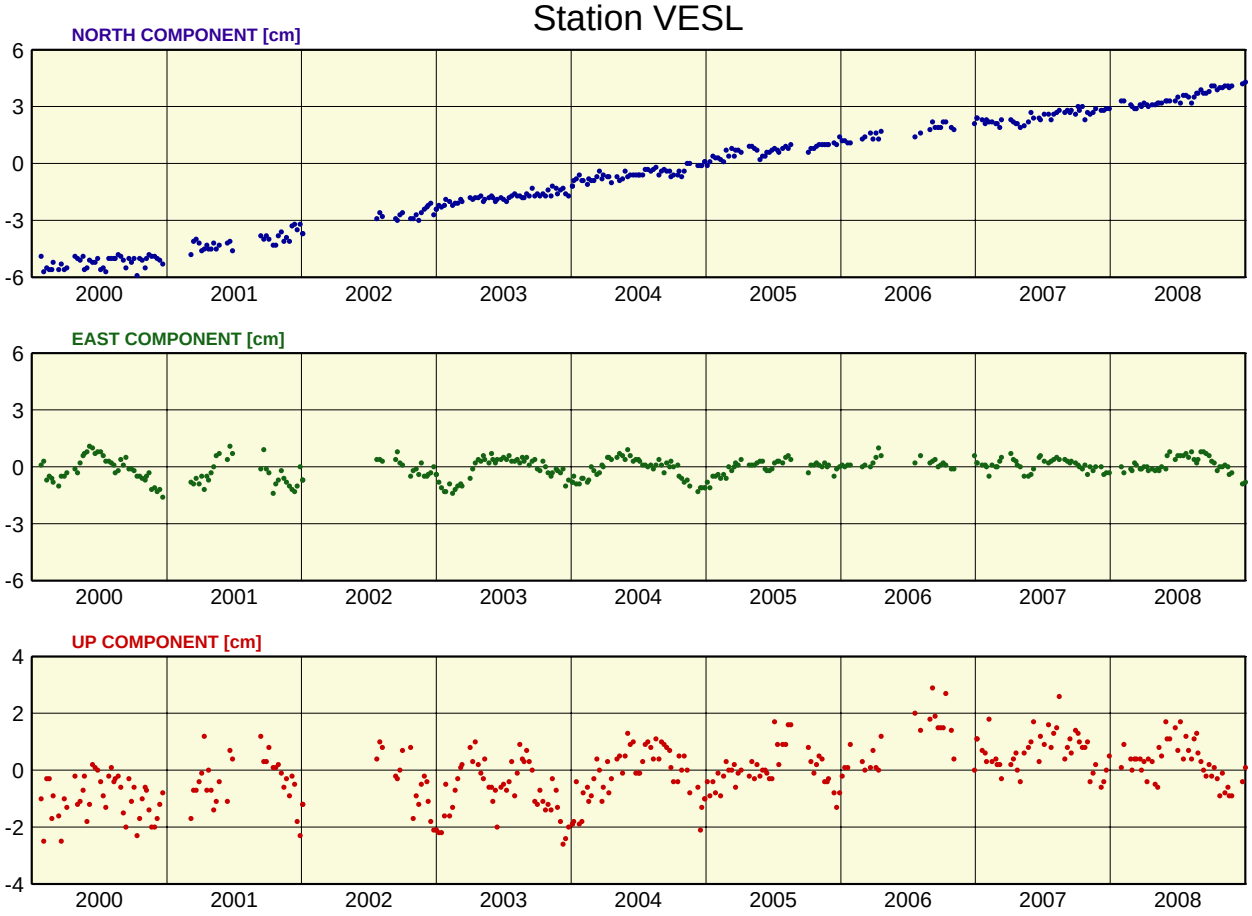

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