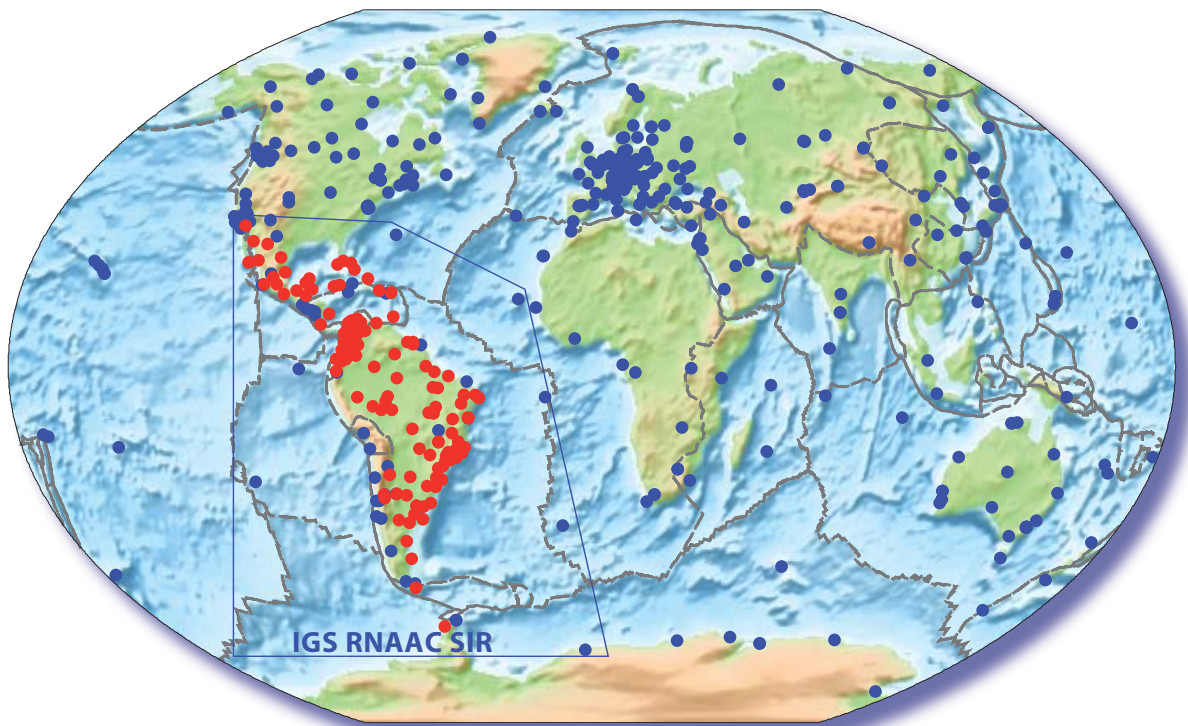


DGFI Report
No. 79

**The Position and Velocity Solution DGF08P01 of
IGS Regional Network Associate Analysis Centre SIRGAS
(IGS RNAAC SIR)**

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2008

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Content	Page
1 Introduction	1
2 Activities of IGS Regional Network Associate Analysis Centre SIRGAS (IGS RNAAC SIR)	1
3 Station Position and Velocity Solution DGF08P01	2
4 Impact of Earthquakes in the SIRGAS Region	3
5 References	16
Tables	
Table 1: Development of the number of processed stations by the end of year	1
Table 2: Main characteristics of IGS RNAAC SIR processing	2
Table 3: Geocentric epoch (2004.4) station positions and velocities of solution DGF08P01	12
Table 4: Ellipsoidal (epoch 2004, GRS80) Station positions and velocities of Station DGF08P01	14
Figures	
Figure 1: IGS RNAAC SIR network	4
Figure 2: IGS RNAAC SIR stations ordered by country	5
Figure 3: IGS05 Fiducial Stations in IGS RNAAC SIR	6
Figure 4: Horizontal velocities of IGS05 stations	7
Figure 5: Vertical velocities of IGS05 stations	8
Figure 6: Horizontal velocities of all DGF08P01 stations	9
Figure 7: Vertical velocities of all DGF08P01 stations	10
Figure 8: Earthquake signals (excluded from the station position and velocity solution)	11
Annex: Time series of IGS RNAAC SIR stations ordered by 4-character abbreviation	17–106

1 Introduction

The International GNSS Service (IGS) analyses a global and several regional satellite tracking networks. The global IGS network is processed by ten Analysis Centres (AC), and the regional networks by seven Regional Network Associate Analysis Centres (RNAAC). All the global and regional network solutions are combined to a global polyhedron by two global Network Associate Analysis Centres (GNAAC). The Deutsches Geodaetisches Forschungsinstitut (DGFI) is acting as the IGS RNAAC SIR for the Geocentric Reference System for the Americas (Systema de Referencia Geocentrico para las Americas, SIRGAS).

The IGS decided to introduce the new ITRF2005 (IGS05) solution and to implement absolute phase centre corrections starting with GPS week 1400. To provide homogeneously processed weekly solutions for the complete time span, the IGS RNAAC SIR at DGFI is reprocessing all former weekly solutions since GPS week 0860 (July 1996). This report presents a new position and velocity solution containing the weeks 1199 to 1470 (December 2002 to March 2008).

2 Activities of IGS Regional Network Associate Analysis Centre SIRGAS (IGS RNAAC SIR)

The German Geodetic Research Institute (DGFI) is processing all permanent GPS stations (global IGS and additional regional stations) of South America, Central America, the Caribbean, and surrounding areas. Each week a coordinate solution is delivered to the IGS data centres for combination in the global polyhedron.

At the beginning of the processing in July 1996 (GPS week 0860) the weekly solutions contained only 10 IGS stations. In February 1997, the first regional stations Curitiba (PARA) and Presidente Prudente (UEPP) in Brazil were included. Today the number of processed stations has increased to 189, 131 of them are regional stations (see figures 1 and 2). The development of the number of included permanent stations in the processing is shown in table 1, see also Seemüller and Drewes (1997, 1998, 1999, 2000, 2001, 2004).

Table 1. Development of the number of processed stations by the end of year

Year	IGS Stations	Regional Stations	Sum
1996	15		15
1997	15	6	21
1998	19	10	29
1999	24	14	38
2000	32	16	48
2001	35	17	52
2002	41	18	59
2003	47	19	66
2004	47	28	75
2005	48	55	103
2006	48	72	120
2007	48	128	176
present	48	141	189

Since the year 2000 accumulative combinations of all weekly normal equations resulting in a multi-year position and velocity solution are generated. The first position and velocity solution was DGF00P01, containing 31 stations, all with velocities, followed by solutions DGF02P01 (64 stations, 53 velocities), solution DGF04P01 (85 stations, 72 velocities), and DGF06P01 (120 stations, 101 velocities).

After the introduction of the new ITRF2005 (IGS05, respectively) and the implementation of absolute phase centre corrections since GPS week 1400 the IGS RNAAC SIR at DGFI is reprocessing all former weekly solutions. All weeks are computed with the Bernese GPS software version 5.0. The reference frame is IGS05. 18 IGS05 stations are included as fiducial stations in the IGS RNAAC SIR region (see figure 3). The main characteristics of the IGS RNAAC SIR processing are summarized in table 2.

The time series of several stations show jumps from 2002 to 2003 (see Annex). Therefore the GPS weeks of 2002 have to be reprocessed again. A reason could be the use of approximate coordinates for Arequipa (AREQ) valid before the large earthquake in 2001, which caused a displacement of 66,5 cm in SW direction (see figure 8b).

Two preliminary position and velocity solutions DGF07P01 and DGF07P03 with reprocessed weekly solutions were presented by posters at the AGU Joint Assembly in Acapulco, Mexico, May 2007, and at the AGU Fall Meeting in San Francisco, December 2007. The solution DGF08P01 is described in chapter 3.

At the workshop of the SIRGAS-WGI, held in Rio de Janeiro in August 2006, Experimental Processing Centres (EPC) and Experimental Combination Centres (ECC) were installed. The DGFI was appointed as an ECC. The tasks of an ECC are to compare and to combine the EPC individual solutions and interchange their results within the four weeks following the processed week in order to assess the quality of the combined solutions by comparing them with the weekly solutions delivered by the IGS RNAAC SIR (see Sánchez, Seemüller, Krügel (2008)).

Table 2. Main characteristics of RNAAC SIR processing

Software used	Bernese 5.0
Data Sampling Rate	30 sec
Elevation cutoff	3°
Orbits/EOP	IGS final orbits referred to ITRF2005/ IGS05, daily EOP of IGS corresponding to fi- nal orbits
Baseline strategy	Number of observations
Observations weighting	cos ² (z)
A priori troposphere model	Zenith delay computed from standard atmosphere/mapped using Niell dry
Troposphere	Zenith delay estimated each 2 hours, mapped with Niell wet
Ambiguities	QIF strategy
Ocean tide model	FES2004
Phase center corrections	Absolute
Coordinates and velocities	IGS05 (ITRF2005)

3 Station Position and Velocity Solution DGF08P01

The multi-year station position and velocity solution DGF08P01 covers the time period from December 2002 (GPS week 1199) to March 2008 (GPS week 1470) with 272 reprocessed weeks. The combined adjustment is done with the programme ADDNEQ2 of the Bernese GPS software and is based on the weekly SINEX files regularly submitted to IGS since GPS week 1400 and the reprocessed weekly solution from GPS weeks 1199 to 1399.

The main features of the adjustment strategy are:

- In a first step the daily normal equations are combined to identify outliers and/or jumps
- Inversion of the weekly reprocessed SINEX files to free normal equations and removing the loose constraints included in the weekly solutions
- Accumulation of all normal equations and parameter transformation from weekly epoch coordinates to coordinates at the reference epoch (here 2004.4) and linear velocities
- Identification of position discontinuities due to episodic effects such as co-seismic displacements or antenna configuration changes, and set-up of appropriate parameters in the combined adjustment
- Introduction of positions (epoch 2004.4) and velocities of fiducial stations selected for realising the reference frame, and application of appropriate condition equations to define the geodetic datum

For the datum realization we adopted position and velocities of the global IGS solution IGS05 as fiducials. The selected stations are ASC1, BRAZ, CHPI, CONZ, CORD, CRO1, GLPS, GOLD, ISPA, LPGS, MDO1, OHI2, PIE1, SANT, SCUB, and VESL, the IGS05 stations MANA and UNSA are excluded. The position and velocities of these reference stations were constrained by NNR and NNT conditions with respect to IGS05 at epoch 2004.4, such that the network is optimally referred to the IGS05 by least squares adjustment.

