Stations (existing)

ABBR	Full Name	Country	Lon	Lat	Status	Agency	Collocation VLB	Collocation I	Collocation SLR
TROM	Tromso	Norway	18.9	69.6	Existing	SK		x	x
NYAL	Ny-Alesund	Norway	11.8	78.9	Existing	SK			
ONSA	Onsala	Sweden	11.9	57.3	Existing	0s0		x	
METS	Metsahovi	Finland	24.3	60.2	Existing	FGI		x	x
GRAZ	Graz	Austria	15.4	47.0	Existing	ISRO			x
MATE	Matera	Italy	16.7	40.6	Existing	ISA		x	x
HERS	Hersmonceux	United Kingdom	.3	50.8	Existing	RGO			x
MADR	Madrid	Spain	-4.2	40.4	Existing	NASA/JPL		x	
KOOT	Kootwijk	Netherlands	5.8	52.1	Existing	DUT			x
ZIMM	Zimmerwald	Switzerland	7.4	46.8	Existing	BfL			x
WETT	Wettzell	Germany	12.8	49.1	Existing	I fAG		**x**	x
USUD	Usuda	Japan	138.3	36.1	Existing	I SAS		**x**	
TAIP	Taipei	Taiwan	121.5	25.0	Existing	IESAS			
MASP	Maspalomas	Canary Islands	-15.6	27.7	Existing	ESOC			
STJO	St. Johns	Canada	-52.6	47.5	Existing	EMR			
KITA	Kitab	Uzbekistan	66.5	39.0	Existing	GFZ			
JOZE	Jozeslaw	Poland	21.5	51.0	Existing	? WUT ?			
WUHA	Wuhan	China	114.3	30.5	Existing	WTU/NGS			x
THUL	Thule	Greenland	-69.0	76.3	Existing	CSR			

Stations (planned / possible)

ABBR	Full Name	Country	Lon	Lat	Status	Agency	Collocation VLBI	Collocation SLR
HOFN	Hofn	Iceland	-15.1	64.2	Planned	SK	x	-
BANG	Bangalore	India	77.7	12.9	Planned	GFZ		-
SHAN	Shanghai	China	121.1	31.0	Planned	SAO/NASA/JPL	x	X
CHAN	Changchun	China	125.4	43.7	Planned	SAO		X
KUNM	Kunming	China	102.83	25.2	Planned	SAO		-
BEIJ	Beijing	China	116.2	39.5	Planned	NBSM/GFZ		-
URUM	Urumchi	China	87.3	43.4	Planned	GFZ		-
ULAN	Ulan Bator	Mongolia	106.5	47.5	Planned	GFZ		-
BADA	Badari	Russia	102.2	51.8	Planned	IAAS/JPL		-
NOVO	Novosibirsk	Russia	83.0	55.0	Planned	GFZ		?
ANKA	Ankara	Turkey	32.5	39.5	Planned	IfAG		X
Ussu	Ussuriysk	Russia	131.5	43.4	Planned	SDC/JPL		?
RIYA	Riyadh	Arabia	46.4	24.3	Planned	?		-
SFER	San Fernando	Spain	-6.1	36.2	Planned	?		X
DUDI	Dudinka(Norilsk)	Russia	86.3	69.1	Planned	GFZ		-
PETR	Petrapavlovsk-Kamchatski	Russia	158.4	53.0	Planned	GFZ		-
ZVEN	Zvenigorod	Russia	36.9	55.7	Planned	IAAS/GFZ		-
KRAS	Krasnojarsk	Russia	92.8	56.0	Planned	GFZ		-
IRKU	Irkutsk	Russia	104.3	52.3	Possible	IMVP/DUT/JPL		?
MEND	Mendeleevo	Russia	37.2	56.0	Possible	IMVP/DUT/JPL		X
SVET	Svetloe	Russia	29.8	60.5	Possible	IAA/IfAG	x	-
ZELE	Zelenchukskaya	Russia	41.6	43.8	Possible	??	x	-
FIRU	Firusa	Turkmenistan	58.1	37.9	Possible	??	x	-

Stations (existing non-GPS / recommended)

ABBE	Full Name	Country	Lon	Lat	Status	Agency	Collocation VLBI	Collocation SLR
CARN	Carnusty	United Kingdom	-2.7	56.4	Existing	Non-GPS	x	
BARG	Bar Giyyora	Israel	35.0	31.7	Existing	Non-GPS		x
MIZU	Mizusawa	Japan	141.2	39.1	Existing	Non-GPS	x	
MIYA	Miyazaki	Japan	131.4	32.0	Existing	Non-GPS	x	
SHIN	Shintotsugawa	Japan	141.8	43.5	Existing	Non-GPS	x	
CHIC	Chichijima	Japan	142.1	27.0	Existing	Non-GPS	x	x
MINA	Minami Tori Sims	Japan	153.9	24.2	Existing	Non-GPS	x	x
BRES	Brest	France	-4.5	48.4	Existing	Non-GPS	x	
HELW	Helwan	Egypt	31.3	29.8	Existing	Non-GPS		x
SAOM	Sao Miguel	Azoren	-25.6	37.7	Existing	Non-GPS	x	
RIGA	Riga	Latvia	24.0	56.9	Existing	Non-GPS		x
SIME	Simeis-Katzively	Ukraine	33.9	44.4	Existing	Non-GPS		x
BALK	Balkash	Kazakhstan	73.6	46.2	Existing	Non-GPS		x
MAID	Maidanak	Uzbekistan	67.0	38.8	Existing	Non-GPS		x
PULK	Pulkovo	Russia	30.3	59.8	Existing	Non-GPS		?
KOMS	Komsomolsk-na Amure	Russia	136.9	50.7	Existing	Non-GPS		x
KHAB	Khabarovsk	Russia	133.1	48.5	Existing	Non-GPS		?
DION	Dionysos	Greece	23.9	38.0	Existing	Non-GPS		x
NOTO	Not o	Italy	14.9	36.8	Existing	Non-GPS	x	x
CAGL	Cagliari	Italy	8.9	39.1	Existing	Non-GPS		x
DJIB	Djibouti	Fr. Somalie	43.1	11.3	Recommended		-	-
NARS	Narssak	Greenland	-46.0	60.9	Recommended		-	-
SCOR	Scoresbysund	Greenland	-22.0	70.3	Recommended		-	-
LIME	Limerick	Ireland	-8.3	52.4	Recommended		-	-
FES	Fes	Morocco	-5.0	34.0	Recommended		-	-
TRIP	Tripoli	Libya	13.1	32.5	Recommended		-	-

'Agency abbreviations

BfL	Bundesamt fur Landestopographie (Federal Topography), Switzerland
CSR	Center for Space Research, University of Austin, Texas, USA
DUT	Delft University of Technology, Netherlands
ERI	Earthquake Research Institute, University of Tokyo, Japan
EMR	Energy Mines and Resources, Canada
ESOC	European Space Operations Center
FGI	Finnnish Geodetic Institute, Finland
GFZ	GeoforschungsZentrum Institute, Potsdam, Germany
GS I	Geographical Survey Institute, Tsukuba, Japan
IAAS	Institute of Applied Astronomy, St. Petersburg, Russia
IAAS	Institute for Astronomy of the Academy of Sciences, Russia
IESAS	Academia Sinica, Institue of Earth Sciences, Taiwan
I fAG	Institut fur Angewandte Geodaesie, Frankfurt, Germany
IMVP	Institute for Metrology of Time and Space, Russia
I SAS	Institute for Space and Astronautic Scinece, Sagamihara, Japan
ISRO	Institure for space Research Observatory, Graz, Austria
ISA	Italian Space Agency, Matera, Italy
JPL	Jet Propulsion Laboratory, USA
NASA	National Aeronautics and Space Administration, USA
NBSM	National Beureau of Surveying and Mapping, China
NGS	National Geodetic Survey, USA
0s0	Onsala Space Observatory, Sweden
RGO	Royal Greenwich Observatory, UK
SAO	Shanghai Astronomical Observatory, China
SDC	Space Device Corporation, Russia
SK	Statens Kartverk, Norwegian Mapping Authority, Norway
WUT	Warsaw Univerity of Technology, Poland
WTU	Wuhan Technical University, China

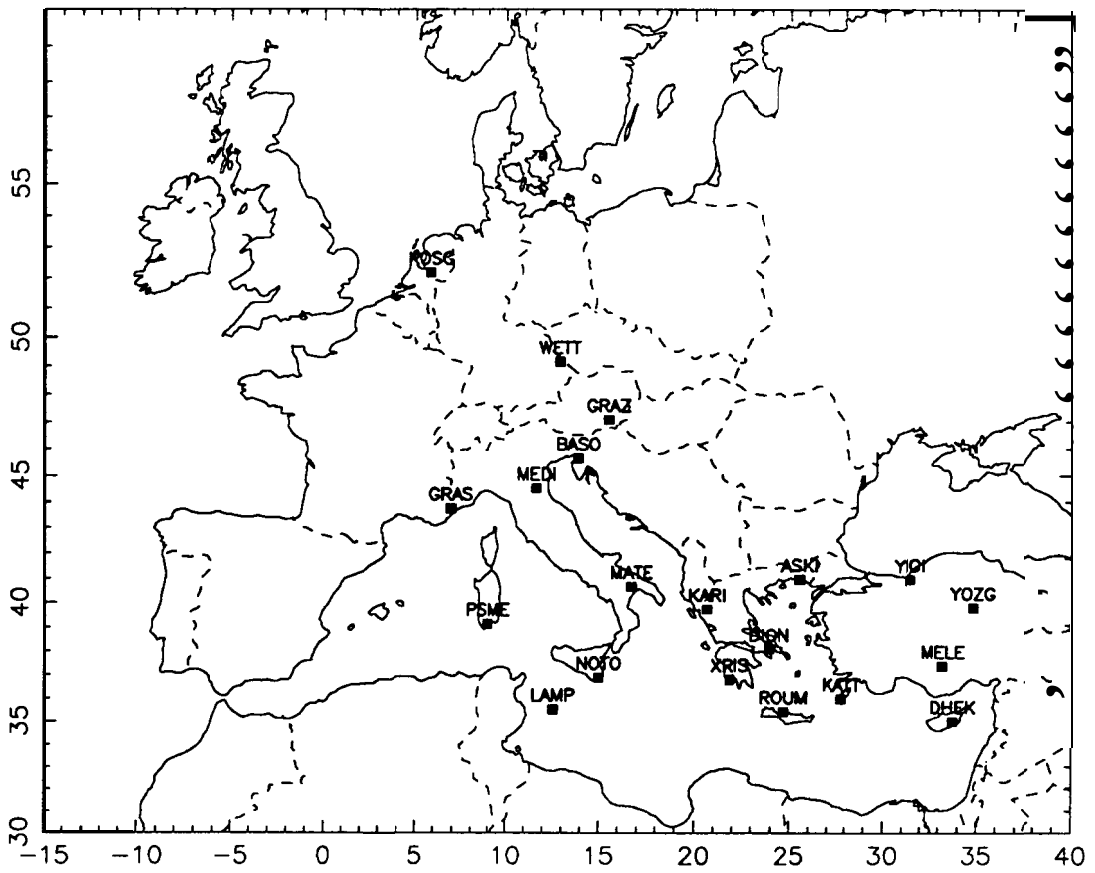
Most information is taken from:

International GPS Service for Geodynamics; Resource Information, October 1993,
IGS Workshops for Analysis and Network Operations

WEGNET analysis:

- IGS standards
- Batch type analyses (2 month delay ?)
- Analyze sub-networks
- Combine results into overall regional solution
- Provide connection with IGS reference frame
- Study long-term network deformations
- Associate analysis centers (Delft, Newcastle, . ..)

THE WEGENER/GPS-92 SITES



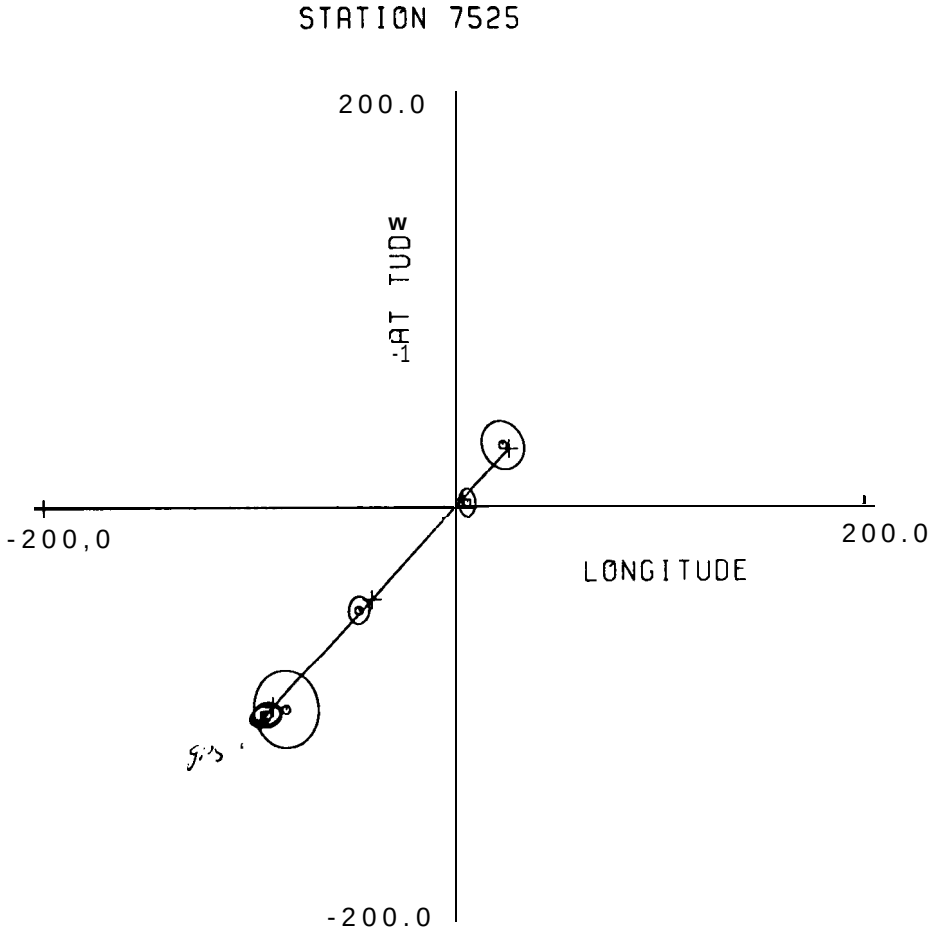
I COMPARISON OF SLR AND GPS COORDINATES (CONT'D)

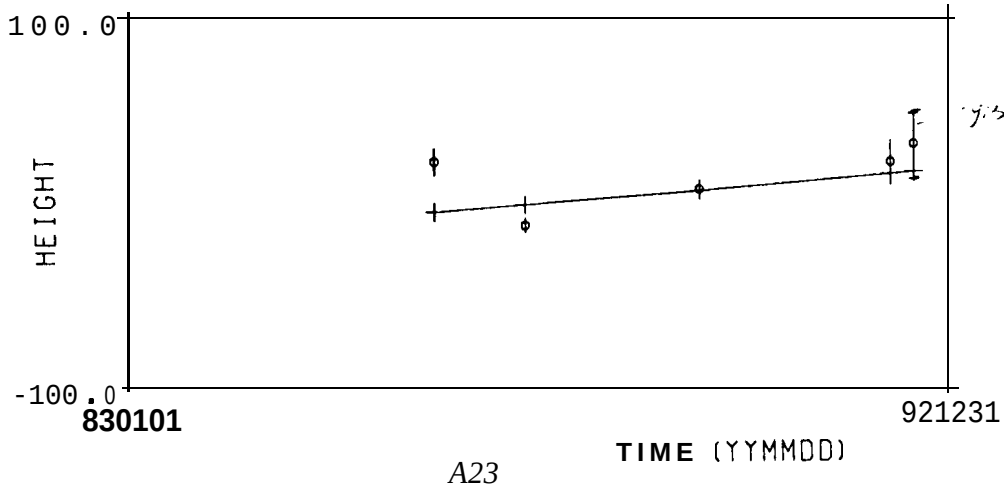
Sitename and Number		Residuals(mm)		
		North	East	up
7510	ASKI	-1.8	-6.5	5.5
7512	KATT	-2.8	**1.0**	-21.7
7515	DION	**1.4**	**4.5**	28.0
7517	ROUM	3.5	**-3.2**	-2.7
7525	XRIS	2.3	**2.9**	14.8
7544	LAMP	3.4	**-5.2**	-4.4
7545	PSME	1.1	**0.4**	-15.2
7550	BASO	**0.7**	**0.1**	-6.2
7580	MELE	**2.1**	**-5.2**	7.4
7585	YOZG	**-0.2**	**10.7**	-7.7
7587	YIGI	**-2.2**	**-2.5**	-11.0
7839	GRAZ	**-0.6**	**-4.9**	**10.3**
7939	MATE	**-11.1**	**8.9**	**11.3**
8833	KOSG	**4.3**	**-3.7**	**-7.4**
RMs		**3.8**	5.2	12.5