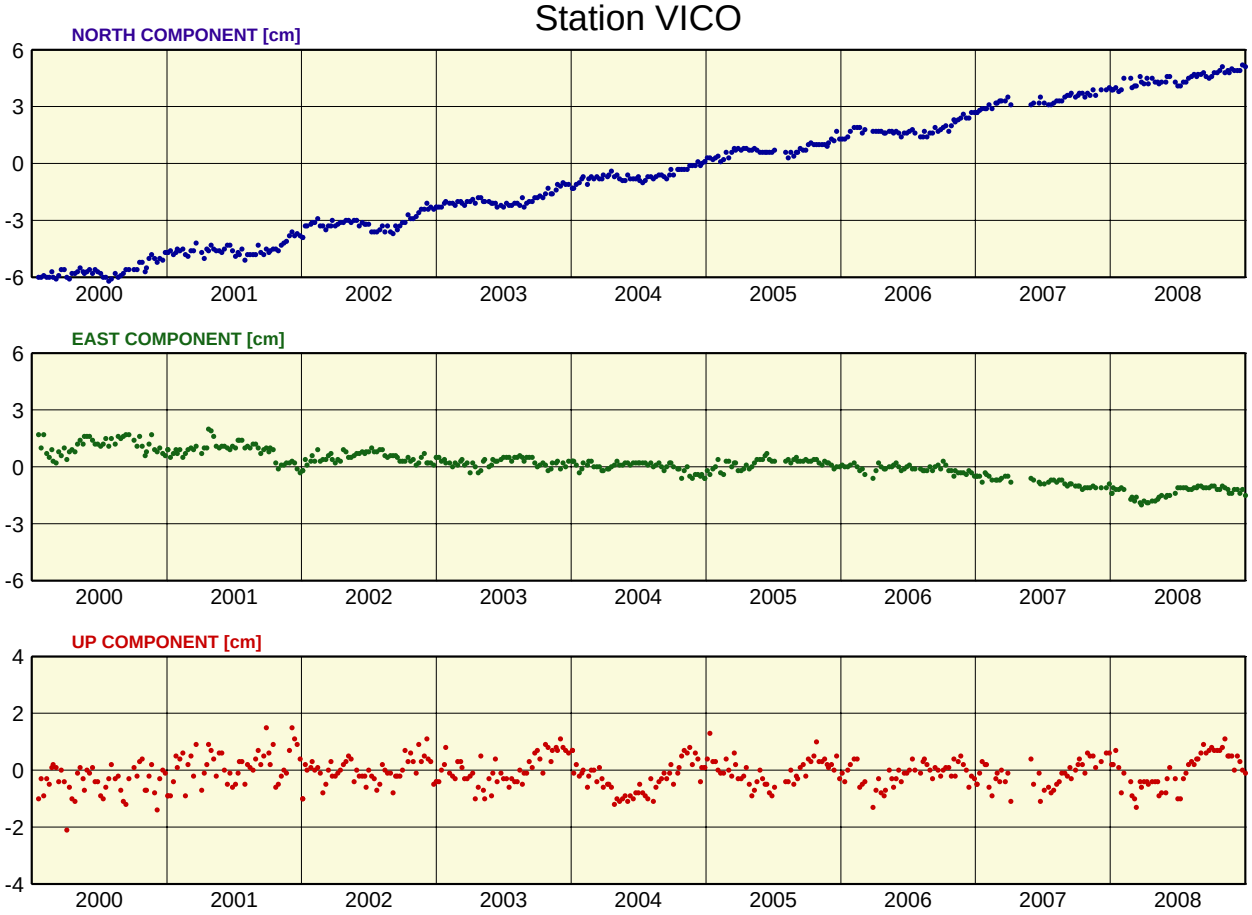

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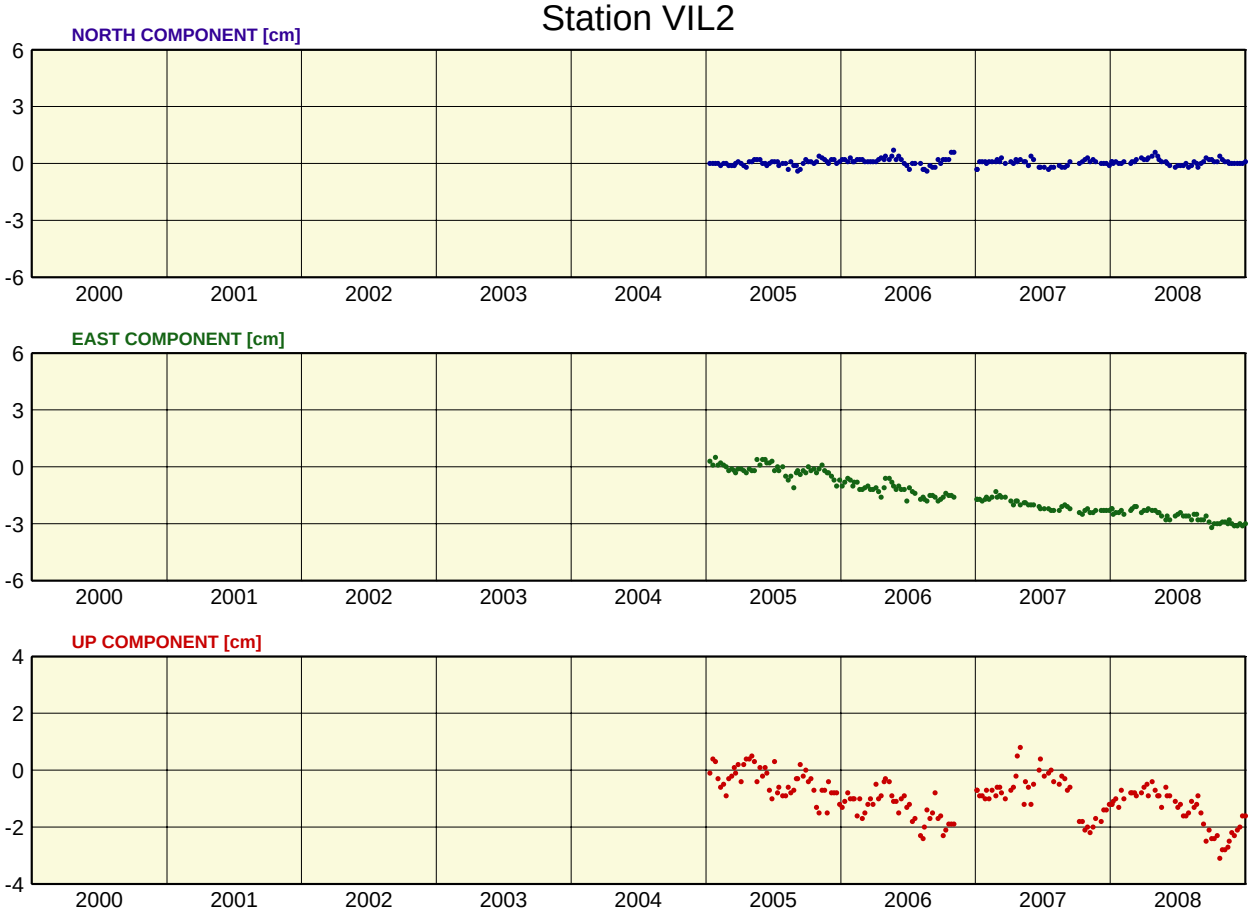