During the several adjustment processes we detected five stations with discontinuities:

Station	Date	Reason
CONZ	2005 05 17 00:00:00	jump: antenna+radome, receiver change
MANA	2004 10 13 00:00:00	jump
PUR3	2005 01 01 00:00:00	jump
RECF	2005 02 02 00:00:00	jump
CHPI	2005 03 01 00:00:00	jump: receiver change

The figures 4 and 5 show the horizontal and vertical velocities of the IGS05 stations, representing the orientation of the solution DGF08P01, the figures 6 and 7 show the same for all stations. Only stations with at least one year of observations are content of DGF08P01. The tables 3 and 4 contain the coordinates and velocities of the 126 stations, the grey shaded stations are IGS05 stations and the stations with a * have a jump and therefore two coordinate and velocity sets (the Domes No. with a b at the end indicate the set after the jump).

4 Impact of Earthquakes in the SIRGAS Region

The western part of the IGS RNAAC SIR region, i.e. the plate boundary zone between Pacific, Cocos, Nazca plates, and North America, Caribbean and South America plates, is a seismically extremely active area, and therefore earthquakes cause many episodic station displacements. These episodic events with impact on the station positions have to be taken into account in the coordinate and velocity estimates by introducing new position and/or velocity parameters for these stations after an earthquake (Kaniuth et al., 2002; Seemüller et al., 2001, 2002). Figure 8 show the earthquake signals of the four earthquakes happened since the start of IGS RNAAC SIR processing in June 1996, figure 1 show the earthquake locations (see also Seemüller et al., 2004).

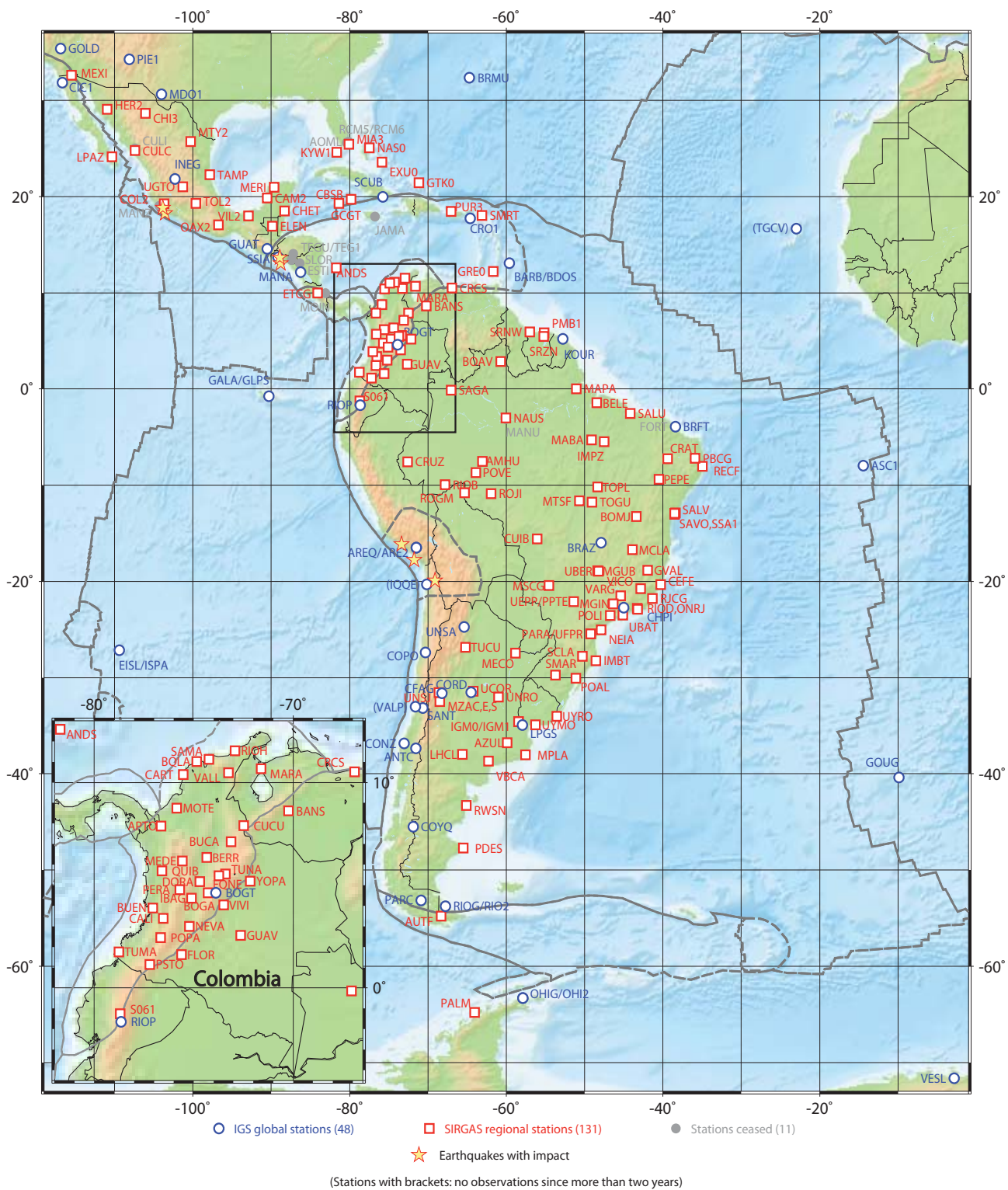


Fig. 1: IGS RNAAC SIR Network (Status: May 10, 2008)

Country	Stations		Number IGS	Number Reg.
	IGS Stations	Regional Stations		
Antarctica	OHIG/OHI2, VESL	PALM	2	1
Argentina	CFAG, CORD, LPGS, RIOG/RIO2, UNSA	AUTF, AZUL, IGM0/1, LHCL, MECO, MPLA, MZAC, MZAE, MZAS, PDES, RWSN, TUCU, UCOR, UNRO, UNSJ, VBCA	5	16
Barbados	BARB/BDOS		1	
Brazil	BRAZ, BRFT, CHPI, (FORT)	AMHU, BELE, BOAV, BOMJ, CEEF, CRAT, CRUZ, CUB, GVAL, IMBT, IMPZ, IMABA, (MANU), MAPA, MCLA, MGIN, MGUB, MSCG, MTSF, NAUS, NEIA, ONRI, PARA/UFRP, PBCG, PEPE, POAL, POLI, POVE, RECF, RI0B, RIOD, RCGG, ROGM, ROJI, SAGA, SALLU, SALV, SAVO, SCLA, SMAR, SSA1, TOGU, TOPL, UBAT, UBER, UEPP/PPTTE, VARG, VICO	4	48
Cape Verde	TGCV		1	
Chile	ANTC, CONZ, COPO, COYQ, EISL/ISPA, IQQE, PARC, SANT, VALP		9	
Colombia	BOGT	ANDS, APTO, BERR, BOGA, BOLA, BUCA, BUEN, CALI, CART, CUCU, DORA, FLOR, FONE, GUAV, IBAG, MEDE, MOTE, NEVA, PERA, POPA, PSTO, QUIB, RIOH, SAMMA, TUMA, TUNA, VALL, VIVI, YOPA	1	29
Costa Rica	(MOIN)	ETCG	1	1
Cuba	SCUB		1	
Ecuador	GALA/GLPS, RIOP	S061	2	1
El Salvador	SSIA		1	
French Guyana	KOUR		1	
Guatemala	GUAT	ELEN	1	1
Honduras	(SLOB), (TEGU/TEG1)		2	
Jamaica	(JAMA)		1	
Mexico	CIC1, INEG, (MANZ)	CAM2, CHET, CH13, COL2, CULC, (CULI), HER2, LPAZ, MERI, MEXI, MTY2, OAX2, TAMP, TOL2, UGTO, VIL2	3	16
Nicaragua	(ESTI), MANA		2	
Peru	AREQ		1	
Suriname		PMB1, SRNW, SRZN	3	3
United Kingdom	ASC1, BRMU, Goug		3	
Uruguay		UYMO, UYRO		2
USA	(AOML), CRO1, GOLD, MDO1, PIET, (RCM5/6)	KYW1, MIA3, PUR3	6	3
Venezuela		BANS, CRCS, MARA		3
Other regional sites		CBSB, EXU0, GCGT, GRE0, GTK0, NAS0, SMRT		7
Stations in brackets are decommissioned (11 sites)			48	131
Total Number of sites (10 are identical/replaced): 189				