COMPARISON OF SLR AND GPS COORDINATES

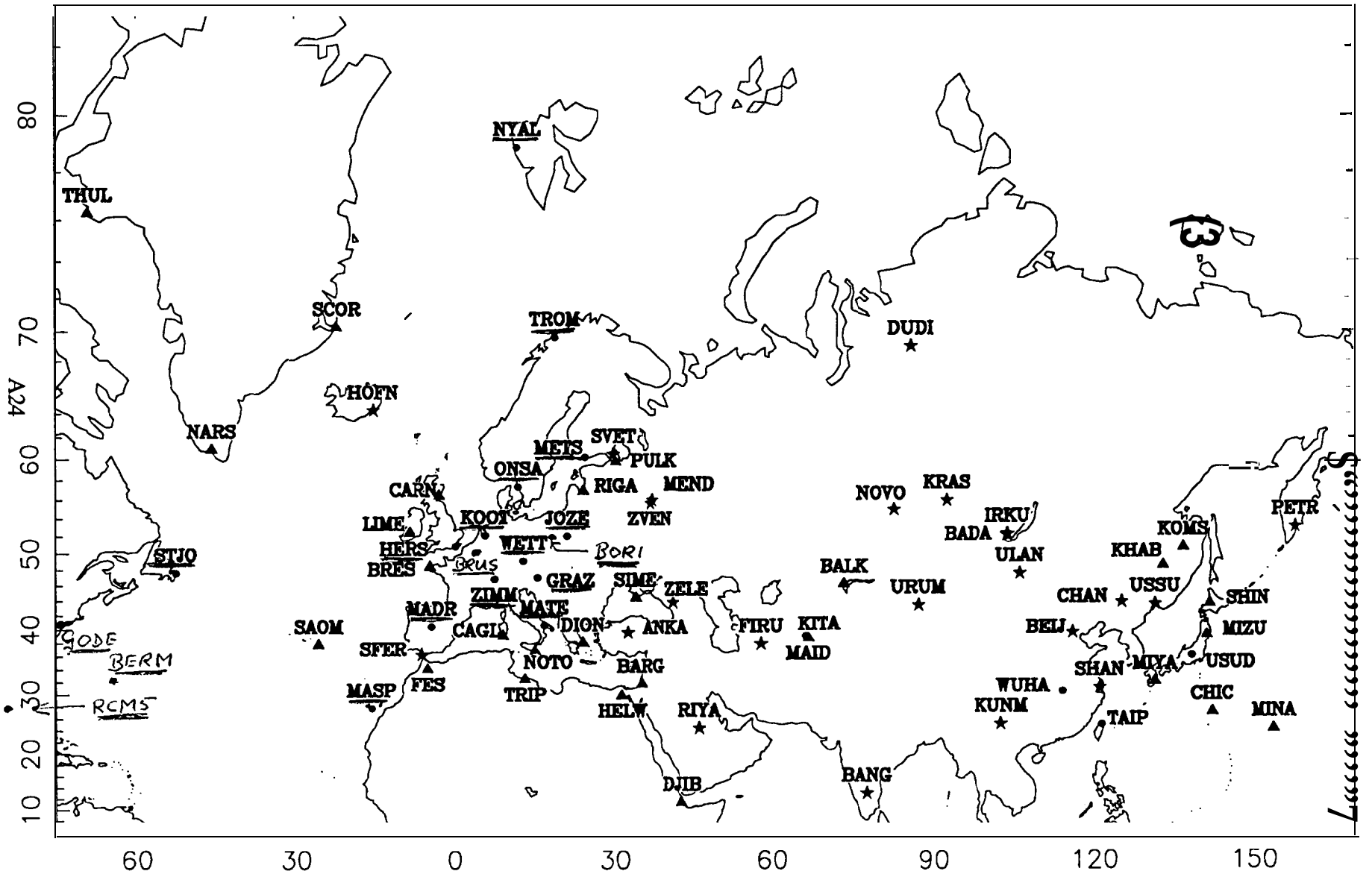
	RMS(mm)			
	North	East	up	Total
DEPENDENT	3.8	5.2	12.5	7.0
INDEPENDENT	12.1	15.4	16.4	14.5

- The SLR solution used for this comparison is the solution SSC(DUT) 93 L 05 as computed at DUT/SSR&T
- Dependent means that the GPS and SLR coordinate solutions have been used simultaneously to estimate the site velocities


STATION 7525
200.0
LATITUDE
-200,0
200.0
LONGITUDE
-200.0


100.0
HEIGHT
-100.0
830101
921231
TIME (YYMMDD)

REGIONAL SUB-NETWORK OF IGS STATIONS ANALYZED AT DELFT UNIV.
(ONLY UNDERLINED STATIONS)

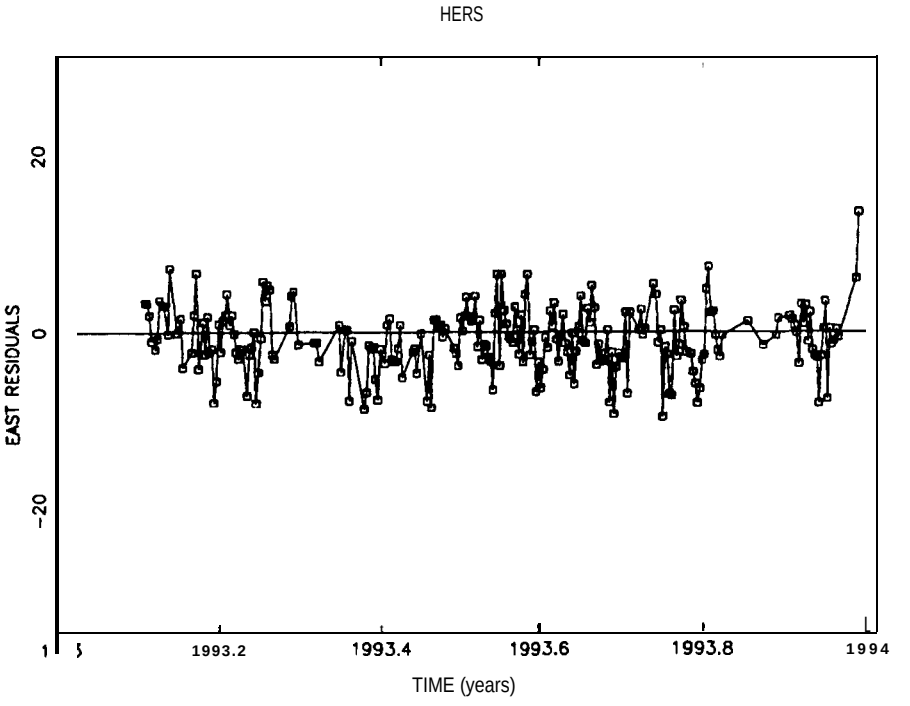


Stations (existing non-GPS / recommended)

ABBR	Full Name	Country	Lon	Lat	Status	Agency	Collocation VLBI	Collocation SLR
CARN	Carnusty	United Kingdom	-2.7	56.4	Existing	Non-GPS	x	
BARG	Bar Giyyora	Israel	35.0	31.7	Existing	Non-GPS		x
MIZU	Mizusawa	Japan	141.2	39.1	Existing	Non-GPS	x	
MIYA	Miyazaki	Japan	131.4	32.0	Existing	Non-GPS	x	
SHIN	Shintotsugawa	Japan	141.8	43.5	Existing	Non-GPS	x	
CHIC	Chichijima	Japan	142.1	27.0	Existing	Non-GPS	x	x
MINA	Minami Tori Sims	Japan	153.9	24.2	Existing	Non-GPS	x	x
BRES	Brest	France	-4.5	48.4	Existing	Non-GPS	x	
HELW	He lwan	Egypt	31.3	29.8	Existing	Non-GPS		x
SAOM	Sao Miguel	Azoren	-25.6	37.7	Existing	Non-GPS	x	
RIGA	Riga	Latvia	24.0	56.9	Existing	Non-GPS		x
SIME	Simeis-Katzively	Ukraine	33.9	44.4	Existing	Non-GPS		x
BALK	Balkash	Kazakhstan	73.6	46.2	Existing	Non-GPS		x
MAID	Maidanak	Uzbekistan	67.0	38.8	Existing	Non-GPS		x
PULK	Pulkovo	Russia	30.3	59.8	Existing	Non-GPS		?
KOMS	Komsomolsk-na Amure	Russia	136.9	50.7	Existing	Non-GPS		x
KHAB	Khabarovsk	Russia	133.1	48.5	Existing	Non-GPS		?
DION	Dionysos	Greece	23.9	38.0	Existing	Non-GPS		x
NOTO	Noto	Italy	14.9	36.8	Existing	Non-GPS	x	x
CAGL	Cagliari	Italy	8.9	39.1	Existing	Non-GPS		x
DJIB	Djibouti	Fr. Somalie	43.1	11.3	Recommended			- -
NARS	Narssak	Greenland	-46.0	60.9	Recommended			- -
SCOR	Scoresbysund	Greenland	-22.0	70.3	Recommended			- -
LIME	Limerick	Ireland	-8.3	52.4	Recommended			- -
FES	Fes	Morocco	-5.0	34.0	Recommended			- .
TRIP	Tripoli	Libya	13.1	32.5	Recommended			- -

[DAILY HELMERT RESIDUALS (cent'd)]

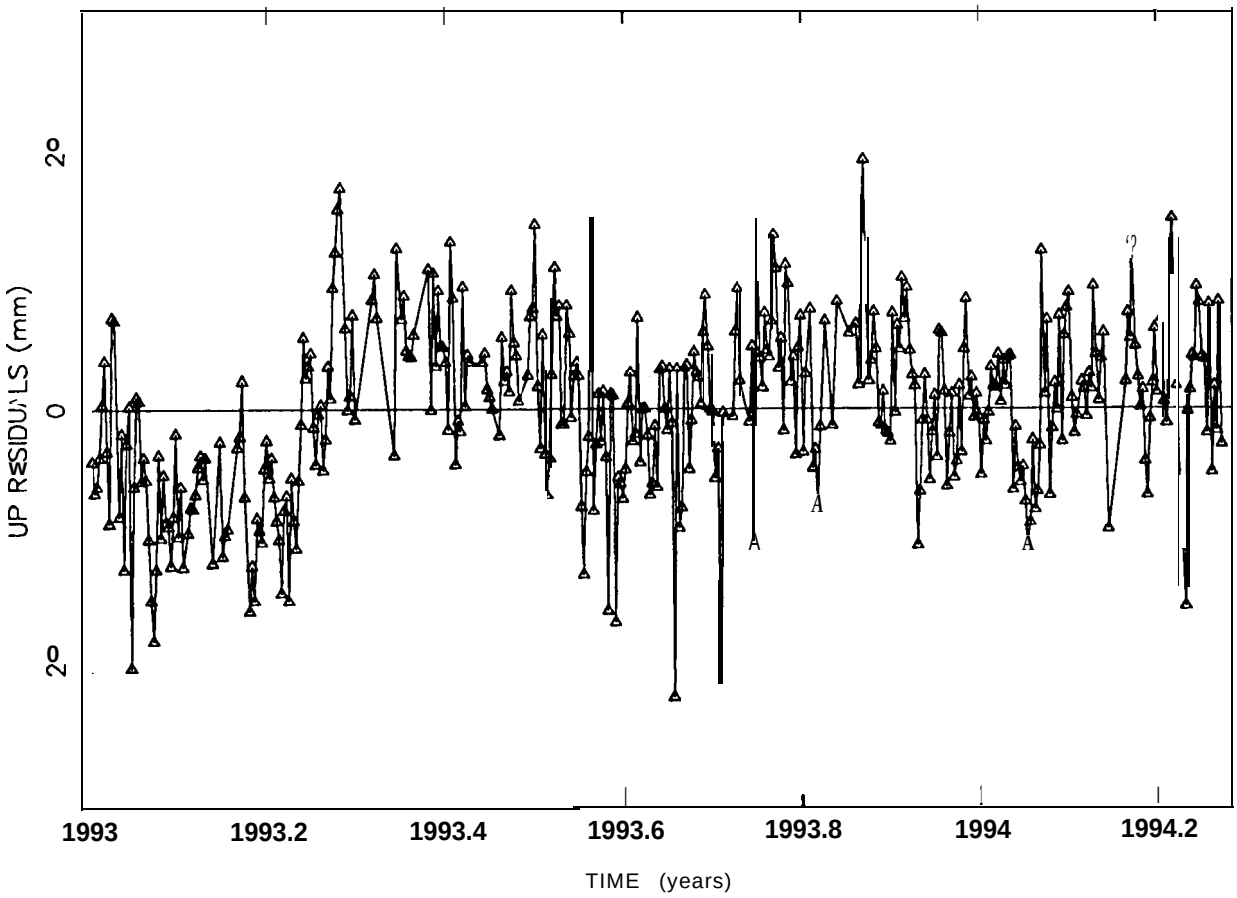
East residuals for Herstmonceux with respect to the obtained coordinate solution and the ITRF'92 velocity field



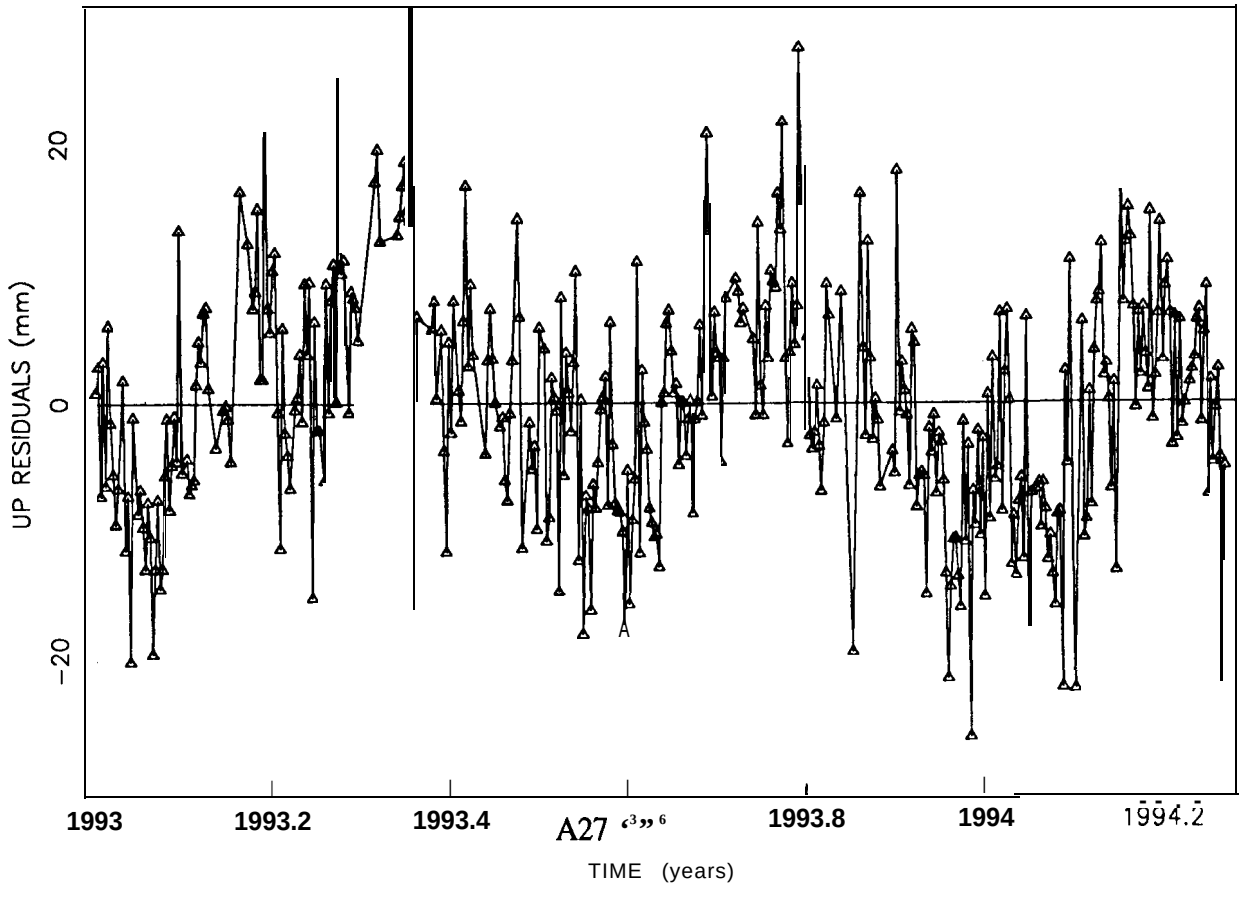
Stations (existing non-GPS / recommended)