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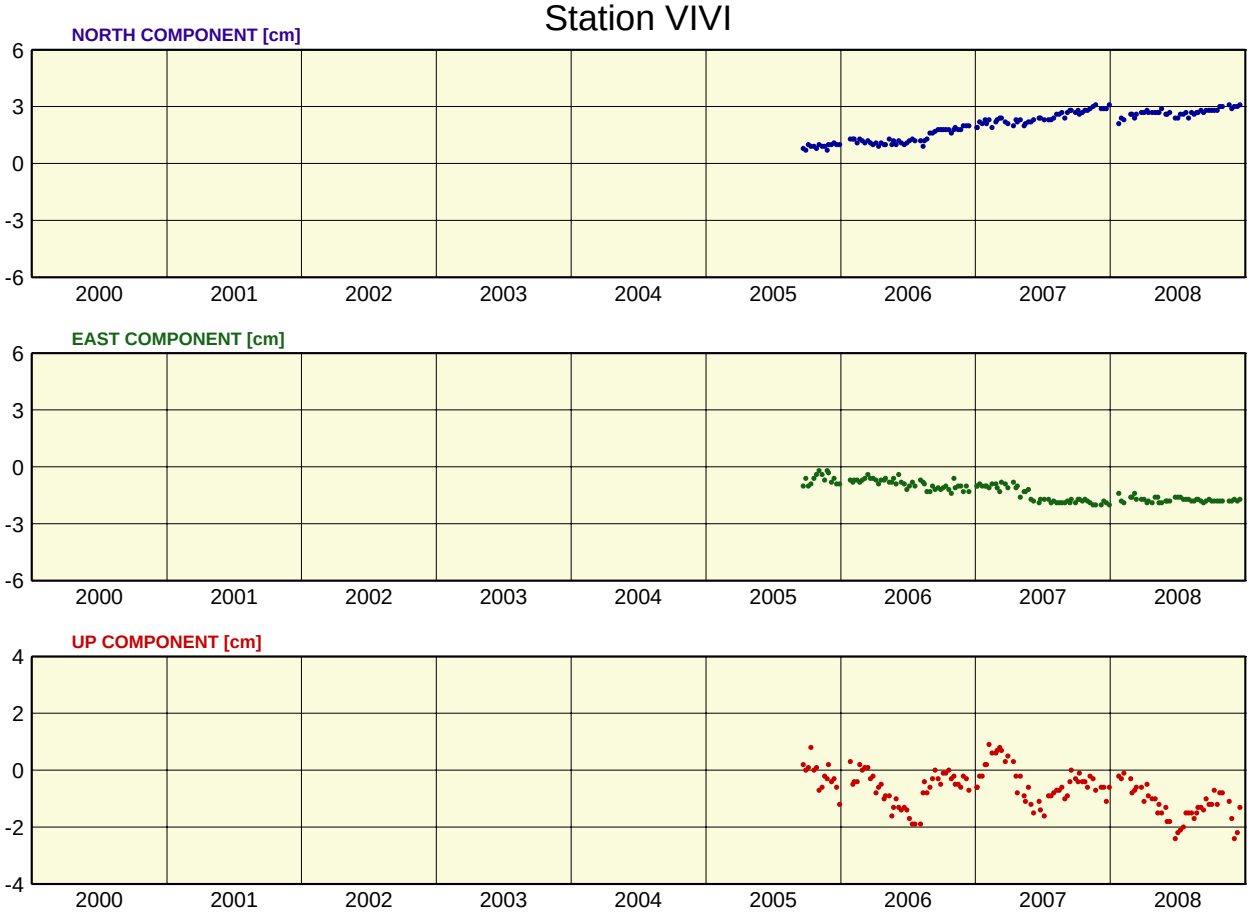

Station YOPA