Fig. 2: IGS RNAAC SIR stations ordered by country

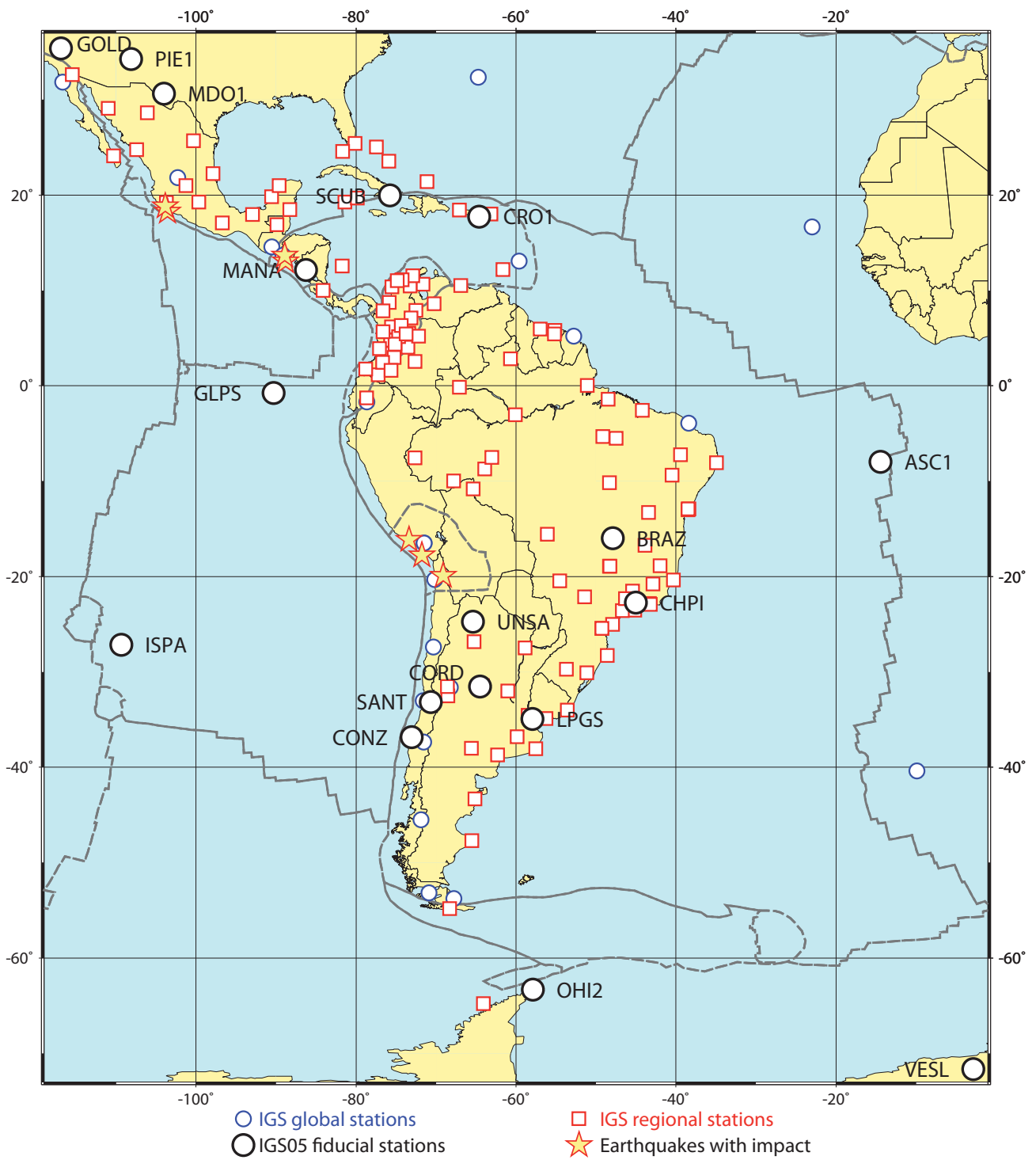


Fig. 3: IGS05 fiducial stations in IGS RNAAC SIR

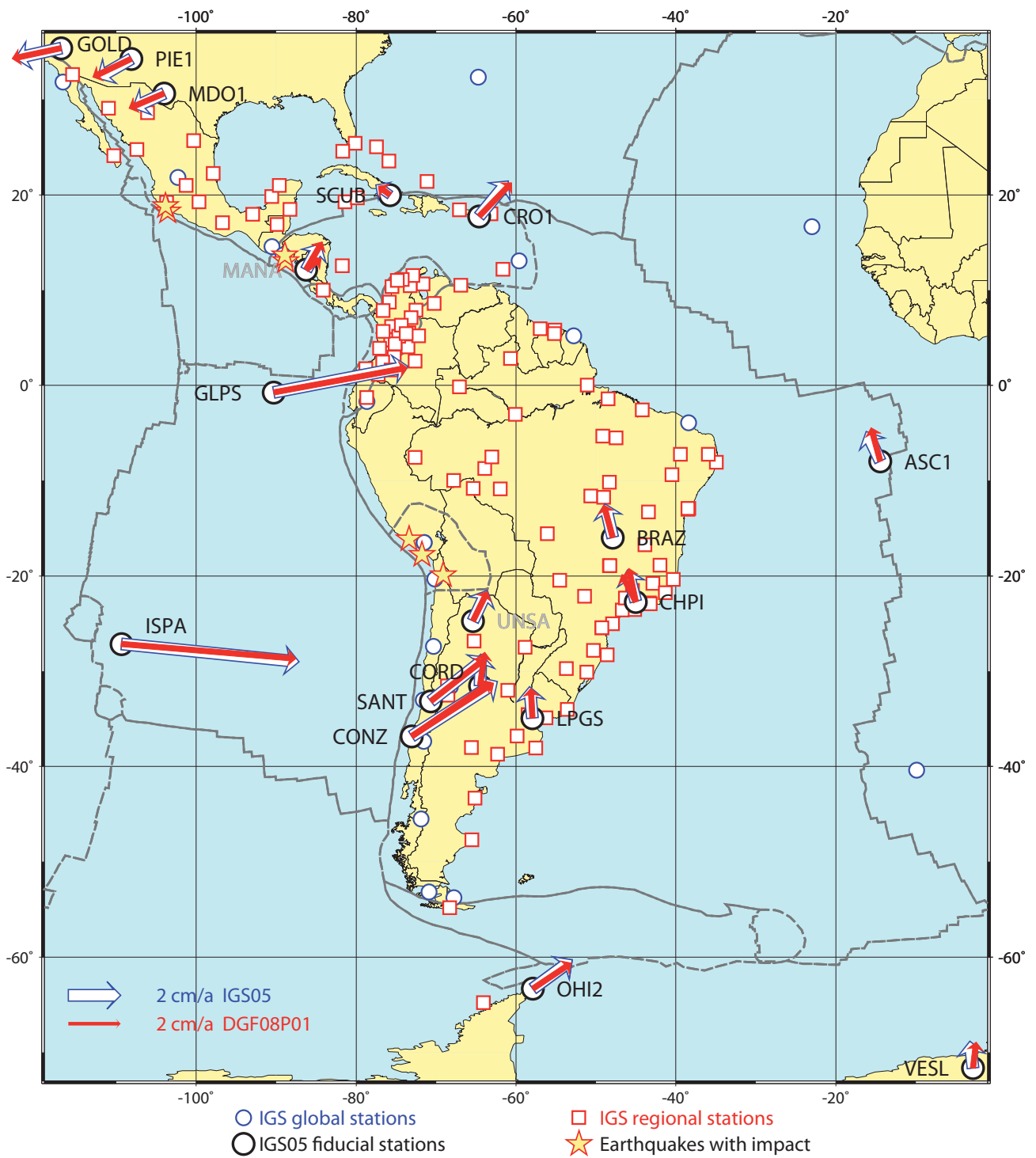


Fig. 4: Horizontal velocities of IGS05 stations

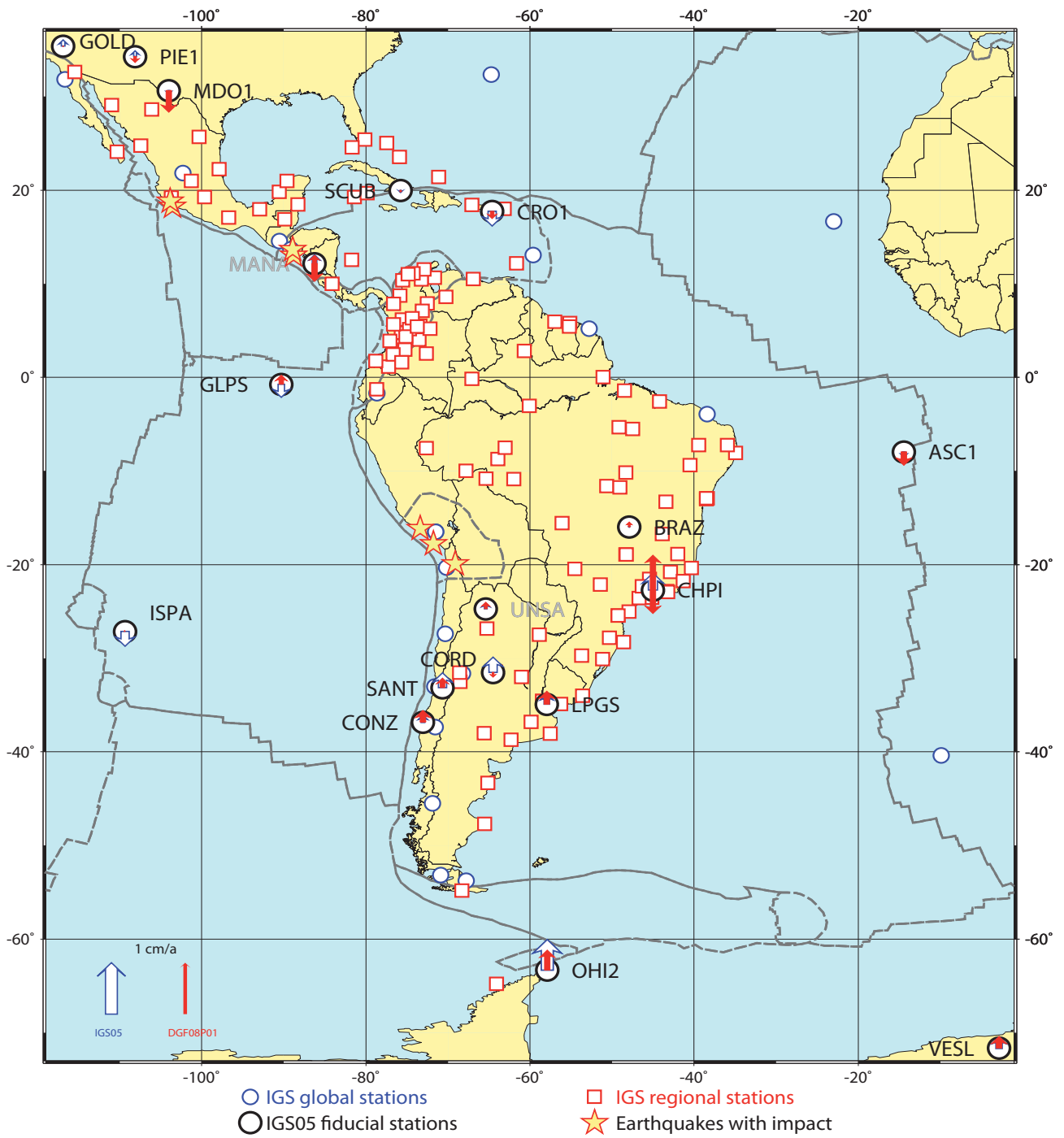