ABBE	Full Name	Country	Lon	Lat	Status	Agency	Collocation VLBI	Collocation SLR
CARN	Carnusty	United Kingdom	-2.7	56.4	Existing	Non-GPS	x	
BARG	Bar Giyyora	Israel	35.0	31.7	Existing	Non-GPS		x
MIZU	Mizusawa	Japan	141.2	39.1	Existing	Non-GPS	x	
MIYA	Miyazaki	Japan	131.4	32.0	Existing	Non-GPS	x	
SHIN	Shintotsugawa	Japan	141.8	43.5	Existing	Non-GPS	x	
CHIC	Chichijima	Japan	142.1	27.0	Existing	Non-GPS	x	x
MINA	Minami Tori Sims	Japan	153.9	24.2	Existing	Non-GPS	x	x
BRES	Brest	France	-4.5	48.4	Existing	Non-GPS	x	
HELW	Helwan	Egypt	31.3	29.8	Existing	Non-GPS		x
SAOM	Sao Miguel	Azoren	-25.6	37.7	Existing	Non-GPS	x	
RIGA	Riga	Latvia	24.0	56.9	Existing	Non-GPS		x
SINE	Simeis-Katzively	Ukraine	33.9	44.4	Existing	Non-GPS		x
BALK	Balkash	Kazakhstan	73.6	46.2	Existing	Non-GPS		x
MAID	Maidanak	Uzbekistan	67.0	38.8	Existing	Non-GPS		x
PULK	Pulkovo	Russia	30.3	59.8	Existing	Non-GPS		?
KOMS	Komsomolsk-na Amure	Russia	136.9	50.7	Existing	Non-GPS		x
KHAB	Khabarovsk	Russia	133.1	48.5	Existing	Non-GPS		?
DION	Dionysos	Greece	23.9	38.0	Existing	Non-GPS		x
NOTO	Noto	Italy	14.9	36.8	Existing	Non-GPS	x	x
CAGL	Cagliari	Italy	8.9	39.1	Existing	Non-GPS		x
DJIB	Djibouti	Fr. Somalie	43.1	11.3	Recommended			- -
NARS	Narssak	Greenland	-46.0	60.9	Recommended			- -
SCOR	Scoresbysund	Greenland	-22.0	70.3	Recommended			- -
LIME	Limerick	Ireland	-8.3	52.4	Recommended			- -
FES	Fes	Morocco	-5.0	34.0	Recommended			- -
TRIP	Tripoli	Libya	13.1	32.5	Recommended			- -

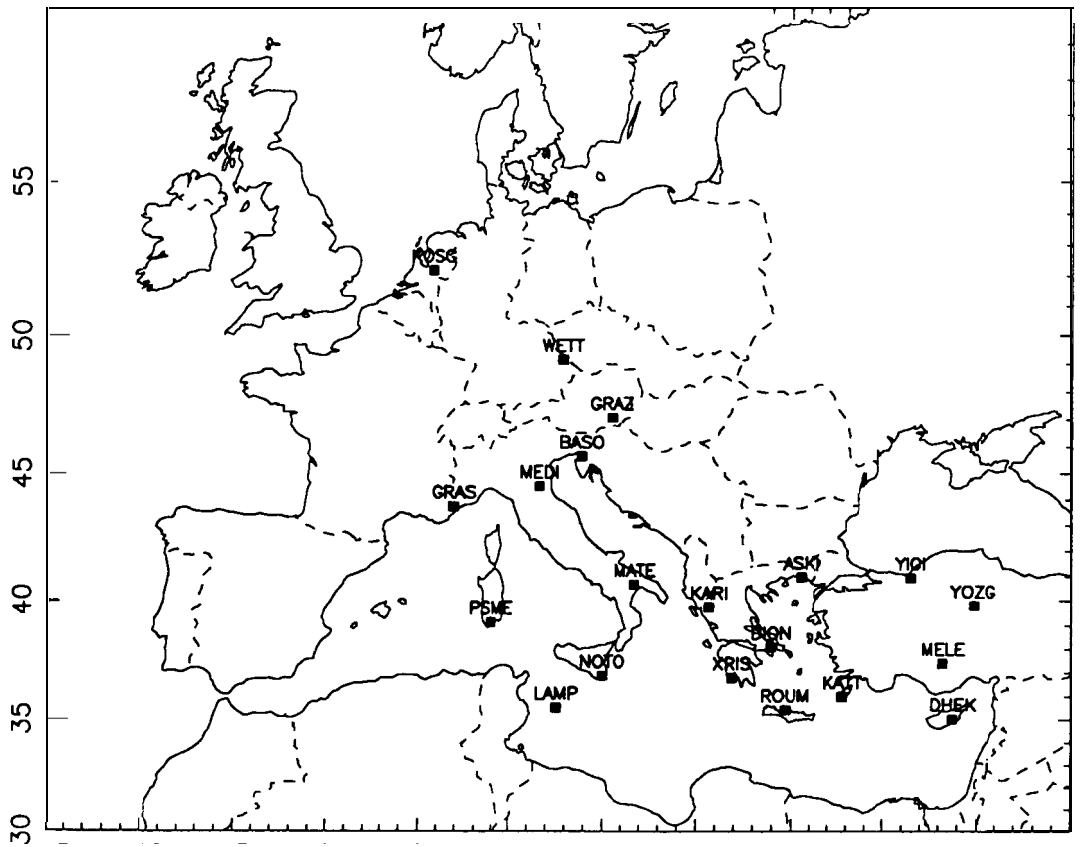
KOSG


UP RESIDUALS (mm)
20
0
-20
1993
1993.2
1993.4
1993.6
1993.8
1994
1994.2
TIME (years)

MADR


UP RESIDUALS (mm)
20
0
-20
1993
1993.2
1993.4
1993.8
1994
1994.2
TIME (years)

THE WEGENER/GPS-92 SITES



[COMPARISON OF SLR AND GPS COORDINATES (CONT'D)

Sitename and Number		Residuals(mm)		
		North	East	up
7510	ASKI	-1.8	-6.5	**5.5**
7512	KATT	-2.8	1.0	**-21.7**
7515	DION	**1.4**	4.5	**28.0**
7517	ROUM	3.5	-3.2	**-2.7**
7525	XRIS	2.3	2.9	**14.8**
7544	LAMI?	3.4	-5.2	**-4.4**
7545	PSME	1.1	**0.4**	**-15.2**
7550	BASO	**0.7**	**0.1**	**-6.2**
7580	MELE	**2.1**	**-5.2**	**7.4**
7585	YOZG	**-0.2**	**10.7**	**-7.7**
7587	YIGI	**-2.2**	**-2.5**	-11.0
7839	GRAZ	**-0.6**	**-4.9**	10.3
7939	MATE	-11.1	**8.9**	11.3
8833	KOSG	**4.3**	**-3.7**	-7.4
RMs		**3.8**	5.2	12.5

A21

AUSLIG

(Ramesh GOVIND)

(1). Figure 1 shows the 14 stations comprising the Australian Regional GPS Network (ARGN). Table 1 gives their approximate locations. AUSLIG is the data centre for the ARGN.

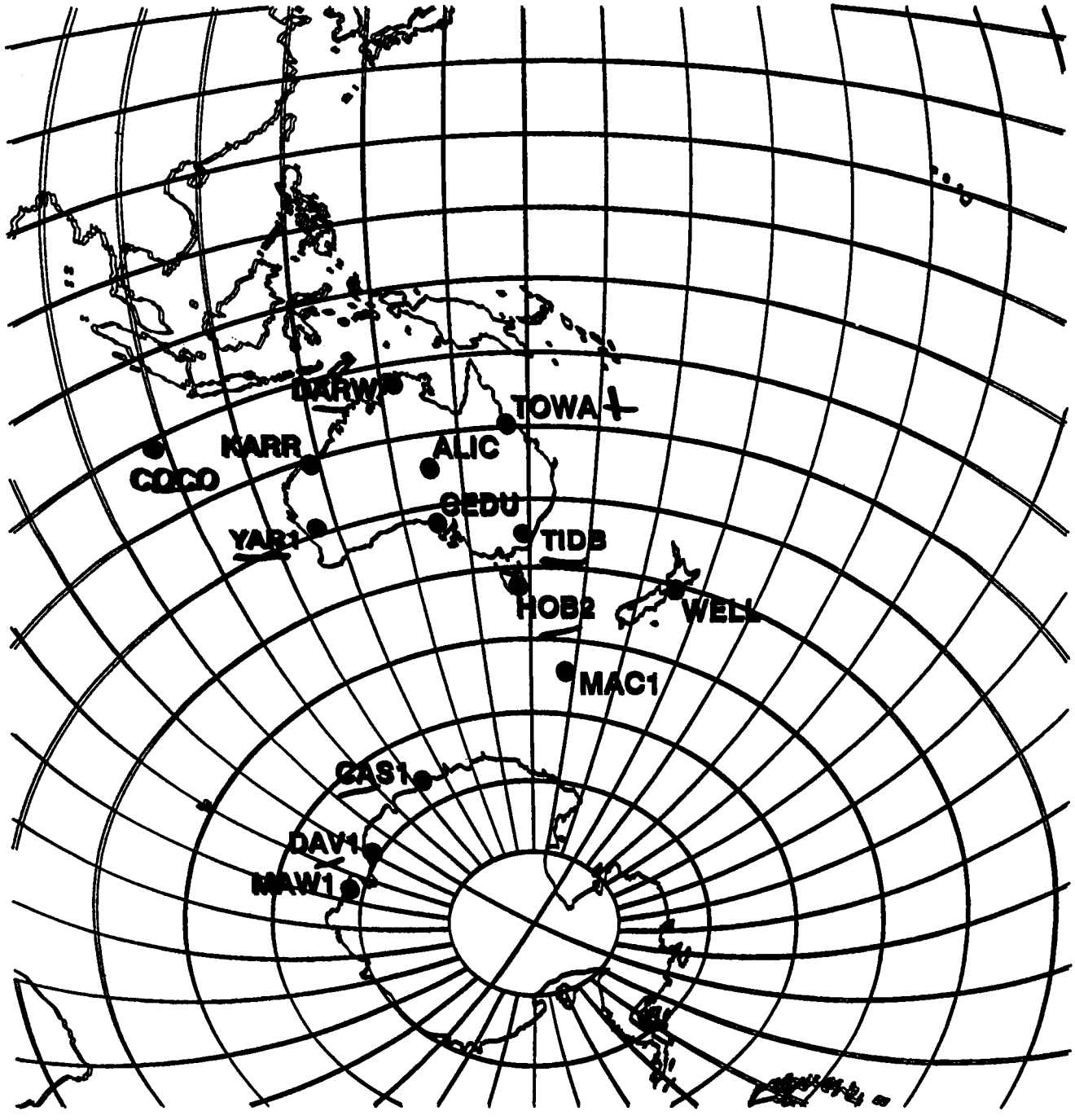
2). It is intended that data from the following selected stations, designated as global stations, be freely available to IGS through anonymous ftp: Cocos Island, Darwin, Hobart, Tidbinbilla, Yaragadee, Davis and Casey.

3). Data from the remaining stations, designated as local sites, will not be freely available — but may be made available on request for specific projects that are of benefit to Auslig and Australia.

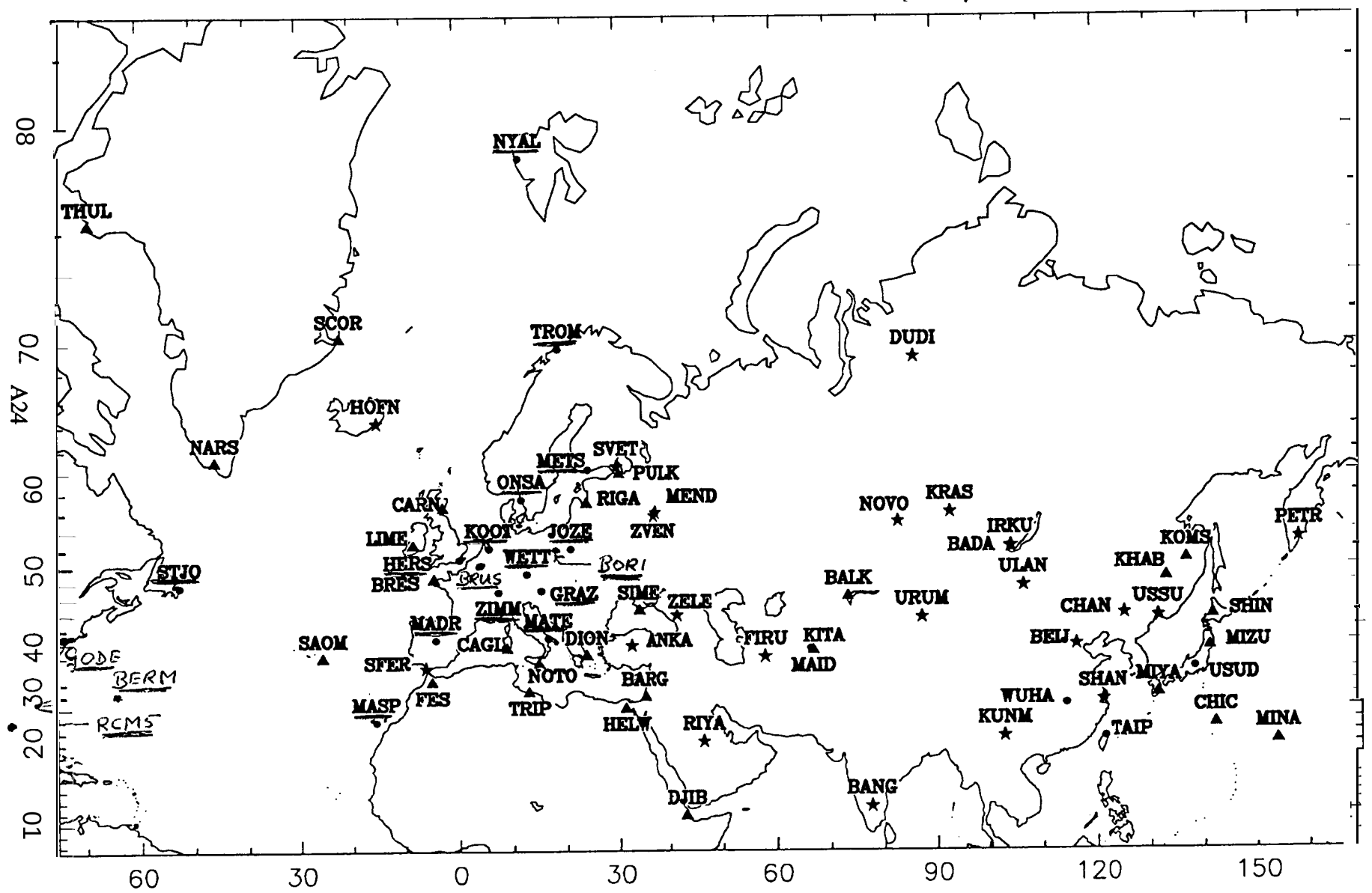
4) All sites except Townsville are installed and are currently either operational or being field tested.

5) An Associate Analysis Centre is being established to routinely process this data with the intention of submitting the results to the IERS.