Fig. 5: Vertical velocities of IGS05 stations

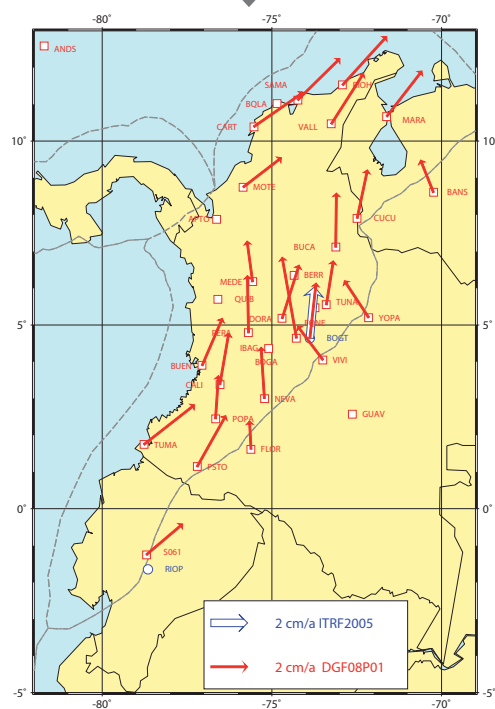
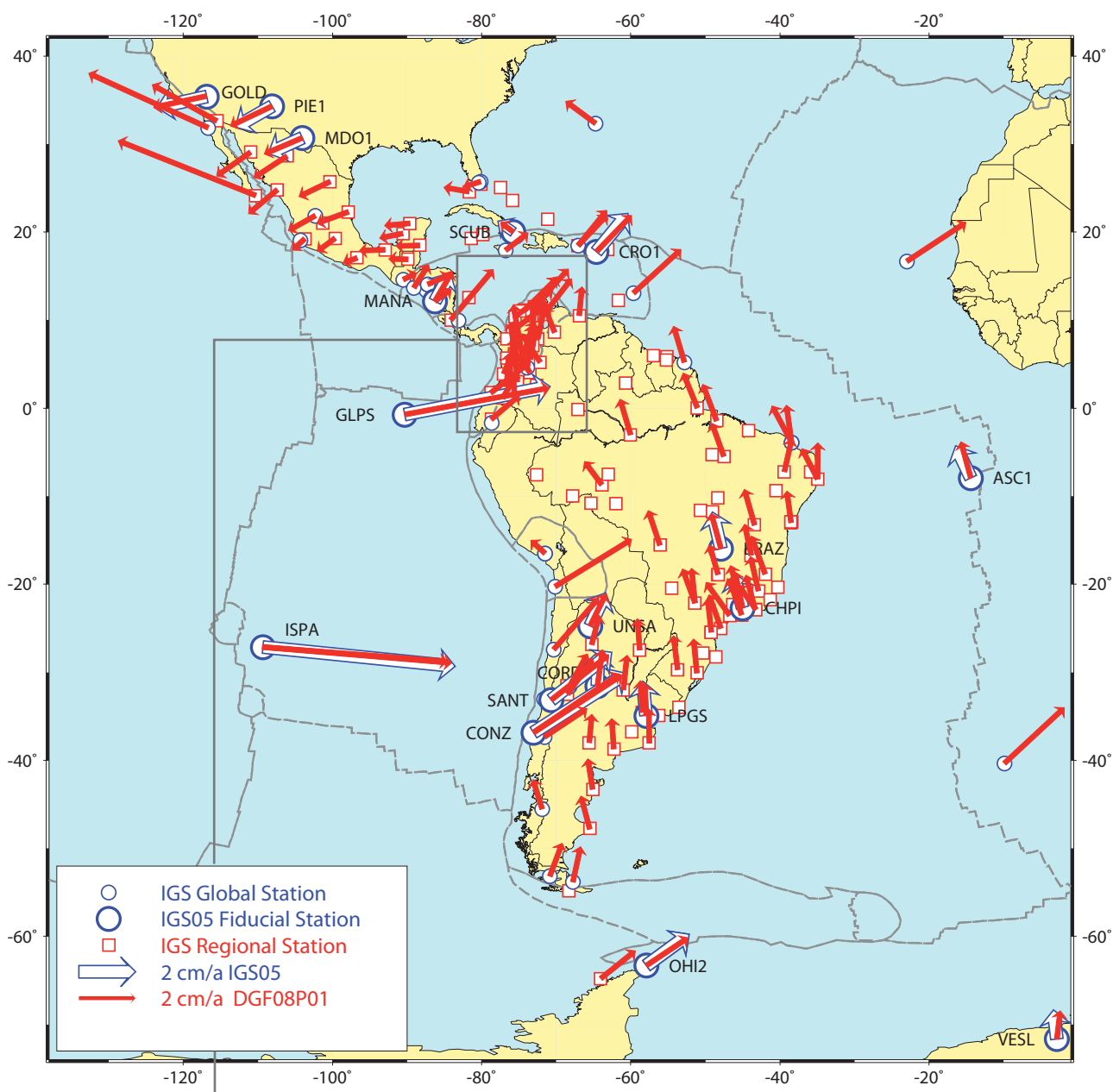


Fig. 6: Horizontal velocities of all DGF08P01 stations

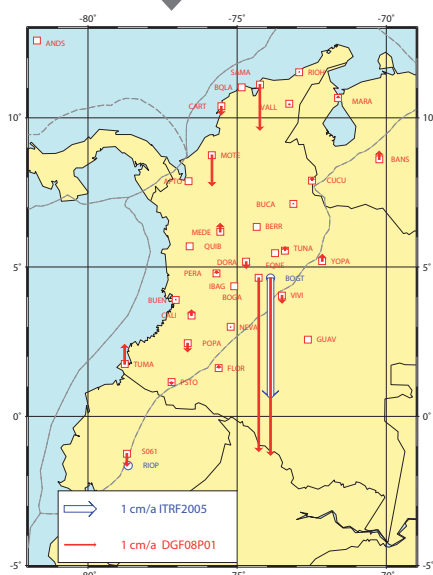
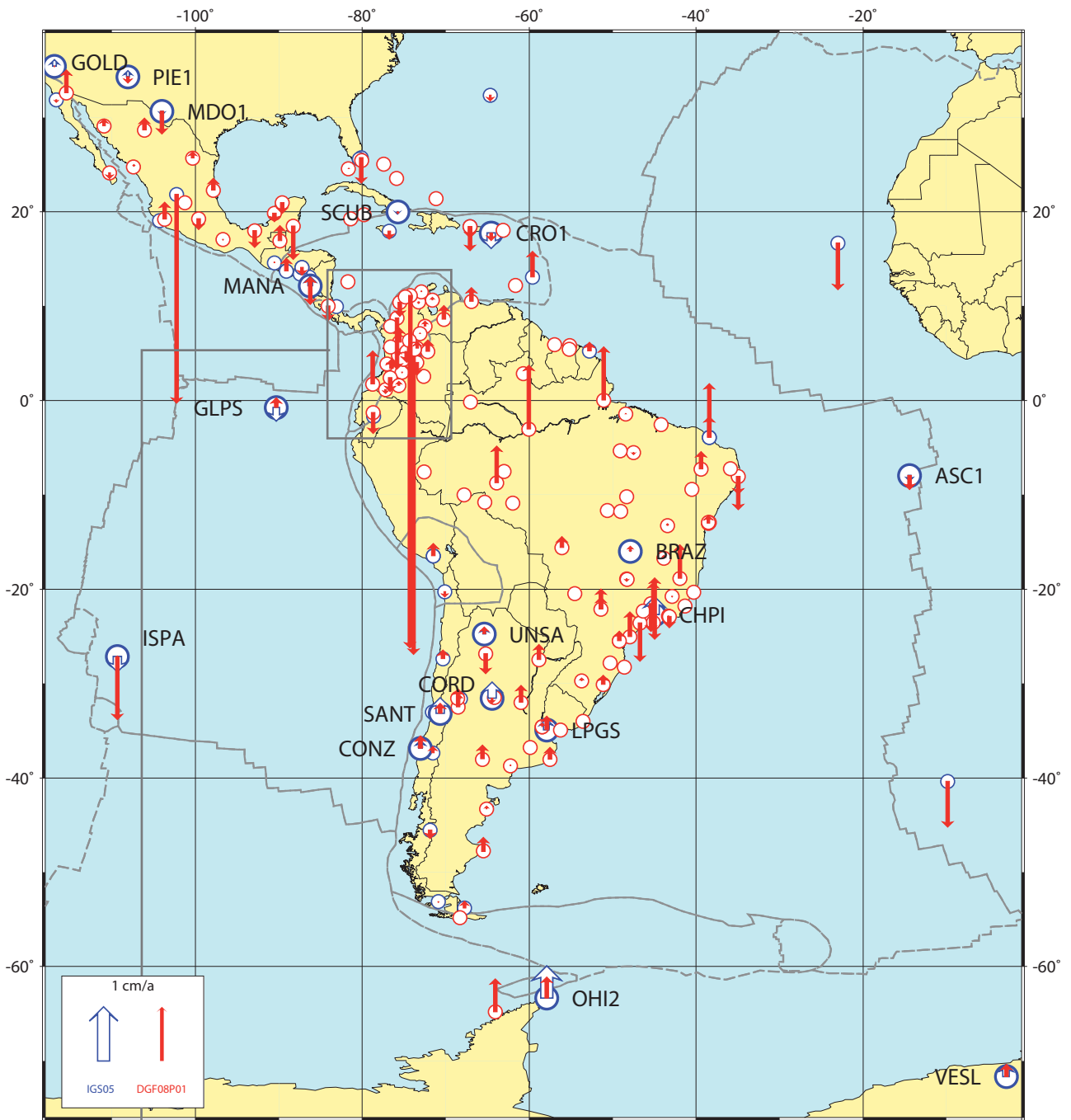