Australian **Regional GPS Network**



REGIONAL SUB-NETWORK OF IGS STATIONS ANALYZED AT DELFT UNIV.
(ONLY UNDERLINED STATIONS)



Other Contributions to Position Paper 1 Appendix

HIRO TSUJI

Geographical Survey Institute

A Nationwide GPS Array in Japan for Geodynamics and Surveying

H. Tsuji and T. Sagiya

Geographical Survey Institute , Japan

GPS GSI SINCE1987

From theodolites to GPS

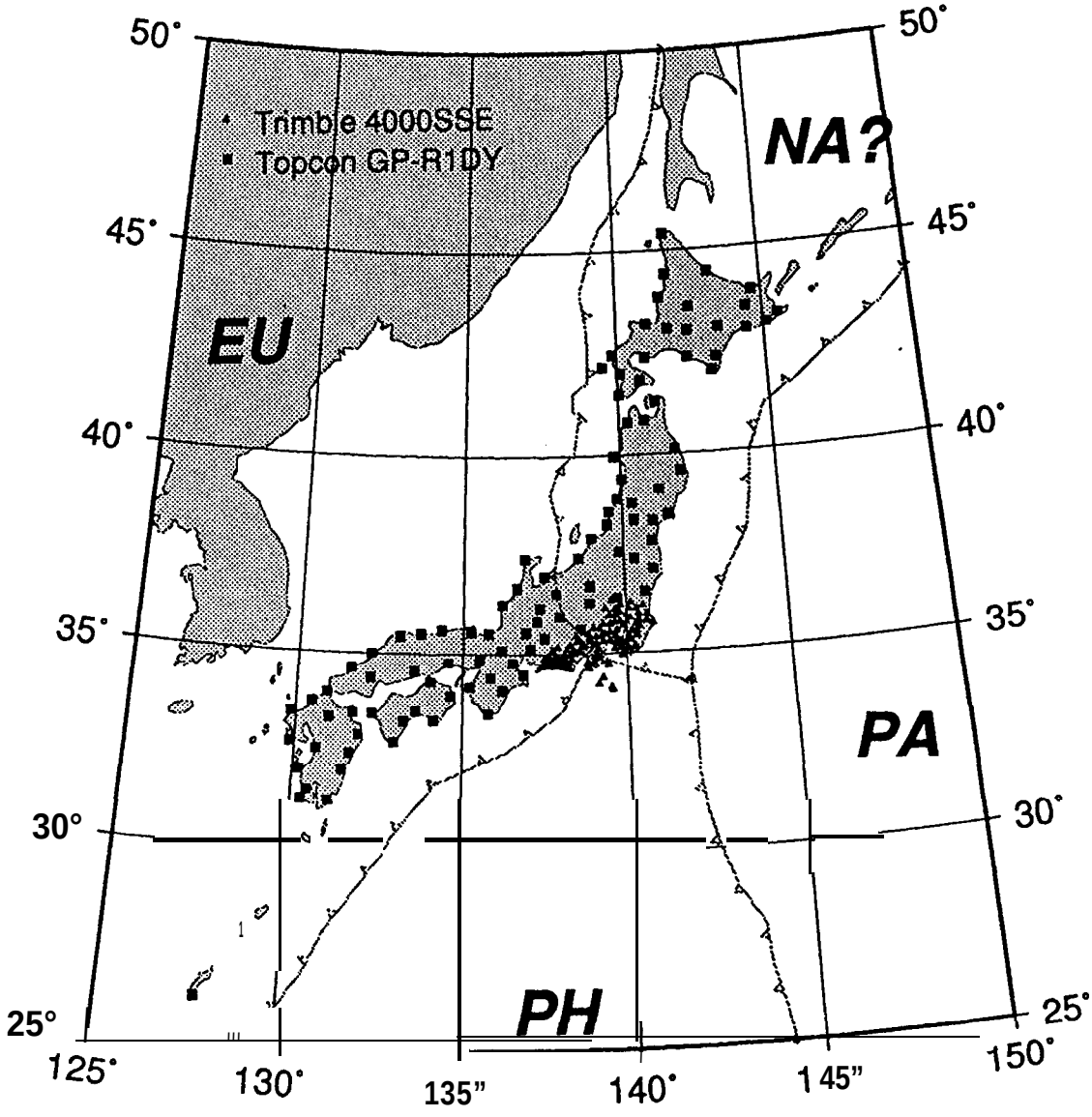
History of the First order horizontal geodetic surveys in Japan

Name of survey	Period	Instrument	#of stations
Meiji First Order Triangulation	1882-1911	Theodolites	345
Remeasurement after earthquake		Theodolites	
Nobi	1895		6
Kanto	1924-1926		18
Tango	1928		21
Izu	1931		9
Oga	1940		6
Nankai	1948-1949		47
Fukui	1950-1951		11
Tokachi-oki	1954-1955		9
Remeasurement of the Meiji Triangulation	1949-1973	Theodolites	313
Primary **Precise Geodetic Survey (1st)**	**1974-1984**	EDM	2912
Primary Precise Geodetic Survey (2nd)	**1985-1994**	EDM+GPS	2775

GPS GSI SINCE 1987

GSI's nationwide GPS array

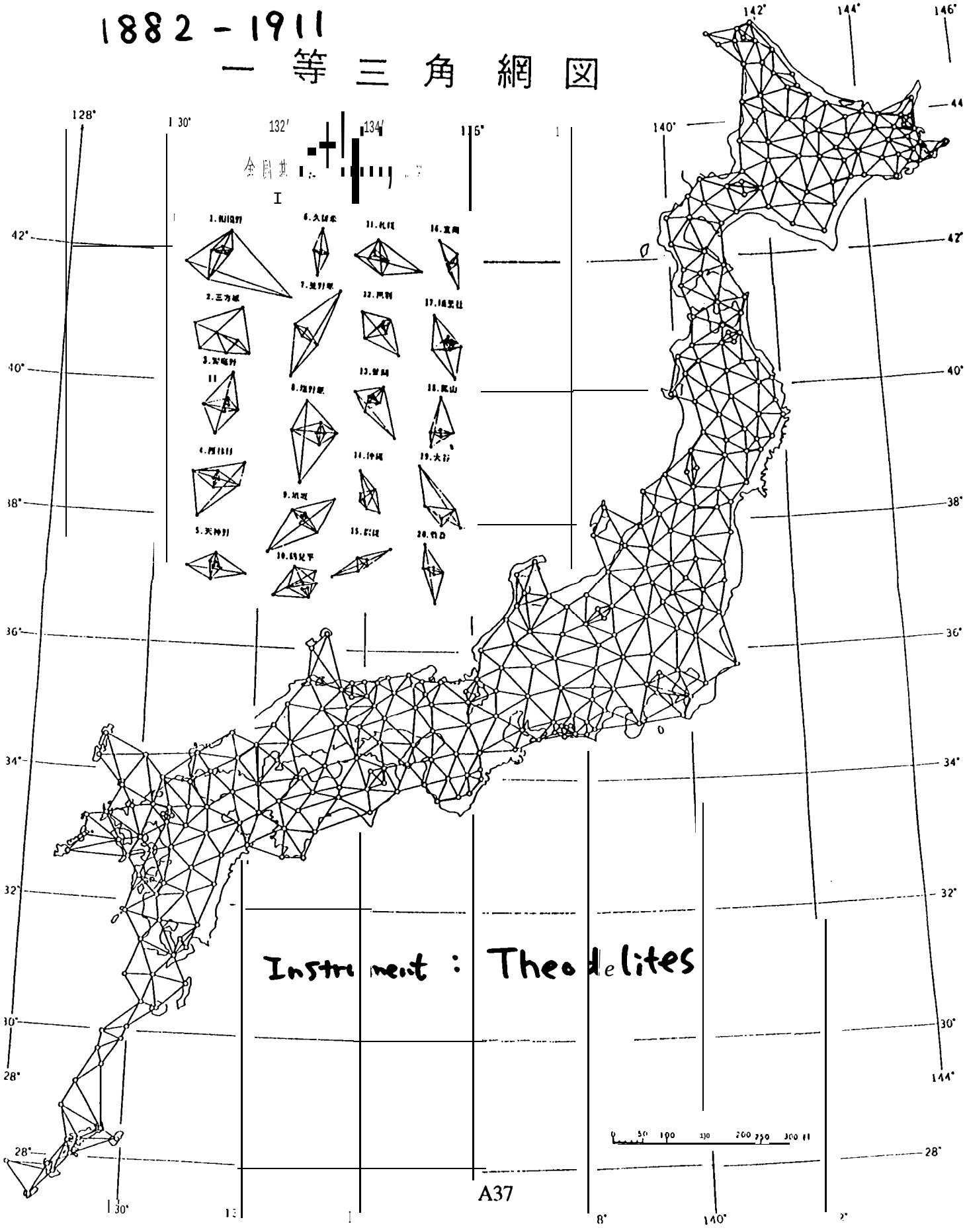
210 permanent stations



First Order Triangulation Network

1882 - 1911

一 等 三 角 網 図

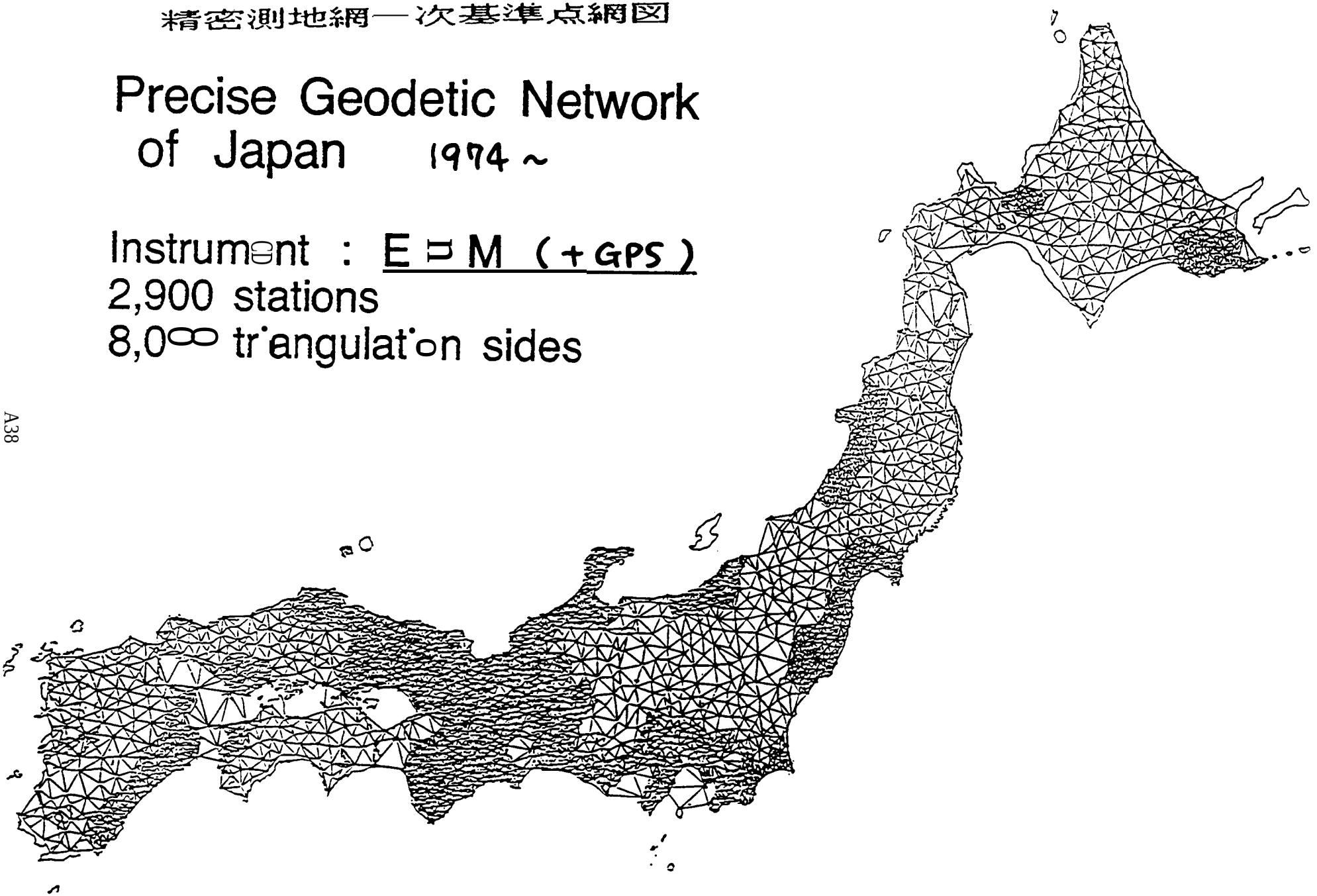


Instrument : Theodolites

精密測地網—次基準点網図

Precise Geodetic Network of Japan 1974 ~

Instrument : EDM (+GPS)
2,900 stations
8,000 triangulation sides



A nationwide GPS array

- **3 D** geodetic network for
  - monitoring crustal deformation
  - (future) national reference frame

- 2 sub- networks
  - South Kanto and Tokai (1993 FY)
  - All Japan (1994 FY)

- P-code GPS receiver on 5-m pillar

- Analysis centers at GSI

GPS GSI SINCE 19S 7

2 sub- networks

Network	Receiver	#	Dist.	Software	Ohs. time
South Kanto and Tokai	Trimble 4000SSE	110	15 km	WAVE	6 hours
All Japan	Topcon GP-R1 DY*	100	120 km	GAMIT/ GLOBK	24 hours

* Equivalent to Ashtech Z-1 2

GPS GSI SINCE1987

Divide and Rule

Block solutions with GAMIT

- 5-7 blocks to cover Japan
- non-fiducial
- with nearby IGS sites

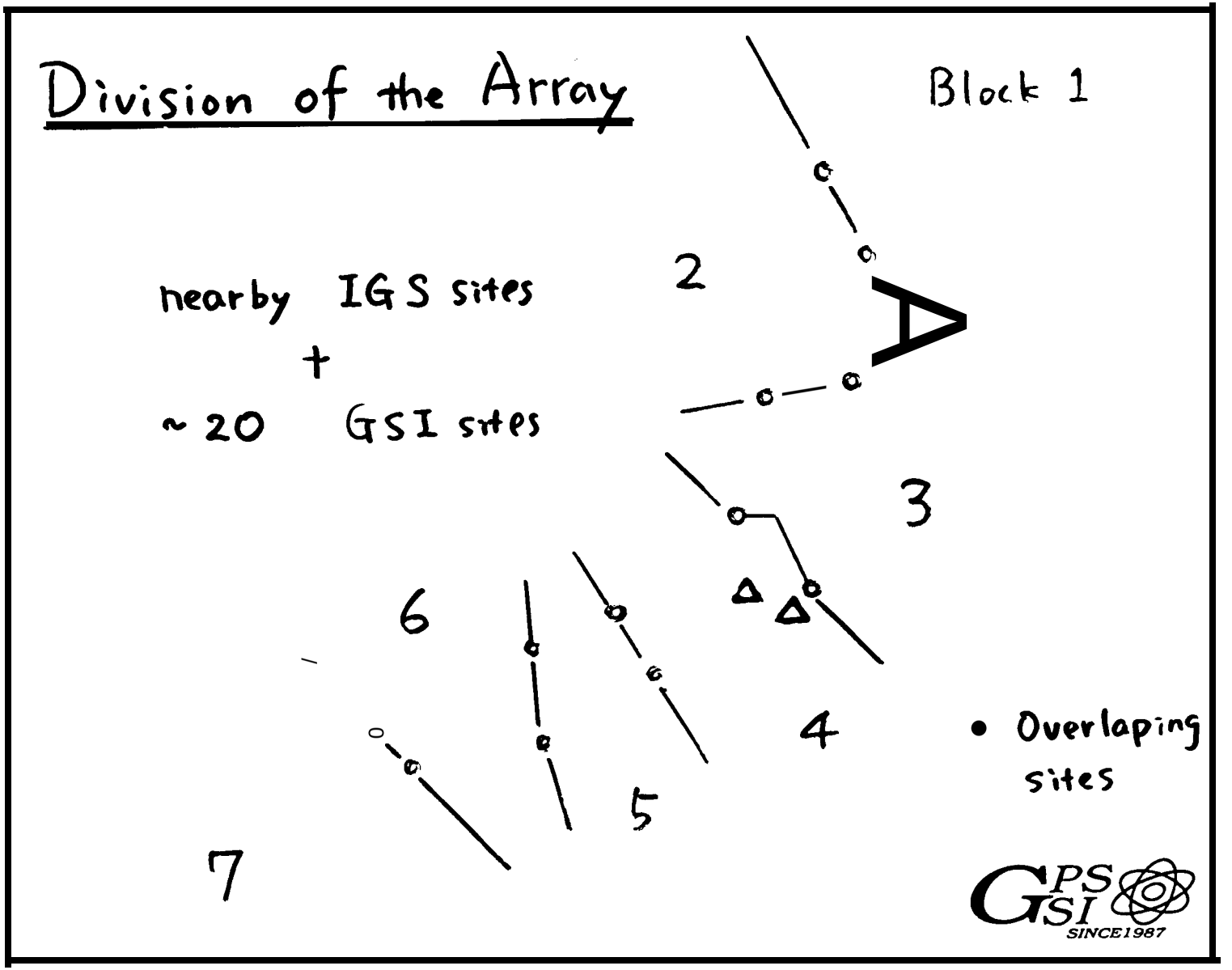
Sequential adjustment with GLOBK

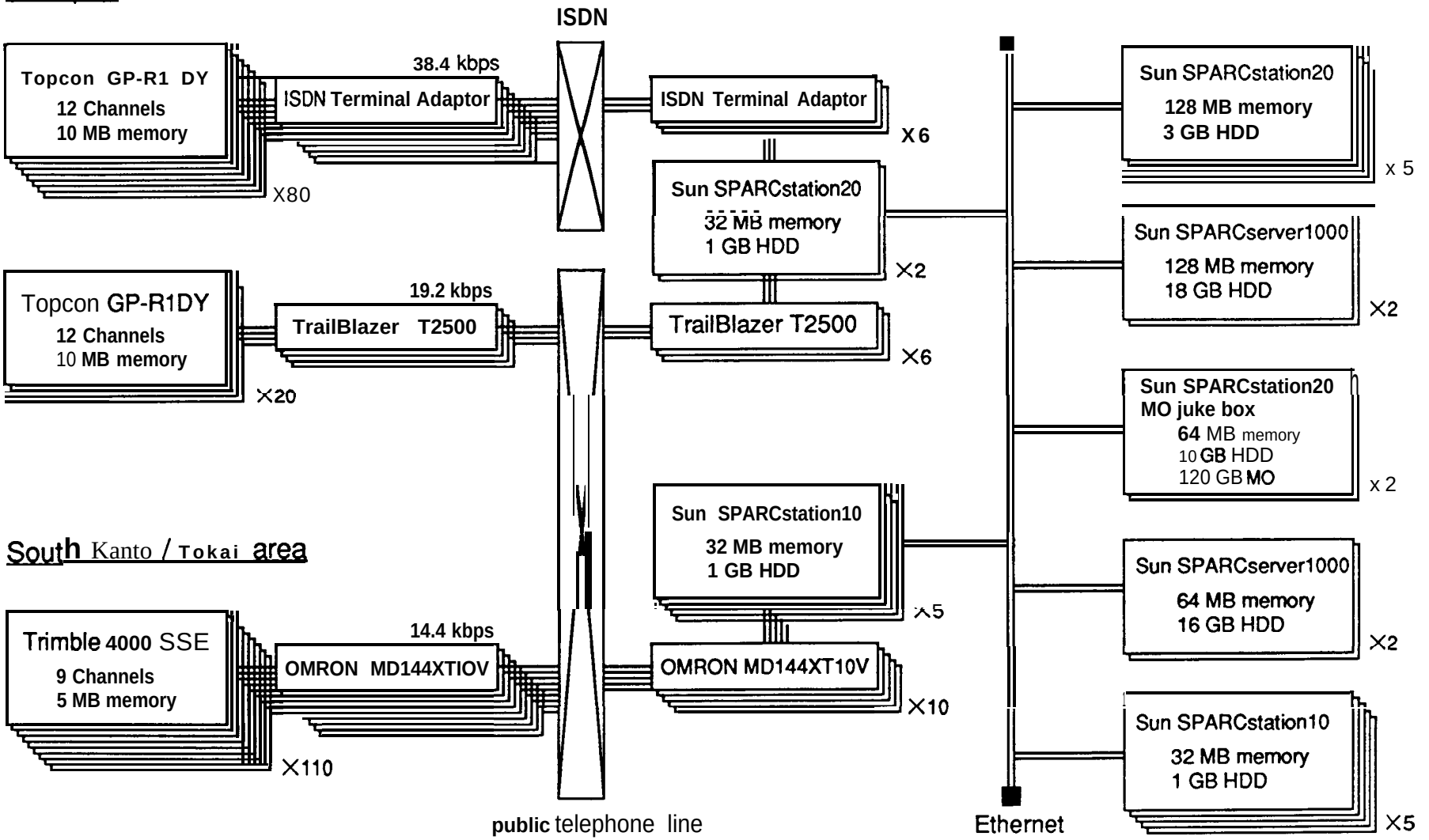
- fixing IGS sites with ITRF

Economical and natural realization of ITRF

GPS SI SINCE 1987

Division of the Array



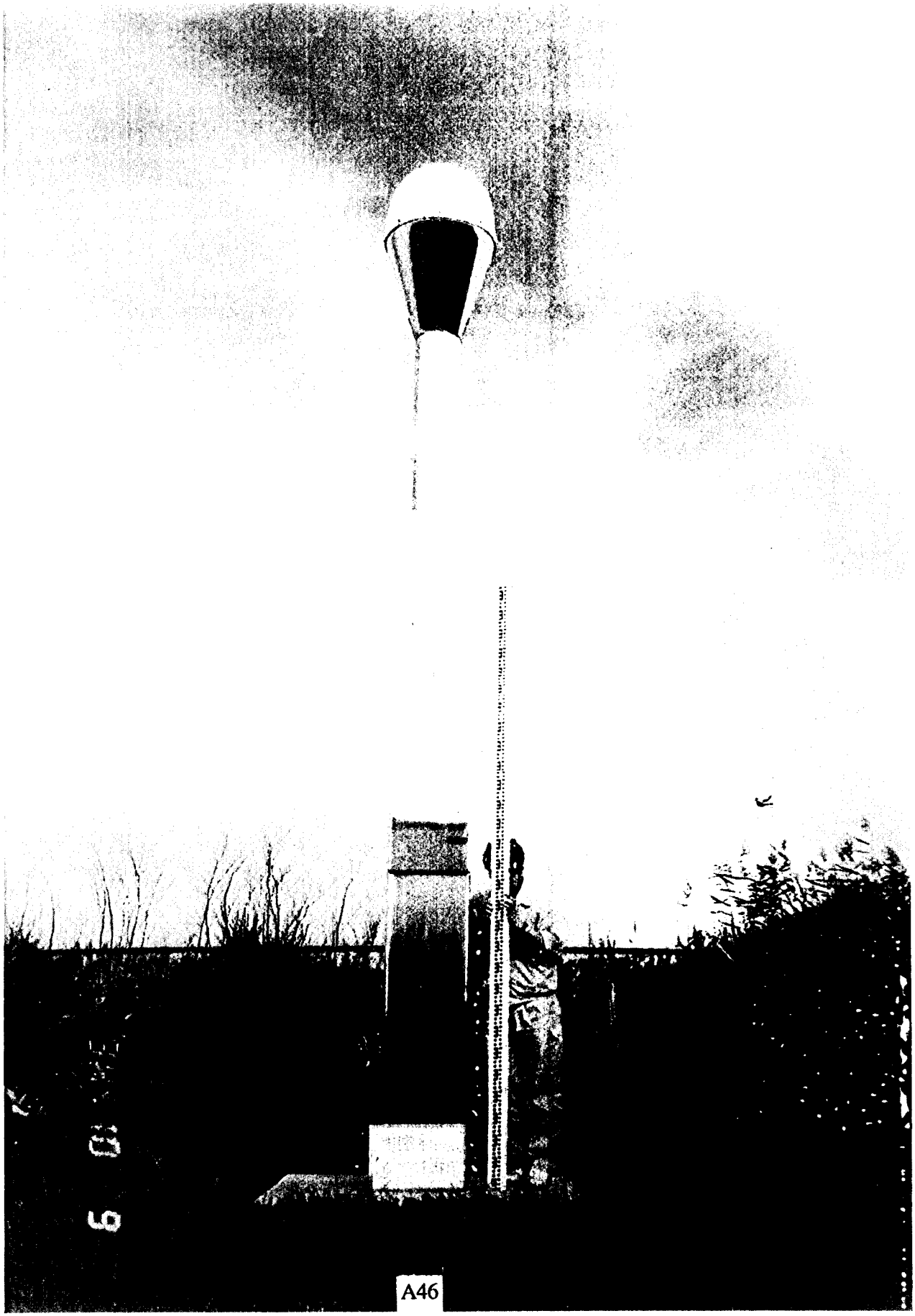


GSI's Nationwide GPS Array System

Initial results

- Coseismic crustal movements
  - The October 4, 1994 Kurile Islands earthquake
- Aseismic deformation
  - Ito area in Izu pen.

GPS GSI SINCE 1987



Methods of GPS Analysis

Static solutions of 21 sites in Hokkaido w.r.t. Usuda

Since all sites in Hokkaido are suspected to be displaced during the earthquake, we selected the Usuda site of IGS*, 1000 km apart from the epicenter, as a fixed point. GPS data from 00:00 to 24:00 UT with a 60 second interval are used for each daily solution for the period of two weeks spanning the earthquake. Since the earthquake occurred at 13:23 UT on Oct. **4, we** divided the day into two sessions; one from 00:00 to 12:00 UT, and the other from 15:00 to 24:00 UT. We used the **GAMIT** software with the NGS precise ephemerides and the Earth orientation parameters from IERS Bulletin B. Tropospheric delays are estimated at each station with a 3-hour interval.

A Kinematic solution of Nemuro-Hamanaka baseline

To examine temporal details of coseismic movements, we tried a kinematic solution of a baseline near the epicenter. Ionospheric corrected phase data are processed using the Bernese software with the IGS precise ephemeris . Tropospheric delays are not estimated.

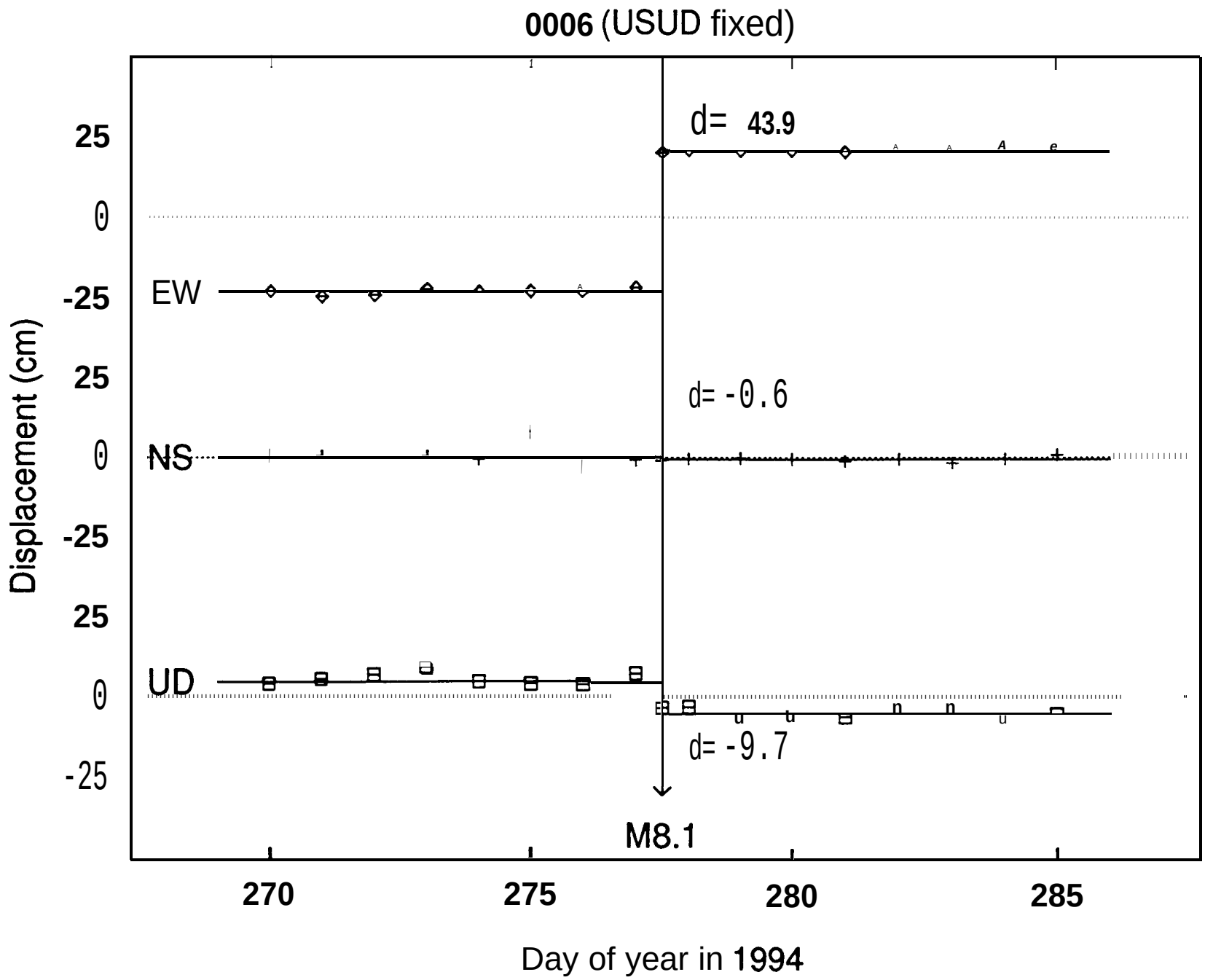
* **International** GPS Service for Geodynamics