Fig. 7: Vertical velocities of all DGF08P01 stations

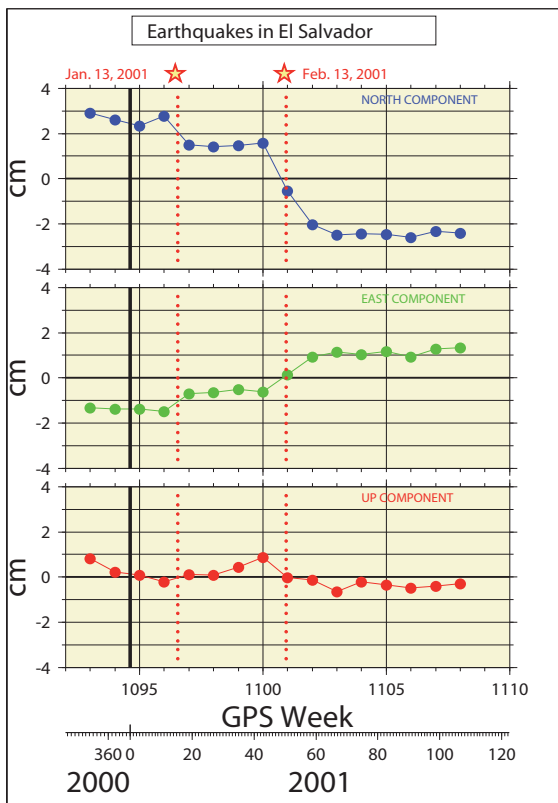


Fig. 8a) Earthquakes in San Salvador

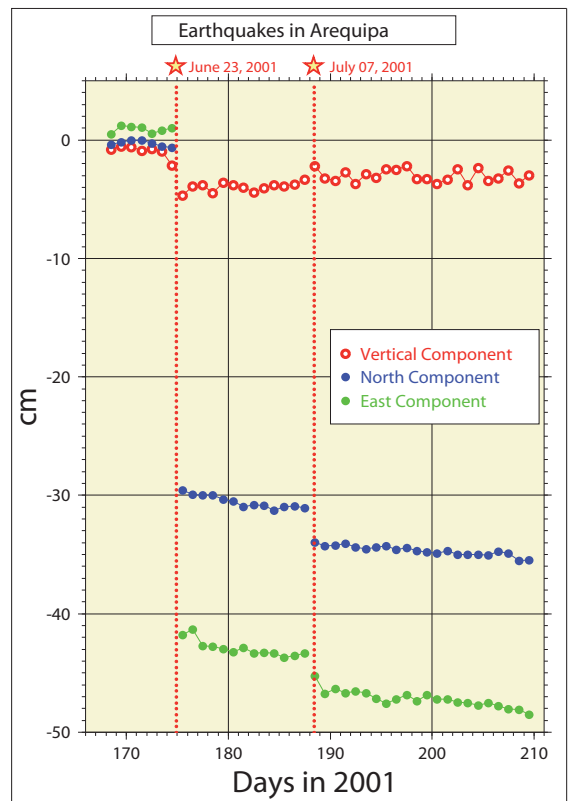


Fig. 8b) Earthquakes in Peru

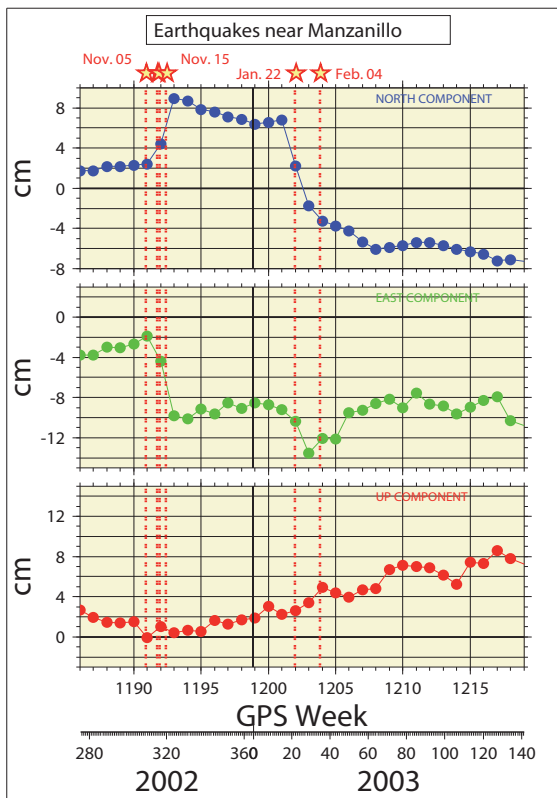


Fig. 8c) Earthquakes in Mexico

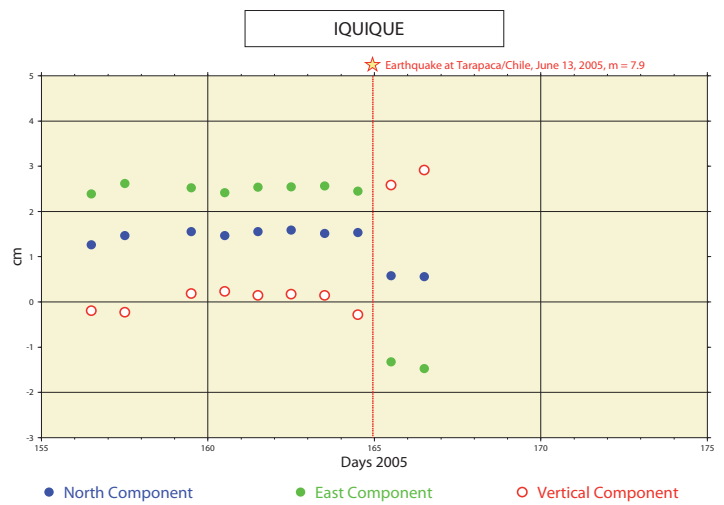


Fig. 8d) Earthquakes near Iquique

Fig. 8: Earthquake Signals (excluded from the Station Position and Velocity Solution)

Table 3: Geocentric Station Positions (epoch 2004.4) and Velocities of Solution DGF08P01

Stat./Country	ID	Domes No.	X [m]	Y [m]	Z [m]	VX [m/a]	VY [m/a]	VZ [m/a]	
Antuco	CL	ANTC	41713S001	1608539.5613	-4816369.7177	-3847798.5458	0.0165	-0.0018	0.0072
Key Biscayne	US	AOML	49914S001	982296.7317	-5664607.2229	2752614.4942	-0.0065	0.0023	-0.0038
Arequipa	PE	AREQ	42202M005	1942826.2185	-5804070.3172	-1796894.2659	-0.0037	-0.0050	0.0037
Ascencion	UK	ASC1	30602M001	6118526.0518	-1572344.7396	-876451.0760	-0.0017	-0.0032	0.0130
Barinas	VE	BANS	42403M001	2132376.3732	-5935471.3250	948857.2245	-0.0029	-0.0023	0.0091
Barbados	BB	BDOS	43401M001	3143382.1912	-5359714.8280	1434875.7735	0.0150	0.0074	0.0160
Belem	BR	BELE	41622M001	4228139.0432	-4772752.0952	-155761.3187	-0.0034	-0.0035	0.0129
Bogota	CO	BOGA	41901M002	1744517.3969	-6116051.6249	512580.8847	-0.0189	0.0521	0.0175
Bogota	CO	BOGT	41901M001	1744399.0427	-6116037.5752	512731.7173	-0.0137	0.0543	0.0105
Bom Jesus da Lapa	BR	BOMJ	41612M001	4510195.8274	-4268322.3380	-1453035.2367	-0.0002	-0.0049	0.0122
Brasilia	BR	BRAZ	41606M001	4115014.0789	-4550641.5626	-1741443.9657	0.0003	-0.0054	0.0117
Eusebio	BR	BRFT	41602M002	4985393.5405	-3954993.4097	-428426.7130	-0.0006	-0.0083	0.0126
Bermuda	UK	BRMU	42501S004	2304703.4845	-4874817.1904	3395186.9535	-0.0116	0.0002	0.0060
Bucaramanga	CO	BUCA	41911S001	1838191.2992	-6057527.6795	785312.1910	-0.0003	0.0017	0.0146
Buenaventura	CO	BUEN	41912S001	1430383.8460	-6200818.1808	428933.9644	0.0052	0.0019	0.0128
Cali	CO	CALI	41903S001	1483099.9370	-6193060.1962	373124.0368	0.0025	-0.0003	0.0140
Campeche	MX	CAM2	40514M001	-56581.3274	-6001449.5796	2151509.1602	-0.0082	0.0010	-0.0021
Cartagena	CO	CART	41902M001	1567348.5916	-6075293.5351	1142850.8075	0.0119	0.0074	0.0087
Caucete	AR	CFAG	41517S001	2016584.8691	-5050165.6382	-3323308.7712	0.0082	-0.0036	0.0095
Chetumal	MX	CHET	40526M001	179584.7877	-6048080.6884	2010447.3592	-0.0085	0.0055	-0.0021
Chihuahua	MX	CHIH	40525M001	-1552307.7874	-5382771.9585	3041779.7959	-0.0127	-0.0021	-0.0056
Cachoeira *	BR	CHPI	41609M003	4164613.8770	-4162456.8769	-2445028.8110	-0.0014	-0.0025	0.0136
Cachoeira *	BR	CHPI	41609M003b	4164613.8788	-4162456.8646	-2445028.8033	0.0035	-0.0110	0.0070
Ensenada	MX	CIC1	40508M002	-2433177.0752	-4845044.9079	3348295.8636	-0.0329	0.0283	0.0161
Colima	MX	COL2	40524M001	-1427005.6197	-5852976.0374	2089088.9657	-0.0052	-0.0031	-0.0028
Concepcion *	CL	CONZ	41719M002	1492007.5632	-4887910.7282	-3803639.9499	0.0337	-0.0030	0.0158
Concepcion *	CL	CONZ	41719M002b	1492007.5684	-4887910.7134	-3803639.9461	0.0330	-0.0048	0.0151
Copiapo	CL	COPO	41714S001	1907040.7475	-5337379.0155	-2916334.8501	0.0182	-0.0038	0.0153
Cordoba	AR	CORD	41511M001	2345503.8800	-4910842.8344	-3316365.3632	0.0041	-0.0046	0.0114
Coyhaique	CL	COYQ	41715S001	1391587.1961	-4255574.4741	-4527925.9572	-0.0011	-0.0069	0.0084
Crato	BR	CRAT	41619M001	4888826.0209	-4017957.4516	-798308.9545	0.0052	-0.0009	0.0110
Caracas	VE	CRCS	42401M001	2459721.8599	-5770508.8868	1155112.0246	0.0012	-0.0002	0.0104
Saint Croix	US	CRO1	43201M001	2607771.2144	-5488076.7181	1932767.7846	0.0089	0.0100	0.0118
Cucuta	CO	CUCU	41904S001	1901228.7053	-6025504.3091	870700.4594	0.0024	0.0017	0.0132
Cuiaba	BR	CUIB	41603M001	3430711.3984	-5099641.5765	-1699432.8786	-0.0005	-0.0066	0.0112
Culiacan	MX	CULI	40523M001	-1730936.6986	-5528855.2558	2658865.6311	-0.0108	-0.0006	-0.0076
La Dorada	CO	DORA	41915S001	1679425.2159	-6123536.8849	602182.2307	0.0035	0.0044	0.0142
Easter Island	CL	EISL	41703M003	-1884951.2691	-5357596.0093	-2892890.5430	0.0656	-0.0097	0.0007
Santa Elena	GT	ELEN	40902S001	14103.7846	-6103995.0235	1843981.7377	-0.0068	-0.0026	0.0010
Heredia	CR	ETCG	40602M001	645208.2267	-6249842.2154	1100399.4175	0.0144	0.0073	0.0171
Florencia	CO	FLOR	41916S001	1585141.0950	-6175731.4541	179144.8405	-0.0003	-0.0007	0.0077
Fortaleza	BR	FORT	41602M001	4985386.5950	-3954998.6039	-428426.3849	0.0073	-0.0081	0.0123
Galapagos	EC	GLPS	42005M002	-33801.6851	-6377516.5282	-82154.3957	0.0510	-0.0022	0.0094
Goldstone	US	GOLD	40405S031	-2353614.3106	-4641385.3401	3676976.4361	-0.0177	0.0064	-0.0033
Gough	UK	GOUG	30608M001	4795578.6507	-835299.4011	-4107633.9502	0.0098	0.0197	0.0204
Guatemala	GT	GUAT	40901S001	-56063.5852	-6174978.6822	1596665.2662	0.0048	0.0003	0.0023
Gov. Valadares	BR	GVAL	41623M001	4490200.7896	-4036984.9318	-2048288.3413	0.0043	-0.0105	0.0106
Hermosillo	MX	HER2	40522M001	-1996003.9498	-5208674.5192	3082959.5838	-0.0130	-0.0006	-0.0067
Buenos Aires	AR	IGM1	41505M003	2751804.0372	-4479879.2948	-3598922.5303	0.0029	-0.0063	0.0088
Imperatriz	BR	IMPZ	41615M001	4289656.4345	-4680884.9509	-606347.2741	-0.0026	-0.0034	0.0116
Aguascalientes	MX	INEG	40507M001	-1260435.6787	-5788547.2958	2360340.1051	-0.0021	0.0350	-0.0192
Iquique	CL	IQQE	41708S002	2034208.4870	-5629172.2758	-2196141.8612	0.0269	0.0046	0.0159
Easter Island	CL	ISPA	41703M007	-1881703.6956	-5359979.7139	-2890599.2432	0.0637	-0.0198	-0.0051
Kingston	JM	JAMA	42601S001	1388059.8343	-5909149.0502	1951963.8703	0.0069	0.0050	0.0053
Kourou	FR	KOUR	97301M210	3839591.3932	-5059567.5698	579957.0346	-0.0028	-0.0026	0.0127
Key West 1	US	KYW1	49852S001	842464.4351	-5741929.0122	2637061.5169	-0.0089	-0.0008	0.0014
Lihue Calel	AR	LHCL	41518S001	2079355.6092	-4582903.4608	-3905925.6753	0.0042	-0.0070	0.0063
La Paz	MX	LPAZ	40521M001	-2022283.3072	-5461274.2636	2592317.0805	-0.0424	0.0251	0.0172
La Plata	AR	LPGS	41510M001	2780102.9953	-4437418.9192	-3629404.5194	0.0040	-0.0075	0.0078
Managua *	NI	MANA	41201S001	407981.8406	-6222925.7194	1333528.9785	0.0060	0.0011	0.0106
Managua *	NI	MANA	41201S001b	407981.8356	-6222925.7302	1333528.9680	0.0054	0.0047	0.0033
Macapa	BR	MAPA	41629M001	4005461.1346	-4963550.2960	5162.2892	0.0023	-0.0107	0.0122
Maracaibo	VE	MARA	42402M001	1976117.1511	-5948895.1670	1173592.2210	0.0085	0.0047	0.0122
Montes Claros	BR	MCLA	41624M001	4404519.5858	-4235798.4123	-1823409.1162	0.0010	-0.0041	0.0103

Table 3 (continued): Geocentric Station Positions (epoch 2004.4) and Velocities of Solution DGF08P01

Stat./Country	ID	Domes No.	X [m]	Y [m]	Z [m]	VX [m/a]	VY [m/a]	VZ [m/a]	
Fort Davis	US	MDO1	40442M012	-1329998.7683	-5328393.3858	3236504.1694	-0.0129	0.0039	-0.0071
Corrientes	AR	MECO	41526M001	2946968.5635	-4730056.9658	-3091865.0228	0.0034	-0.0070	0.0082
Medellin	CO	MEDE	41921S001	1579608.4428	-6142783.8416	684352.2880	-0.0011	-0.0017	0.0113
Merida	MX	MERI	40520M001	39480.7918	-5957733.1108	2269335.1261	-0.0089	0.0015	-0.0015
Mexicali	MX	MEXI	40519M001	-2312590.8983	-4853743.6717	3419740.4432	-0.0192	0.0128	0.0130
Monteria	CO	MOTE	41922S001	1539876.9140	-6112744.6477	968435.2619	0.0075	0.0129	0.0064
Mar del Plata	AR	MPLA	41521M001	2700316.8303	-4243736.7171	-3908569.7465	0.0048	-0.0078	0.0082
Monterrey	MX	MTY2	40518M001	-1029483.4463	-5657637.2330	2750926.1194	-0.0114	-0.0014	-0.0042
Mendoza	AR	MZAC	41503M001	1932262.6722	-5001226.5211	-3444667.8539	0.0118	-0.0058	0.0088
Manaus	BR	NAUS	41614M002	3179409.3607	-5519130.6444	-334110.1123	0.0030	-0.0126	0.0118
Cananeia	BR	NEIA	41620M002	3875254.9824	-4292588.7110	-2681108.7217	0.0030	-0.0096	0.0088
Neiva	CO	NEVA	41923S001	1617259.9753	-6161575.1533	324674.6436	-0.0011	0.0006	0.0139
Oaxaca	MX	OAX2	40517M001	-713483.0307	-6058316.0895	1861594.7007	-0.0050	0.0002	-0.0018
O'Higgins	AN	OH12	66008M005	1525811.8606	-2432478.2183	-5676165.5892	0.0181	-0.0011	0.0010
Rio de Janeiro	BR	ONRJ	41635M001	4283638.3754	-4026028.8400	-2466096.7787	-0.0033	-0.0056	0.0089
Palmer	AN	PALM	66005M002	1192671.9012	-2450887.6113	-5747096.0298	0.0159	-0.0050	-0.0014
Curitiba	BR	PARA	41610M001	3763751.6524	-4365113.8207	-2724404.6458	0.0034	-0.0059	0.0099
Punta Arenas	CL	PARC	41716S001	1255992.4404	-3622975.1211	-5079719.2737	0.0070	-0.0072	0.0071
Puerto Deseado	AR	PDES	41524M001	1753203.6634	-3922031.1041	-4698513.5192	0.0013	-0.0107	0.0058
Pereira	CO	PERA	41905S001	1571418.6853	-6160208.4229	529446.3874	-0.0004	0.0004	0.0156
Pie Town	US	PIE1	40456M001	-1640916.8954	-5014781.2117	3575447.1085	-0.0149	0.0018	-0.0065
Porto Alegre	BR	POAL	41616M001	3467519.4089	-4300378.5512	-3177517.6831	0.0037	-0.0065	0.0094
Sao Paulo	BR	POLI	41630M001	4010099.5421	-4259927.3297	-2533538.7559	-0.0074	-0.0043	0.0135
Popayan	CO	POPA	41924S001	1477067.4494	-6200659.1206	270141.2736	0.0001	0.0032	0.0116
Porto Velho	BR	POVE	41628M001	2774265.6249	-5662060.1163	-959415.9219	-0.0019	-0.0099	0.0071
Presidente Prudente	BR	PPTE	41611M002	3687624.3617	-4620818.6754	-2386880.3162	0.0015	-0.0089	0.0097
Pasto	CO	PSTO	41925S001	1404951.7208	-6222655.1037	134028.5831	0.0073	0.0028	0.0139
Puerto Rico 3 *	US	PUR3	82001S003	2358177.9064	-5573619.6527	2007083.9426	0.0060	0.0115	0.0103
Puerto Rico 3 *	US	PUR3	82001S003b	2358177.9101	-5573619.6685	2007083.9486	0.0073	0.0089	0.0095
Recife *	BR	RECF	41617M001	5176588.6298	-3618162.1612	-887363.8598	-0.0035	0.0026	0.0134
Recife *	BR	RECF	41617M001b	5176588.6403	-3618162.1569	-887363.8590	-0.0046	-0.0034	0.0110
Rio de Janeiro	BR	RIOD	41608M001	4280294.8827	-4034431.2446	-2458141.3292	0.0011	-0.0053	0.0110
Rio Grande	AR	RIOG	41507M004	1429907.7918	-3495354.8134	-5122698.6509	0.0066	-0.0089	0.0063
Riohacha	CO	RIOH	41927S001	1841100.9950	-5973351.3629	1264686.5305	0.0108	0.0059	0.0130
Rawson	AR	RWSN	41513M001	1956973.4312	-4217335.3026	-4351745.4989	0.0017	-0.0077	0.0075
Quito	EC	S061	42003S003	1272867.3091	-6252772.1487	-23801.7686	0.0089	0.0057	0.0084
Salvador	BR	SALV	41618M001	4863495.7200	-3870312.3640	-1426347.7586	0.0020	-0.0036	0.0105
Santa Maria	CO	SAMA	41928S001	1704996.1807	-6020152.3937	1233459.1938	0.0067	0.0185	0.0083
Santiago de Chile	CL	SANT	41705M003	1769693.5096	-5044574.1689	-3468320.9524	0.0225	-0.0030	0.0122
Santiago de Cuba	CU	SCUB	40701M001	1474538.0962	-5811243.2833	2168958.8231	-0.0048	0.0003	0.0031
Santa Maria	BR	SMAR	41621M001	3280748.4111	-4468909.7610	-3143408.6428	0.0026	-0.0059	0.0101
San Salvador	SV	SSIA	41401S001	95566.9963	-6197785.5930	1500590.5276	0.0052	-0.0003	0.0084
Tampico	MX	TAMP	40516M001	-807922.6236	-5849358.2518	2402967.6854	-0.0115	-0.0020	-0.0030
Tegucigalpa 1	HN	TEG1	41101S002	301692.6977	-6181037.6611	1542881.1663	0.0074	0.0026	0.0029
Palmeira	CV	TGCV	39601S001	5624175.6284	-2385323.6120	1826873.7592	-0.0031	0.0239	0.0107
Toluca	MX	TOL2	40515M001	-1009229.1595	-5939511.4368	2094889.2387	-0.0062	0.0013	-0.0051
Tucuman	AR	TUCU	41520S001	2386117.1843	-5171223.3067	-2862949.1305	0.0030	-0.0001	0.0109
Tumaco	CO	TUMA	41929S001	1245829.9775	-6252040.1783	201464.1058	0.0147	-0.0030	0.0110
Tunja	CO	TUNA	41930S001	1818373.1650	-6085596.9160	610964.9780	0.0019	0.0005	0.0121
Ubatuba	BR	UBAT	41627M001	4129567.6763	-4146742.9475	-2527616.4357	0.0051	-0.0103	0.0066
Uberlandia	BR	UBER	41625M001	4014997.2244	-4509022.4442	-2052040.6497	-0.0003	-0.0041	0.0100
Presidente Prudente	BR	UEPP	41611M001	3687624.3175	-4620818.6226	-2386880.2917	0.0032	-0.0058	0.0104
Rosario	AR	UNRO	41525M001	2627448.1839	-4668383.1692	-3450213.5056	0.0057	-0.0074	0.0085
Salta	AR	UNSA	41514M001	2412830.4272	-5271936.7311	-2652209.0461	0.0074	-0.0031	0.0097
Valledupar	CO	VALL	41906S001	1807579.7237	-6006678.3622	1151876.7791	0.0077	0.0052	0.0135
Varginha	BR	VARG	41626M001	4165518.2930	-4229235.8029	-2327739.6048	-0.0028	-0.0017	0.0124
Bahia Blanca	AR	VBCA	41512M001	2319240.8179	-4411743.9321	-3966484.1283	0.0025	-0.0063	0.0081
Sanae/Vesleskarvet	AN	VESL	66009M001	2009329.7848	-99741.4815	-6033158.4282	0.0102	0.0007	0.0009
Vicosa	BR	VICO	41613M001	4373283.3119	-4059639.0642	-2246959.6749	0.0011	-0.0048	0.0114
Villahermosa	MX	VIL2	40527M001	-310300.6300	-6060324.0296	1957383.6081	-0.0087	0.0033	-0.0012
Villavicencio	CO	VIVI	41931S001	1798110.7603	-6103160.6848	450209.5779	-0.0075	0.0010	0.0090
Yopal	CO	YOPA	41932S001	1921562.4287	-6053497.5405	587652.0554	-0.0060	-0.0031	0.0101