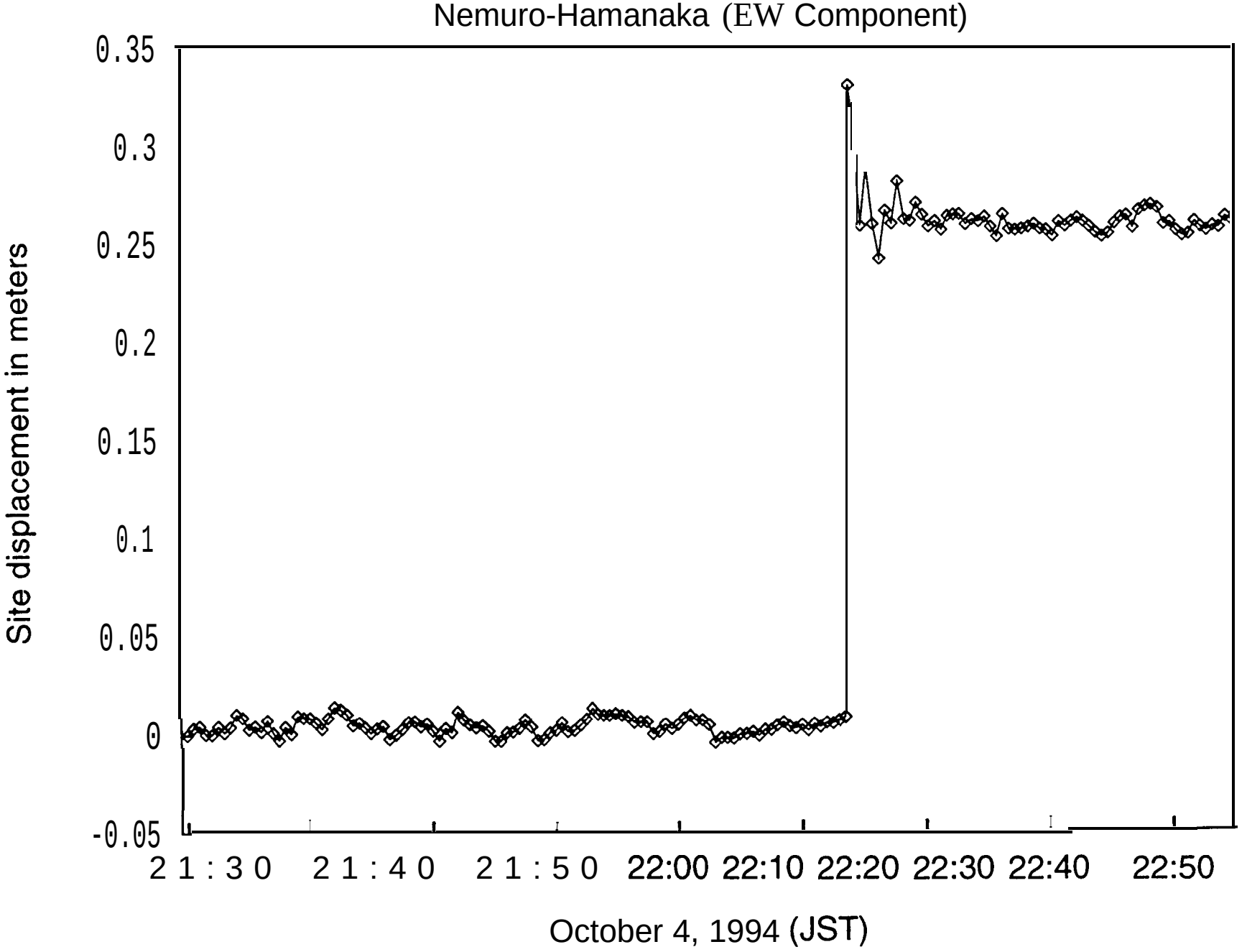
GPS GSI SINCEI987

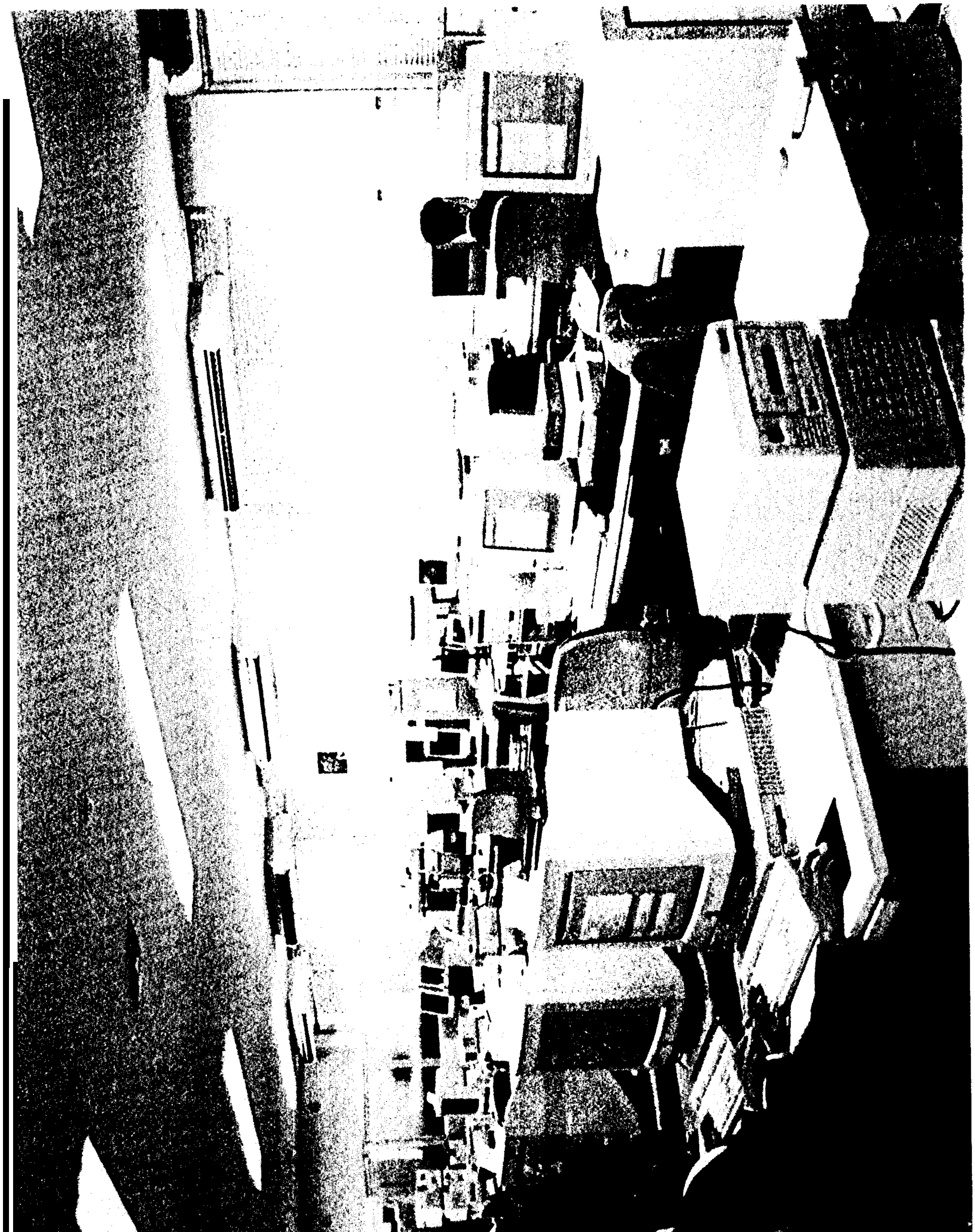
Initial results

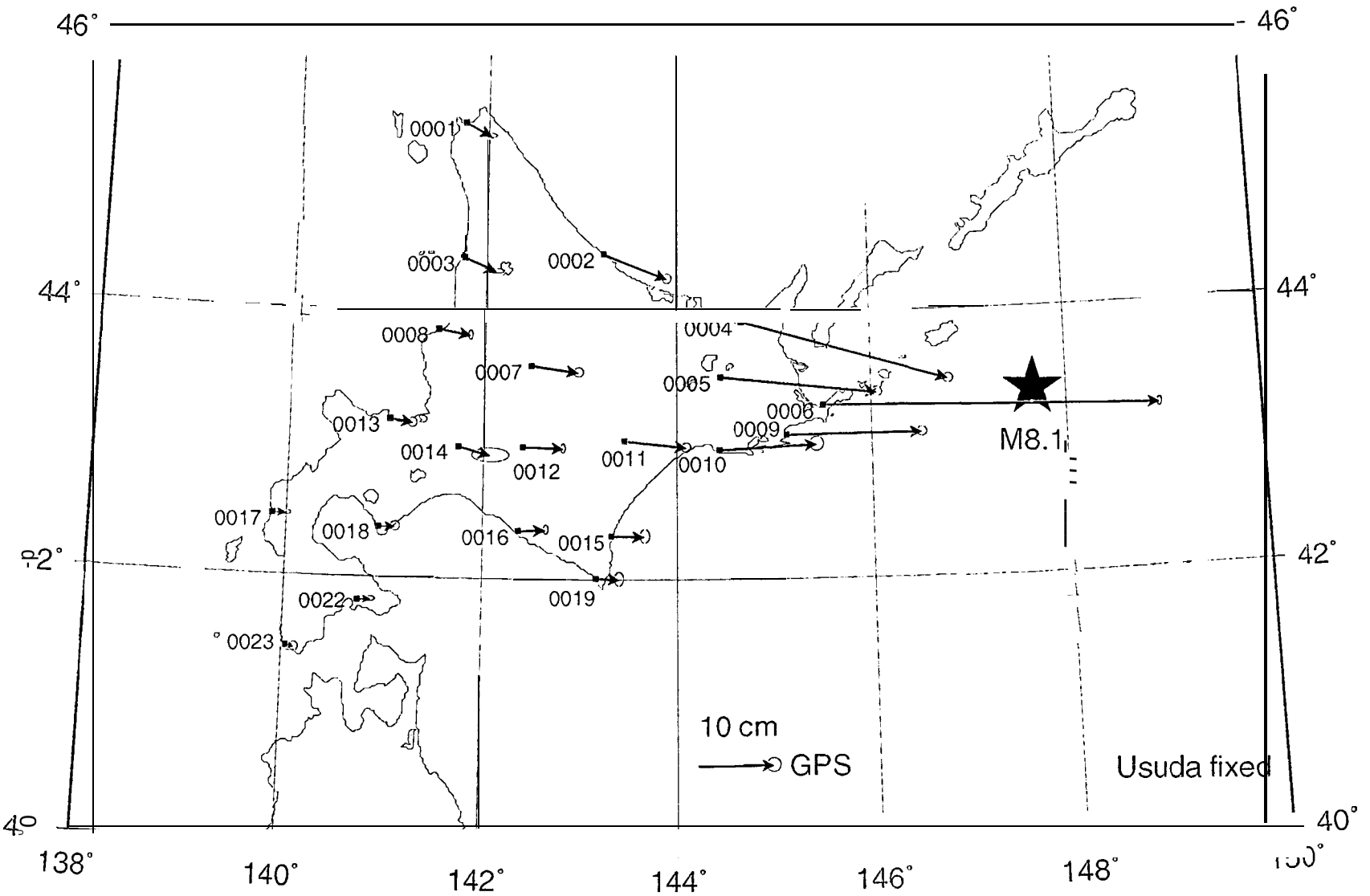
- Coseismic crustal movements
  - The October 4, 1994 Kurile Islands earthquake
- Aseismic deformation
  - Ito area in Izu pen.

GPS SI SINCE 1987


0006 (USUD fixed)
d= 43.9
EW
d= -0.6
NS
UD
d= -9.7
M8.1
25
0
-25
25
0
-25
25
0
-25
Displacement (cm)
270
275
280
285
Day of year in 1994


Nemuro-Hamanaka (EW Component)
Site displacement in meters
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
-0.05
21:30
21:40
21:50
22:00
22:10
22:20
22:30
22:40
22:50
October 4, 1994 (JST)





A52

Displacement of GPS stations from the 1994 Hokkaido-Toho-Oki Eq.

GMT Nov 29 00:31 touhou_g.drv

Conclusions

- The nationwide GPS array is newly established in Japan.
- IGS products and strategies are fully implemented.
- The array already detected coseismic and Aseismic deformations.

Acknowledgements

- SIO and MIT for GAMIT
- Participants to the bench mark test

GPSI SINCE I 987

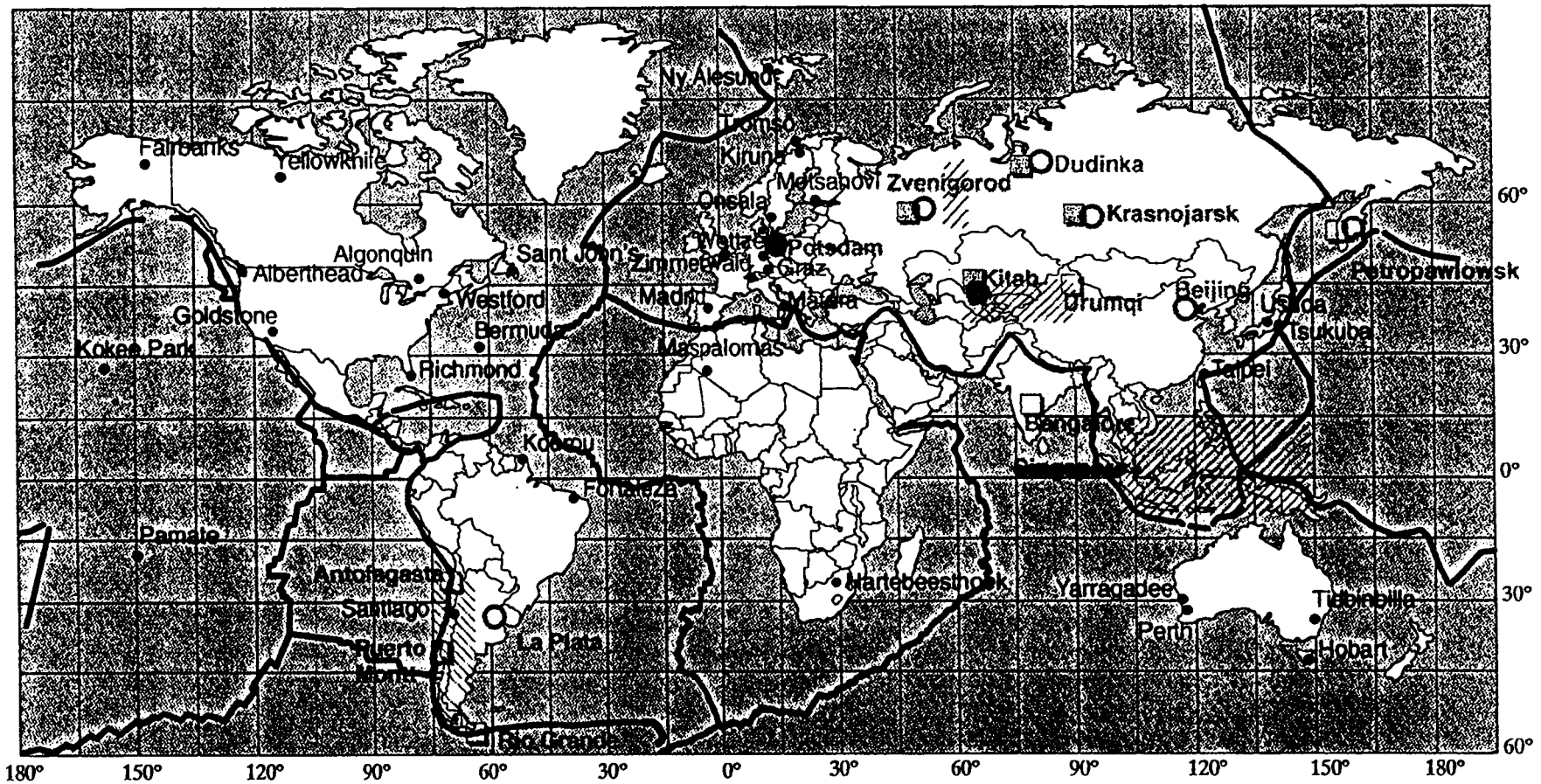
Other Contributions to Position Paper 1 Appendix

ROMAN GALAS

GeoforschungsZentrum Institute

GEO FORSCHUNGS ZENTRUM P M

GFZ Sub- Net for IGS



GFZ
Dept. 1

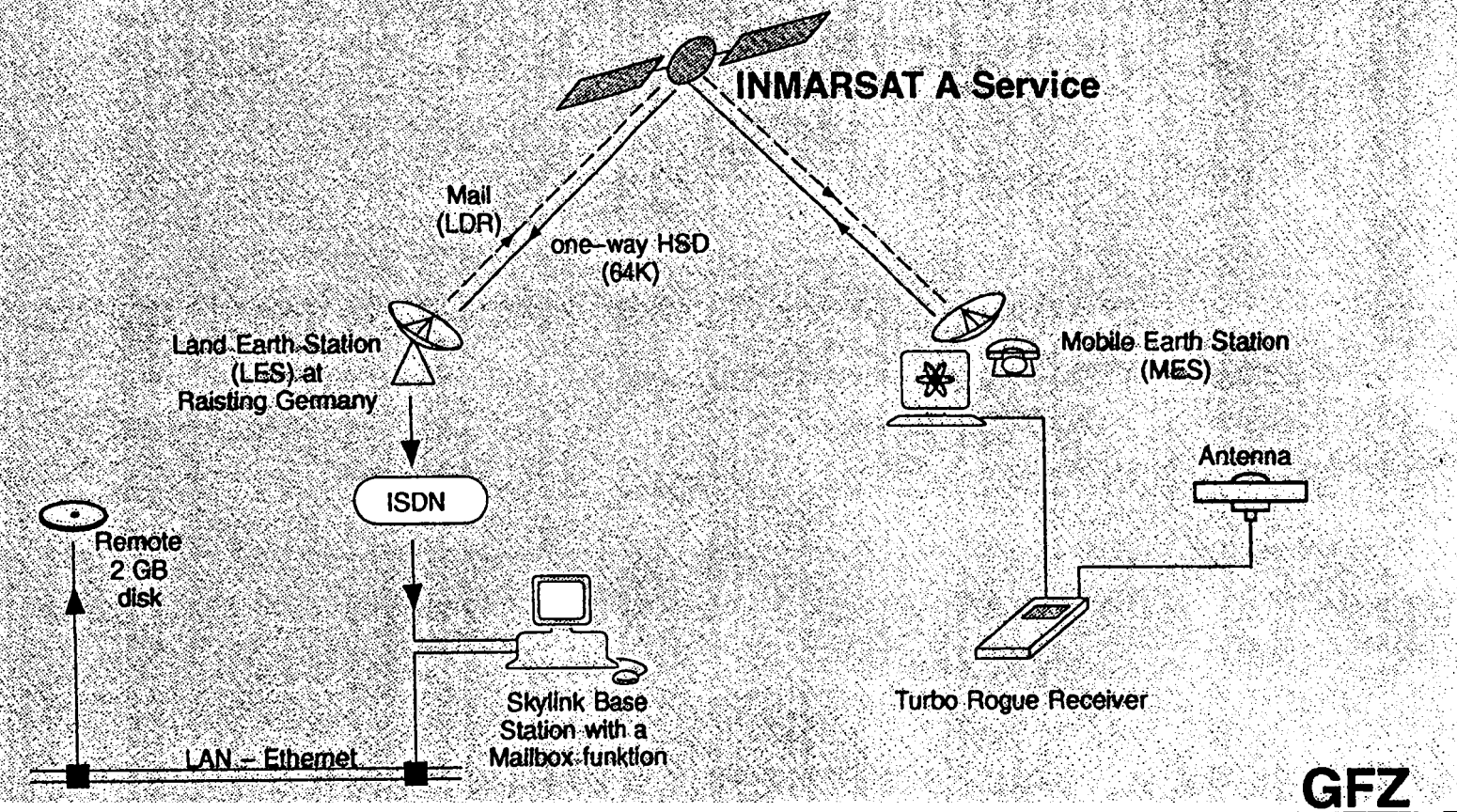
A56

GPS – GFZ Stations

Site Name	Country	Receiver	Class	Status	Collocation
Kitab	Usbekistan	Turbo Rogue	IGS / Core	operational	DORIS, PRARE
Maidanak	Usbekistan	Trimble	GFZ / Permanent	operational	SLR
Beijing	China	Turbo Rogue	IGS / Core	planned	SLR
Urumqi	China	Turbo Rogue	GFZ / Permanent	planned	
Bangalore	India	Turbo Rogue	GFZ / Permanent	planned	PRARE
Potsdam	Germany	Turbo Rogue	IGS / Fiducial	operational	SLR, PRARE
Zwenigorod	Russia	TUrbo Rogue	GFZ / Permanent future IGS / Core	operational	
Krasnoyarsk	Russia	Turbo Rogue	GFZ / Permanent future IGS / Core	operational	(GLONASS?), DORIS?
Petropawlowsk	Russia	Turbo Rogue	IGS / Core	future	GLONASS?
Dudinka	Russia	Turbo Rogue	GFZ / Permanent future IGS / Core	operational	GLONASS
La Plata	Argentina	Turbo Rogue	IGS / Core	future	
Antofagasta	Chile	Turbo Rogue	GFZ / Permanent	future	
Puerto Montt	Chile	Turbo Rogue	GFZ / Permanent	future	

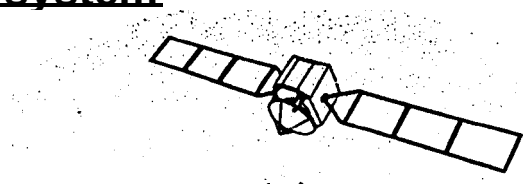
Principle of Inmarsat link

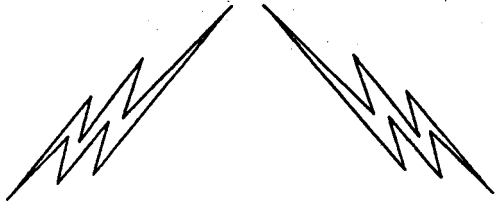
for GPS data transfer



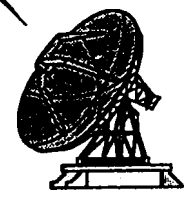
TransTel SkyLink Photo/Video

A complete system comprises:

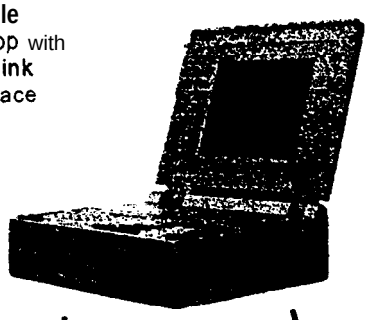




Mobile Inmarsat High Speed Data Terminal



Inmarsat LES



Mobile Laptop with SkyLink interface

switched digital network international

ISDN national

ISDN terminal adaptor

SkyLink base station with mailbox capability and video and audio interface

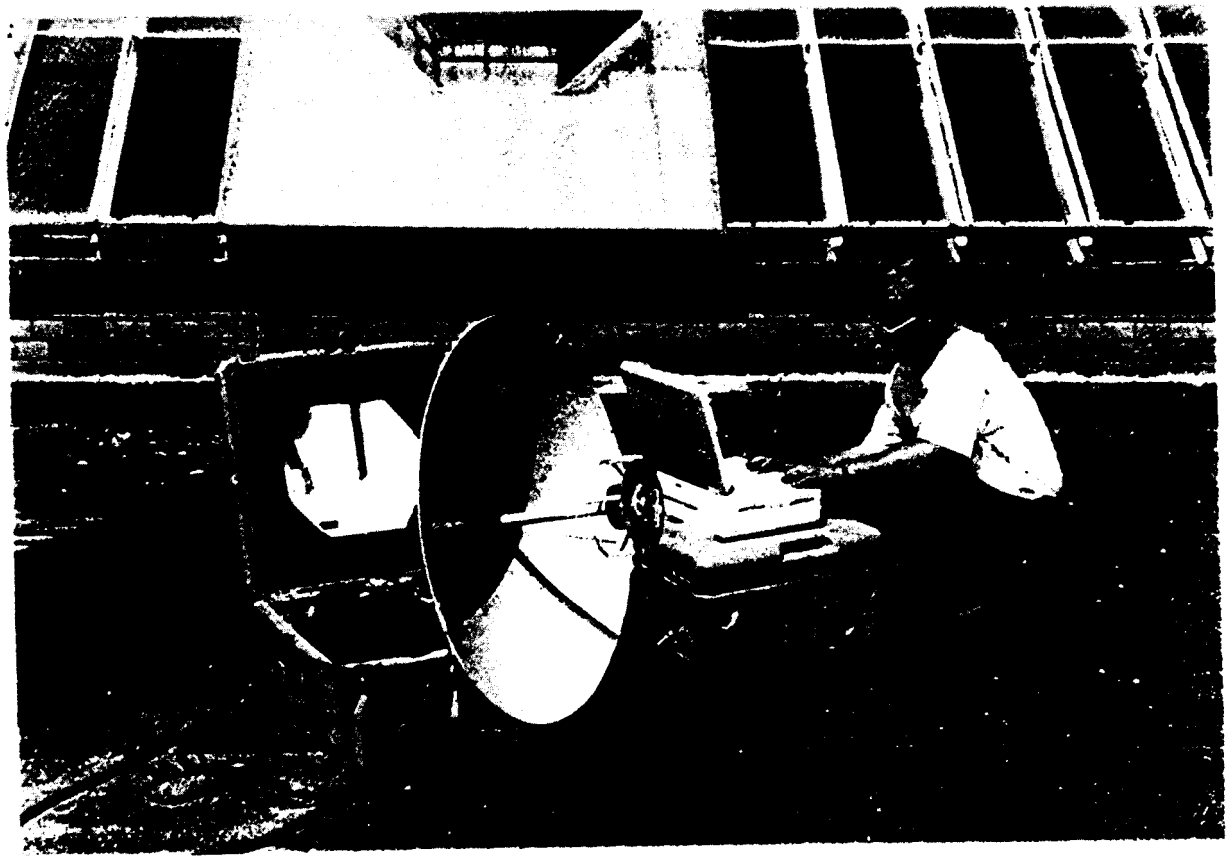
digital camera
Kodak
DCS 420
or
video CODEC

pictures, video and audio of your choice

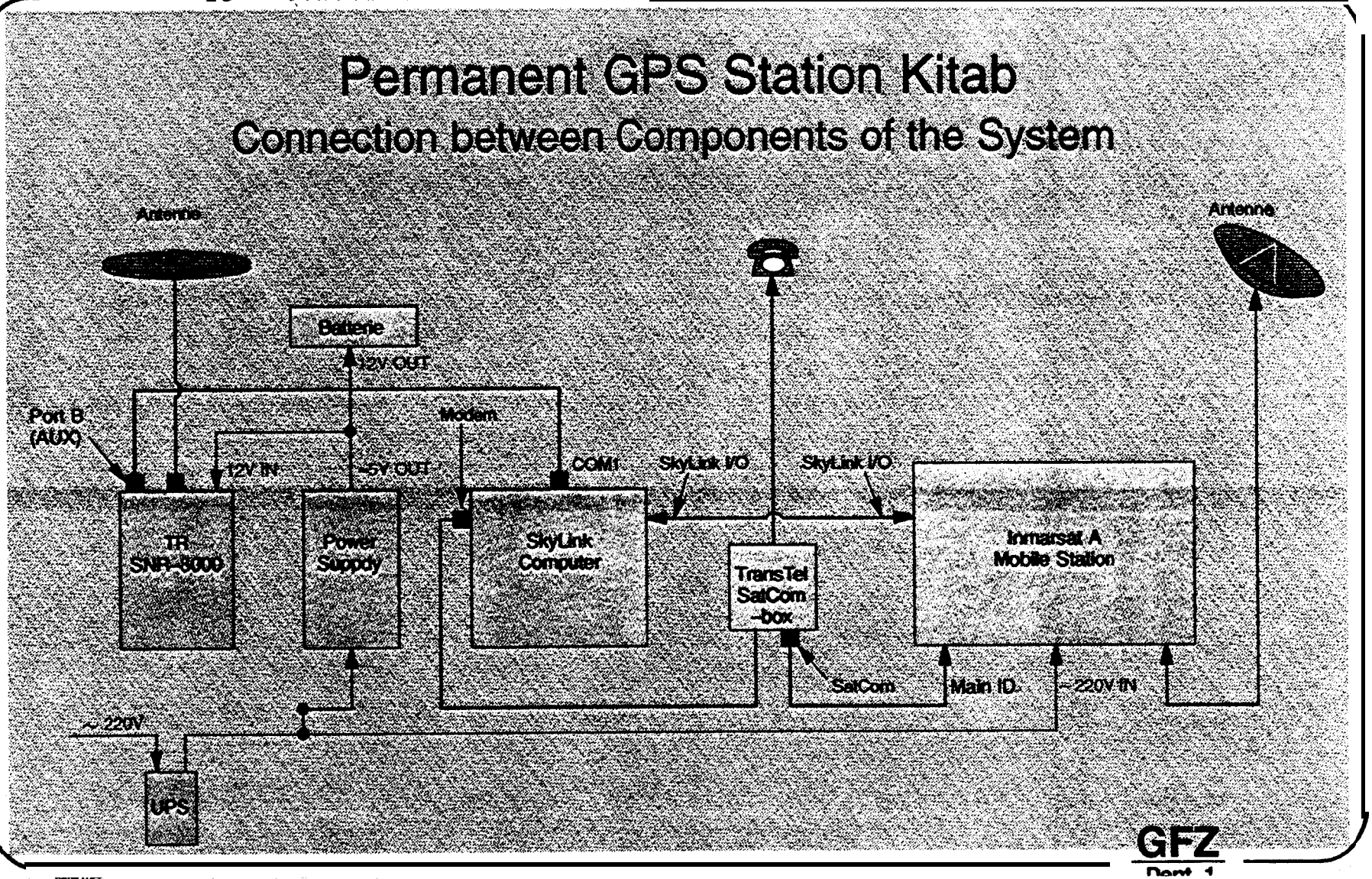
replay and further use of video and audio signal

GEO FORSCHUNGS ZENTRUM POTSDAM

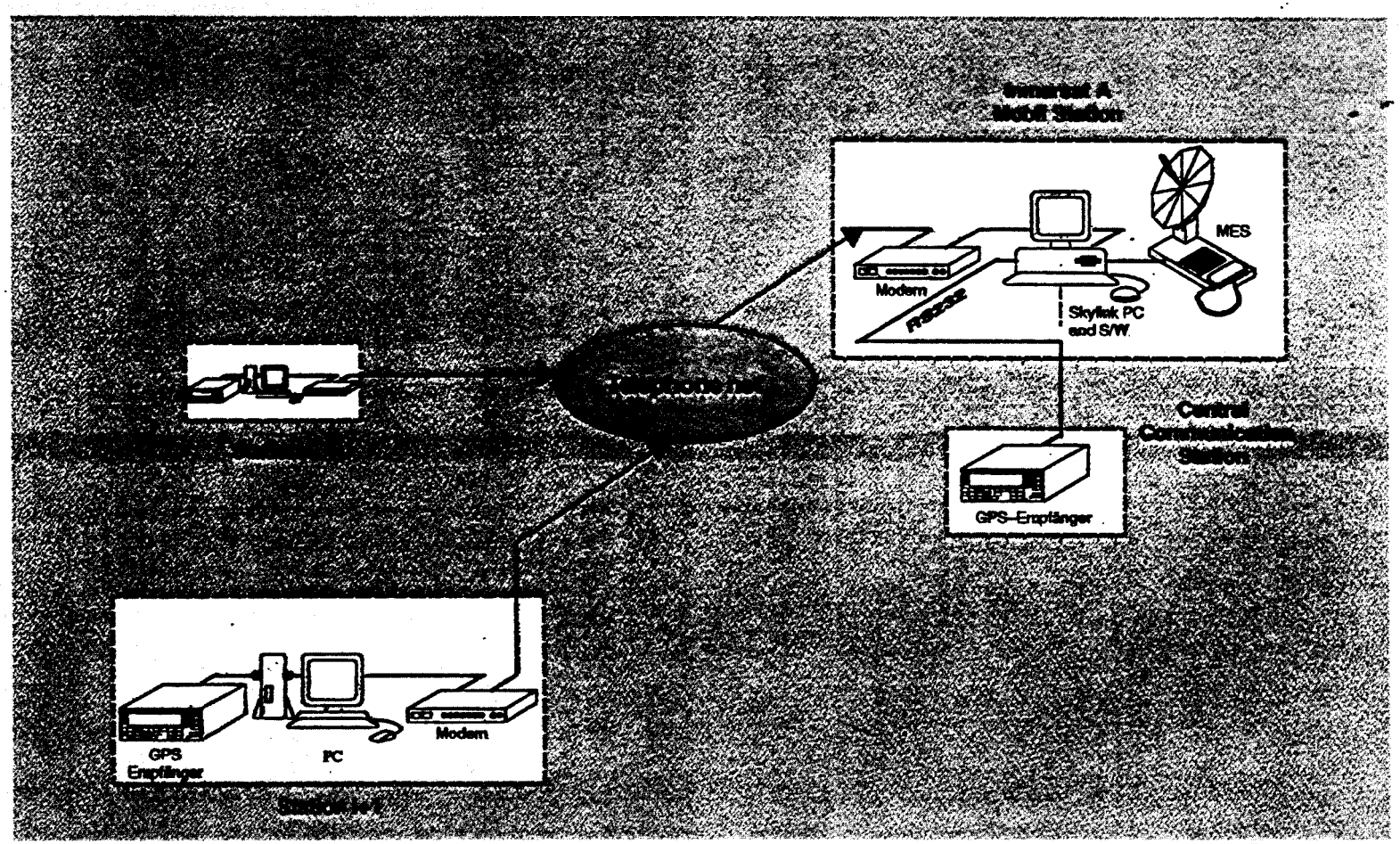
NMARSAT A Mobile Station



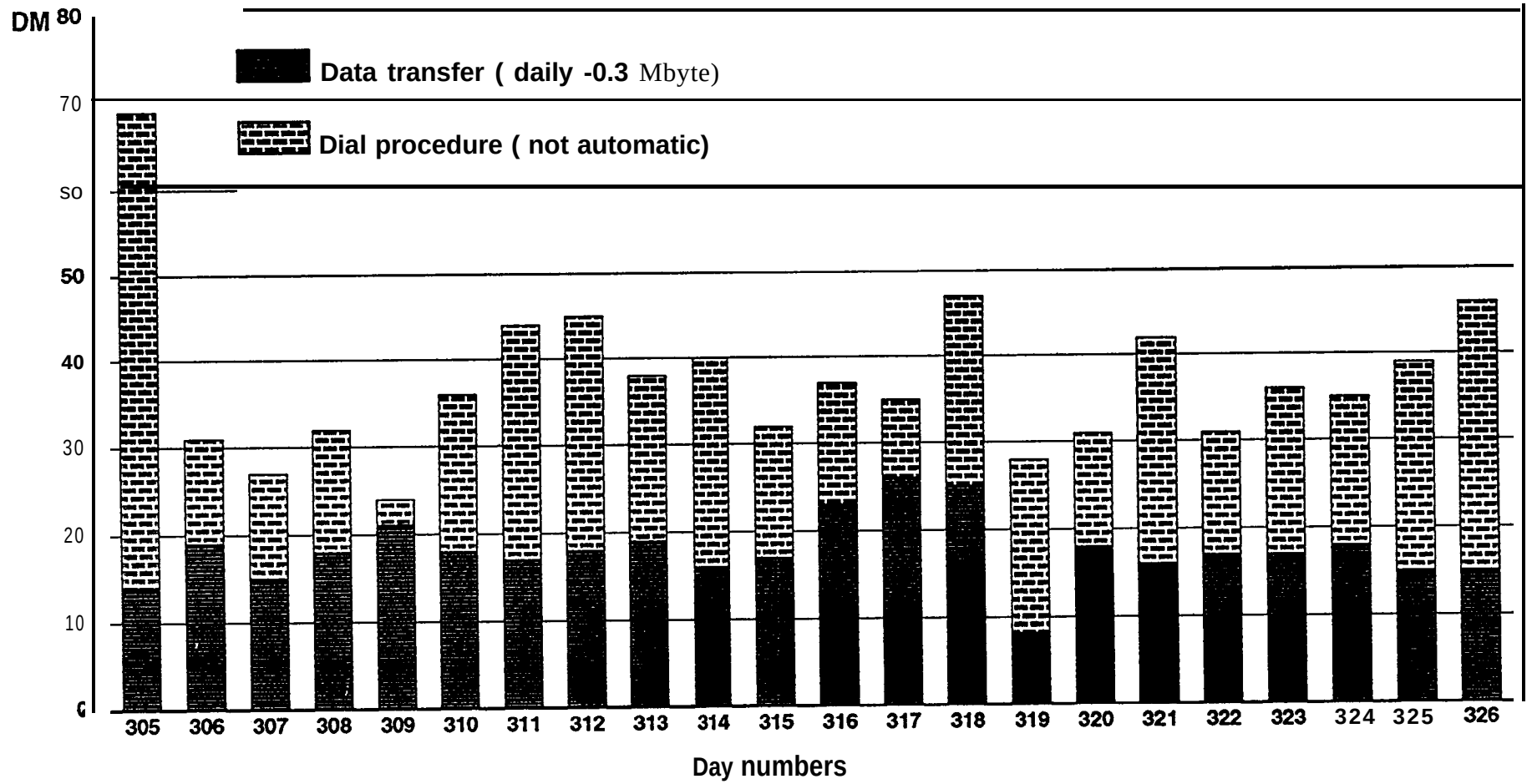
GFZ
Dept. 1


Permanent GPS Station Kitab
Connection between Components of the System
Antenne
Batterie
+12V OUT
Port B
(AUX)
Modem
12V IN
-5V OUT
COM1
SkyLink I/O
SkyLink I/O
Antenne
TR
SNR-8000
Power
Supply
SkyLink
Computer
TransTel
SatCom
-box
Inmarsat A
Mobile Station
SatCom
Main ID.
~220V IN
~ 220V
UPS
GFZ