grey shaded stations are IGS05 stations, * stations with a b at the end of the Domes No. indicate the set after the jump

Table 4: Ellipsoidal (epoch 2004.4, GRS80) Station Positions and Velocities of Solution DGF08P01

Stat./Country	ID	Domes No.	Phi [°]	Lamda [°]	h [m]	VPhi [m/a]	VLam [m/a]	Vh [m/a]	
Antuco	CL	ANTC	417135001	-37.33870280	288.46795033	745.400	0.0099	0.0151	0.0011
Key Biscayne	US	AOML	499145001	25.73469160	279.83780090	0.096	-0.0020	-0.0060	-0.0047
Arequipa	PE	AREQ	42202M005	-16.46551701	288.50720361	2488.918	0.0046	-0.0051	0.0024
Ascencion	UK	ASC1	30602M001	-7.95121362	345.58792756	105.116	0.0128	-0.0035	-0.0026
Barinas	VE	BANS	42403M001	8.61265175	289.76132407	204.983	0.0088	-0.0035	0.0025
Barbados	BB	BDOS	43401M001	13.08795360	300.39090272	-38.620	0.0153	0.0167	0.0048
Belem	BR	BELE	41622M001	-1.40879490	311.53745029	9.081	0.0129	-0.0049	0.0000
Bogota	CO	BOGA	41901M002	4.63868018	285.92005105	2610.416	0.0219	-0.0039	-0.0537
Bogota	CO	BOGT	41901M001	4.64007276	285.91906043	2576.793	0.0150	0.0017	-0.0549
Bom Jesus da Lapa	BR	BOMJ	41612M001	-13.25555785	316.57826464	419.390	0.0126	-0.0037	0.0003
Brasilia	BR	BRAZ	41606M001	-15.94747486	312.12213089	1106.012	0.0124	-0.0034	0.0008
Eusebio	BR	BRFT	41602M002	-3.87744684	321.57446286	21.676	0.0129	-0.0069	0.0038
Bermuda	UK	BRMU	42501S004	32.37039868	295.30372691	-11.606	0.0078	-0.0104	-0.0011
Bucaramanga	CO	BUCA	41911S001	7.11893431	286.88071964	1005.557	0.0147	0.0002	0.0001
Buenaventura	CO	BUEN	41912S001	3.88202244	282.98957936	57.757	0.0128	0.0055	0.0002
Cali	CO	CALI	41903S001	3.37578634	283.46743527	1027.498	0.0139	0.0024	0.0017
Campeche	MX	CAM2	40514M001	19.84442715	269.45983463	12.197	-0.0017	-0.0082	-0.0016
Cartagena	CO	CART	41902M001	10.39133426	284.46614624	4.079	0.0093	0.0134	-0.0026
Cauce	AR	CFAG	41517S001	-31.60216733	291.76735186	702.551	0.0114	0.0063	0.0005
Chetumal	MX	CHET	40526M001	18.49526761	271.70077560	2.983	-0.0002	-0.0083	-0.0061
Chihuahua	MX	CHIH	40525M001	28.66219288	253.91326073	1413.183	-0.0076	-0.0116	0.0022
Cachoeira *	BR	CHPI	41609M003	-22.68714582	315.01484159	617.407	0.0104	-0.0053	0.0068
Cachoeira *	BR	CHPI	41609M003b	-22.68714578	315.01484169	617.397	0.0128	-0.0028	-0.0045
Ensenada	MX	CIC1	40508M002	31.87067797	243.33423930	64.340	0.0192	-0.0421	-0.0004
Colima	MX	COL2	40524M001	19.24444304	256.29811633	528.763	-0.0041	-0.0043	0.0032
Concepcion *	CL	CONZ	41719M002	-36.84376130	286.97451832	180.710	0.0206	0.0302	0.0023
Concepcion *	CL	CONZ	41719M002b	-36.84376134	286.97451842	180.697	0.0203	0.0314	0.0007
Copiapo	CL	COPO	41714S001	-27.38452699	289.66176332	479.094	0.0180	0.0159	0.0016
Cordoba	AR	CORD	41511M001	-31.52843485	295.52995169	746.848	0.0128	0.0017	-0.0009
Coyhaique	CL	COYQ	41715S001	-45.51434113	288.10791920	476.176	0.0103	-0.0032	-0.0016
Crato	BR	CRAT	41619M001	-7.23801816	320.58439443	436.030	0.0115	0.0026	0.0032
Caracas	VE	CRCS	42401M001	10.50252967	293.08648391	913.034	0.0101	0.0010	0.0025
Saint Croix	US	CRO1	43201M001	17.75689812	295.41568011	-31.936	0.0128	0.0123	-0.0014
Cucuta	CO	CUCU	41904S001	7.89845772	287.51206025	311.177	0.0132	0.0028	0.0009
Cuiaba	BR	CUIB	41603M001	-15.55526252	303.93013333	237.436	0.0122	-0.0041	0.0020
Culiacan	MX	CULI	40523M001	24.79855241	252.61605744	75.406	-0.0085	-0.0101	0.0003
La Dorada	CO	DORA	41915S001	5.45384403	285.33668658	204.500	0.0145	0.0045	-0.0020
Easter Island	CL	EISL	41703M003	-27.14820934	250.61671010	114.529	-0.0051	0.0651	-0.0116
Santa Elena	GT	ELEN	40902S001	16.91605598	270.13238639	118.129	0.0002	-0.0068	0.0028
Heredia	CR	ETCG	40602M001	9.99948229	275.89410273	1193.641	0.0178	0.0151	-0.0027
Florencia	CO	FLOR	41916S001	1.62026251	284.39549800	314.257	0.0077	-0.0005	0.0008
Fortaleza	BR	FORT	41602M001	-3.87744523	321.57438735	19.446	0.0130	-0.0018	0.0099
Galapagos	EC	GLPS	42005M002	-0.74299947	269.69632760	1.792	0.0094	0.0510	0.0018
Goldstone	US	GOLD	40405S031	35.42515606	243.11075004	986.668	-0.0040	-0.0187	-0.0000
Gough	UK	Goug	30608M001	-40.34883299	350.11928337	81.255	0.0196	0.0211	-0.0084
Guatemala	GT	GUAT	40901S001	14.59040408	269.47981706	1519.885	0.0023	0.0048	0.0002
Gov. Valadares	BR	GVAL	41623M001	-18.85560649	318.04238076	178.629	0.0133	-0.0049	0.0062
Hermosillo	MX	HER2	40522M001	29.09254716	249.03278511	186.950	-0.0084	-0.0119	0.0013
Buenos Aires	AR	IGM1	41505M003	-34.57224393	301.56068069	50.692	0.0112	-0.0008	0.0007
Imperatriz	BR	IMPZ	41615M001	-5.49176572	312.50276533	105.003	0.0116	-0.0042	-0.0004
Aguascalientes	MX	INEG	40507M001	21.85615372	257.71579709	1888.019	-0.0053	-0.0095	-0.0385
Iquique	CL	IQQE	41708S002	-20.27354144	289.86828589	38.947	0.0166	0.0269	-0.0010
Easter Island	CL	ISPA	41703M007	-27.12498280	250.65558803	112.494	-0.0056	0.0667	0.0002
Kingston	JM	JAMA	42601S001	17.93902328	283.21912799	-2.935	0.0061	0.0079	-0.0015
Kourou	FR	KOUR	97301M210	5.25218120	307.19404034	-25.754	0.0126	-0.0038	0.0015
Key West 1	US	KYW1	49852S001	24.58227252	278.34696710	-13.785	0.0015	-0.0089	0.0001
Lihue Calel	AR	LHCL	41518S001	-38.00265972	294.40475275	404.541	0.0100	0.0009	0.0025
La Paz	MX	LPAZ	40521M001	24.13879762	249.68065380	-6.835	0.0193	-0.0485	-0.0010
La Plata	AR	LPGS	41510M001	-34.90674534	302.06770048	29.870	0.0112	-0.0006	0.0025
Managua *	NI	MANA	41201S001	12.14893849	273.75100608	71.051	0.0041	0.0057	-0.0035
Managua *	NI	MANA	41201S001b	12.14893838	273.75100602	71.059	0.0105	0.0061	0.0015
Macapa	BR	MAPA	41629M001	0.04668620	308.90266318	-4.258	0.0122	-0.0049	0.0098
Maracaibo	VE	MARA	42402M001	10.67397864	288.37556935	28.394	0.0123	0.0095	0.0005
Montes Claros	BR	MCLA	41624M001	-16.72039461	316.11868368	656.544	0.0109	-0.0023	0.0004

Table 4 (continued): Ellipsoidal (epoch 2004.4, GRS80) Station Positions and Velocities of Solution DGF08P01

Stat./Country	ID	Domes No.	Phi [°]	Lamda [°]	h [m]	VPhi [m/a]	VLam [m/a]	Vh [m/a]	
Fort Davis	US	MDO1	40442M012	30.68051122	255.98500706	2004.509	-0.0058	-0.0135	-0.0042
Corrientes	AR	MECO	41526M001	-29.18488736	301.92415469	116.510	0.0109	-0.0008	0.0028
Medellin	CO	MEDE	41921S001	6.19940383	284.42108332	1553.416	0.0111	-0.0015	0.0026
Merida	MX	MERI	40520M001	20.98004536	270.37968294	7.874	-0.0008	-0.0089	-0.0020
Mexicali	MX	MEXI	40519M001	32.63299126	244.52429721	-22.454	0.0127	-0.0228	0.0042
Monteria	CO	MOTE	41922S001	8.79196482	284.13933050	33.240	0.0080	0.0104	-0.0096
Mar del Plata	AR	MPLA	41521M001	-38.03560374	302.46885804	20.115	0.0121	-0.0001	0.0022
Monterrey	MX	MTY2	40518M001	25.71550676	259.68709431	521.740	-0.0053	-0.0110	0.0013
Mendoza	AR	MZAC	41503M001	-32.89515302	291.12442615	859.835	0.0126	0.0089	0.0033
Manaus	BR	NAUS	41614M002	-3.02291923	299.94498337	93.855	0.0124	-0.0037	0.0119
Cananea	BR	NEIA	41620M002	-25.02023884	312.07503150	6.051	0.0118	-0.0042	0.0046
Neiva	CO	NEVA	41923S001	2.93729994	284.70696851	472.739	0.0139	-0.0009	-0.0001
Oaxaca	MX	OAX2	40517M001	17.07833981	263.28326073	1607.254	-0.0015	-0.0046	0.0014
O'Higgins	AN	OH12	66008M005	-63.32108124	302.09866719	32.461	0.0099	0.0147	0.0038
Rio de Janeiro	BR	ONRJ	41635M001	-22.89569999	316.77566839	35.637	0.0088	-0.0063	-0.0021
Palmer	AN	PALM	66005M002	-64.77509022	295.94887734	31.047	0.0098	0.0121	0.0061
Curitiba	BR	PARA	41610M001	-25.44836812	310.76904508	925.756	0.0118	-0.0013	0.0018
Punta Arenas	CL	PARC	41716S001	-53.13695494	289.12011784	22.292	0.0115	0.0043	-0.0002
Puerto Deseado	AR	PDES	41524M001	-47.75359406	294.08532223	18.005	0.0115	-0.0032	0.0026
Pereira	CO	PERA	41905S001	4.79249524	284.31049062	1496.743	0.0156	-0.0003	0.0008
Pie Town	US	PIE1	40456M001	34.30150598	251.88107305	2347.740	-0.0070	-0.0147	-0.0012
Porto Alegre	BR	POAL	41616M001	-30.07404199	308.88023516	76.736	0.0118	-0.0012	0.0017
Sao Paulo	BR	POLI	41630M001	-23.55564734	313.26968809	730.646	0.0116	-0.0083	-0.0072
Popayan	CO	POPA	41924S001	2.44311357	283.39879401	1782.261	0.0117	0.0008	-0.0026
Porto Velho	BR	POVE	41628M001	-8.70933603	296.10368032	119.570	0.0082	-0.0061	0.0069
Presidente Prudente	BR	POTE	41611M002	-22.11990423	308.59146598	431.017	0.0120	-0.0044	0.0037
Pasto	CO	PSTO	41925S001	1.21171077	282.72291935	2569.117	0.0138	0.0077	-0.0008
Puerto Rico 3 *	US	PUR3	82001S003	18.46297659	292.93304256	89.551	0.0107	0.0102	-0.0021
Puerto Rico 3 *	US	PUR3	82001S003b	18.46297659	292.93304254	89.568	0.0124	0.0100	-0.0046
Recife *	BR	RECF	41617M001	-8.05096330	325.04848347	20.151	0.0106	-0.0055	-0.0033
Recife *	BR	RECF	41617M001b	-8.05096328	325.04848356	20.157	0.0127	0.0001	-0.0062
Rio de Janeiro	BR	RIOD	41608M001	-22.81784394	316.69372328	8.626	0.0119	-0.0031	-0.0002
Rio Grande	AR	RIOG	41507M004	-53.78547213	292.24888202	32.039	0.0124	0.0027	0.0013
Riohacha	CO	RIOH	41927S001	11.51321562	287.13029756	12.477	0.0132	0.0121	0.0002
Rawson	AR	RWSN	41513M001	-43.29888088	294.89275171	27.383	0.0107	-0.0017	0.0005
Quito	EC	S061	42003S003	-0.21515717	281.50639181	2922.557	0.0084	0.0099	-0.0038
Salvador	BR	SALV	41618M001	-13.00866941	321.48764072	35.744	0.0111	-0.0016	0.0013
Santa Maria	CO	SAMA	41928S001	11.22524671	285.81290632	22.764	0.0113	0.0115	-0.0141
Santiago de Chile	CL	SANT	41705M003	-33.15028835	289.33144580	723.066	0.0158	0.0202	0.0019
Santiago de Cuba	CU	SCUB	40701M001	20.01206330	284.23768370	20.927	0.0034	-0.0046	-0.0003
Santa Maria	BR	SMAR	41621M001	-29.71892349	306.28340675	113.104	0.0119	-0.0014	0.0005
San Salvador	SV	SSIA	41401S001	13.69708480	270.88340449	626.638	0.0081	0.0052	0.0024
Tampico	MX	TAMP	40516M001	22.27832107	262.13597316	21.046	-0.0041	-0.0112	0.0021
Tegucigalpa 1	HN	TEG1	41101S002	14.09007305	272.79435459	951.351	0.0034	0.0076	-0.0015
Palmeira	CX	TGCV	39601S001	16.75477331	337.01724311	35.206	0.0138	0.0208	-0.0086
Toluca	MV	TOL2	40515M001	19.29323439	260.35652802	2651.732	-0.0047	-0.0063	-0.0019
Tucuman	AR	TUCU	41520S001	-26.84325531	294.76964836	485.056	0.0103	0.0027	-0.0037
Tumaco	CO	TUMA	41929S001	1.82227351	281.26958560	25.749	0.0108	0.0138	0.0062
Tunja	CO	TUNA	41930S001	5.53132837	286.63611789	2831.859	0.0120	0.0020	0.0012
Ubatuba	BR	UBAT	41627M001	-23.50017657	314.88109809	6.042	0.0104	-0.0037	0.0074
Uberlandia	BR	UBER	41625M001	-18.88953531	311.68302841	791.793	0.0104	-0.0030	-0.0005
Presidente Prudente	BR	UEPP	41611M001	-22.11990426	308.59146596	430.944	0.0121	-0.0011	0.0021
Rosario	AR	UNRO	41525M001	-32.95935317	299.37157476	66.866	0.0122	0.0013	0.0031
Salta	AR	UNSA	41514M001	-24.72745656	294.59235658	1257.802	0.0113	0.0054	0.0013
Valledupar	CO	VALL	41906S001	10.47396553	286.74802967	208.501	0.0138	0.0089	-0.0003
Varginha	BR	VARG	41626M001	-21.54268408	314.56512433	958.654	0.0113	-0.0032	-0.0053
Bahia Blanca	AR	VBCA	41512M001	-38.70076840	297.73077290	59.478	0.0105	-0.0007	0.0002
Sanae/Vesleskarvet	AN	VESL	66009M001	-71.67379632	357.15821709	862.356	0.0099	0.0012	0.0023
Vicosa	BR	VICO	41613M001	-20.76150007	317.13001039	665.946	0.0121	-0.0028	-0.0002
Villahermosa	MX	VIL2	40527M001	17.99041060	267.06890191	27.758	-0.0003	-0.0089	-0.0031
Villavicencio	CO	VIVI	41931S001	4.07466122	286.41600673	407.289	0.0092	-0.0069	-0.0024
Yopal	CO	YOPA	41932S001	5.32176095	287.61100586	334.356	0.0100	-0.0067	0.0021

grey shaded stations are IGS05 stations, * stations with a b at the end of the Domes No. indicate the set after the jump

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Annex