Data collection in a cluster



Daily charges for the data transfer from Kitab with INMARSAT A and Skylink



A64

Other Contributions to Position Paper 1 Appendix

HERMANN DREWES

Deutsches Geodätisches Forschungs Institut

Sistema de Referencia Geocéntrico para América del Sur (SIRGAS)

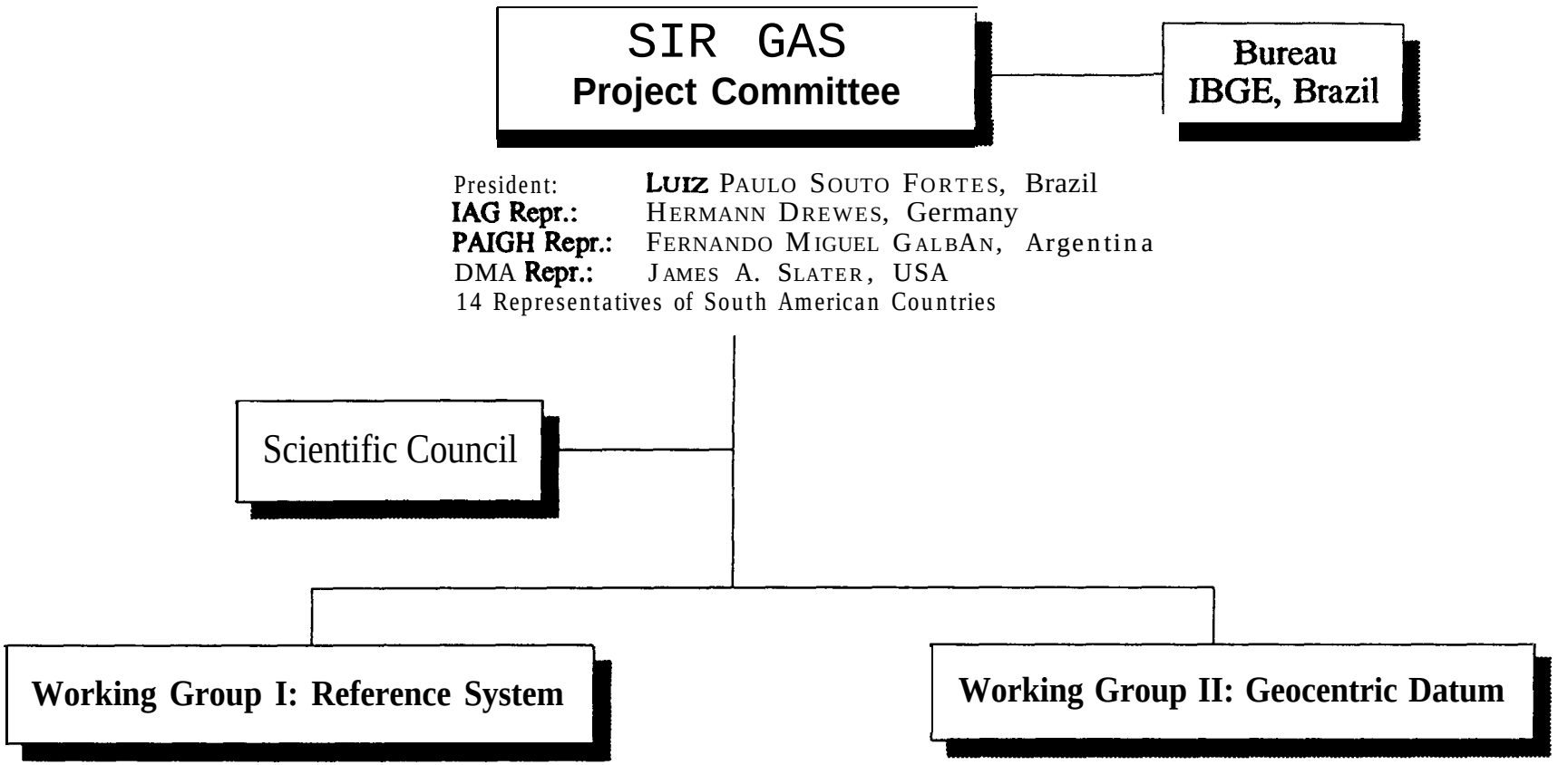
Installed: Asunción / Paraguay, Oct. 4-7, 1993

Objectives:

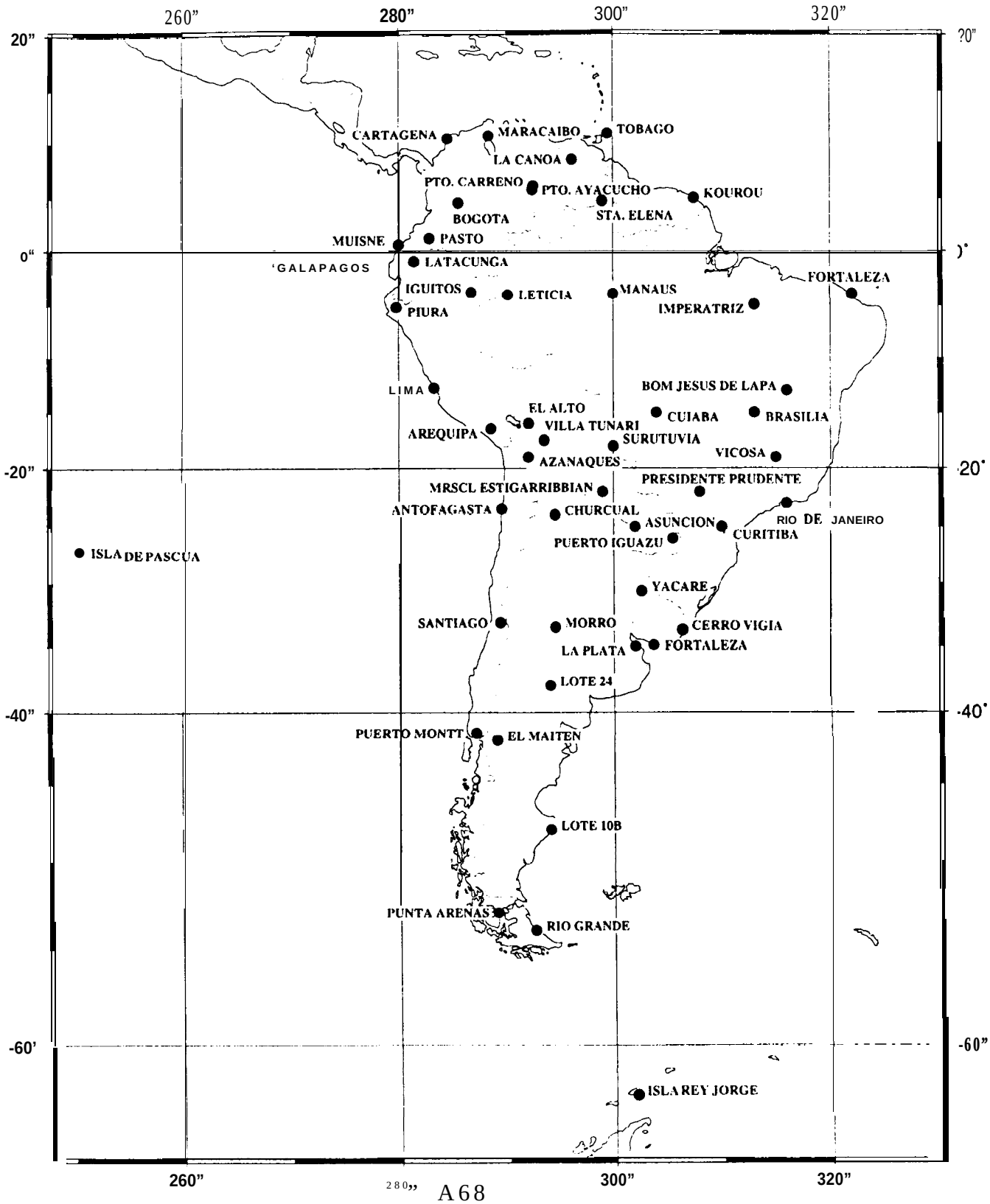
- Define a reference system for South America
- Establish and maintain a reference frame
- Define and establish a geocentric datum

Goals:

- Reach the objectives in 1997
- Establish a high precision GPS network
- Promote and coordinate work in each country
- Facilitate connection to existing networks
- Continue as a permanent task


SIR GAS
Project Committee
Bureau
IBGE, Brazil
President: LUIZ PAULO SOUTO FORTES, Brazil
IAG Repr.: HERMANN DREWES, Germany
PAIGH Repr.: FERNANDO MIGUEL GALBAN, Argentina
DMA Repr.: JAMES A. SLATER, USA
14 Representatives of South American Countries
Scientific Council
Working Group I: Reference System
President: MELVIN J. HOYER R., Venezuela
Members: KATIA DUARTE PEREIRA, Brazil
SUSANA R. ARCINIEGAS, Ecuador
HERVÉ FAGARD, France
Scientific Consultants: HERMANN DREWES, Germany
GÜNTER SEEBER, Germany
MUNEENDRA KUMAR, USA
Working Group II: Geocentric Datum
President: WALTER H. SUBIZA P., Uruguay
Vice-President: LORENZO A. CENTURION, Paraguay
Members: SONIA M. ALVES C., Brazil
SUSANA R. ARCINIEGAS, Ecuador
JOSE NAPOLEÓN HERNANDEZ, Venezuela
Scientific Consultants: MICHAEL PINCH, Canada
DON BEATTIE, Canada
HERMANN DREWES, Germany
MUNEENDRA KUMAR, USA
DAVID J. LEHMAN, USA

SIRGAS (26-1 O-1 994)



Estaciones SIRGAS (26. 10. 1994)				Instr.	Institution
ISLA REY JORGE	Antartida	-62.3	302.	(Z12/SSE)	IGM Chile
CHURCAL	Argentina	-24.	294.5		Univ. Tucuman
PUERTO IGUAZU	Argentina	-26.	305.5		IGM Argentina
MORRO	Argentina	-33.5	294.5	Z12	UAGG Mendoza
LA PLATA	Argentina	-35.	302.	T. Rogue	Ohs. La Plata/GFZ
LOTE 24	Argentina	-38.	294.	SSE	UAGG Mendoza
EL MAITEN	Argentina	-42.	289.	Leica	Cat. Rio Negro
LOTE 10B	Argentina	-48.	294.	(SSE/Z12)	Cat. Chubut
RIO G RANDE	Argentina	-54.	292.5	T. Rogue	Ohs. LaPlata/GFZ
EL ALTO	Bolivia	-16.	292.	SSE	IGM Bolivia
AZANAQUES	Bolivia	-19.	292.	SSE	IGM Bolivia
SURUTUVIA	Bolivia	-18.	300.	SSE	IGM Bolivia
VILLA TUNARI	Bolivia	-17.5	293.5	SSE	IGM Bolivia
FORTALEZA	Brasil	-4.	322.	T. Rogue	IGS
IMPERATRIZ	Brasil	-5.	313.	(SSE/Z12)	IBGE/IfE/
MANAUS	Brasil	-4.	300.	(SSE/Z12)	/UFPR/USP/
BOM JESUS LAPA	Brasil	-13.	316.	(SSE/Z12)	/UNESP/UFPE
BRASILIA	Brasil	-15.	313.	T. Rogue	IBGE / JPL
CUIABA	Brasil	-15.	304.	(SSE/Z12)	\
VIÇOSA	Brasil	-19.	315.	(SSE/Z12)	IBGE/IfE/
PRES. PRUDENTE	Brasil	-22.	308.	(SSE/Z12)	/UFPR/USP/
CURITIBA	Brasil	-25.	310.	(SSE/Z12)	/UNESP/UFPE
CACHOEIRA	Brasil	-23.	316.	(SSE/Z12)	/
ISLA DE PASCUA	Chile	-27.2	250.6	T. Rogue	IGS
ANTOFAGASTA	Chile	-23.5	289.5	T. Rogue	IGM Chile /GFZ
SANTIAGO	C bile	-33.2	289.3	T. Rogue	IGS
PUERTO MONTT	Chile	-41.5	287.	T. Rogue	IGM Chile /GFZ
PUNTA ARENAS	Chile	-53.	289.		IGM Chile
BOGOTA	Colombia	4.5	285.5	Leica	Agustin Codazzi
CARTAGENA	Colombia	10.5	284.5	Leica	Agustin Codazzi
PTO . CARRENO	Colombia	6.1	292.5	Leica	Agustin Codazzi
PASTO	Colombia	1.2	282.8	Leica	Agustin Codazzi
LETICIA	Colombia	-4.1	290.1	Leica	Agustin Codazzi
LATACUNGA	Ecuador	-1.0	281.4		IGM Ecuador
MUISNE	Ecuador	0.6	280.		IGM Ecuador
GALAPAGOS	Ecuador	-1.	269.	(T. Rogue)	(IGS ?)
KOUROU	Guiana	5.	307.5	T. Rogue	ESA / IGS
M ESTIGARRIBIA	Paraguay	-22.	299.		DSGM Paraguay
ASUNCION	Paraguay	-25.	302.		DSGM Paraguay
AREQUIPA	Peru	-16.5	288.5	T. Rogue	IGS
LIMA	Peru	-12.8	283.2	(SSE)	IGN Peru/
IGUITOS	Peru	-3.9	286.7	(SSE)	/(Univ. FA RFA)
PIURA	Peru	-5.3	279.8	(SSE)	/
TOBAGO	Trinidad	11.	299.5		
YACARE	Uruguay	-30.6	302.6	Z12	SGM Uruguay/
CERRO VIGIA	Uruguay	-33.7	306.4	Z12	/Fat. Ing.
FORTALEZA	Uruguay	-34.9	303.7	Z12 + Leica	Univ. de la Rep.
MARACAIBO	Venezuela	10.8	288.3	Leica	\
LA CANOA	Venezuela	8.6	296.2	Leica	DCN/ EIG /
PTO. AYACUCHO	Venezuela	5.7	292.4	Leica	DIGECAFE / DGFI
STA . ELENA	Venezuela	4.7	299.	Leica	/

Proyecto SIRGAS
Grupo de **Trabajo** I **"Sistema de Referencia"**
La Plata/Argentina, 24-28 de **octubre** de 1.994

1. Evaluación de las actividades ejecutadas por el grupo de trabajo

El presidente del grupo, Dr. Melvin Hoyer, informal sobre las actividades ejecutadas:
- Conformación definitiva del grupo
- Plan de trabajo de 10S silos 1994 y 1995
- Comunicaciones enviadas a 10S miembros del grupo y del comité
- Información recibida sobre estaciones e instruments

El Dr. Hermann Drewes informal sobre:
- Estaciones preselecionadas de acuerdo a la información recibida
- Medicines SIRGAS en el año 1994 (17 estaciones en Brasil, Chile, Colombia, Ecuador, Guiana, Venezuela)
- Reuniones en Europa references al proyecto
- Banco de dates SIRGAS ya existente en el DGFI/I

2. Selección y monumentación de estaciones a ser medidas en la campaña 1995

Se revisó y complement el listado de 47 estaciones preseleccionadas. Acordandose medir durante la campaña 51 estaciones, las cuales se presentan en el anexo correspondiente junto ala institución responsible de todas las fases del trabajo referente a la misma. Este conjunto de puntos puede sufrir modificaciones de acuerdo a análisis posteriors.

Se discutieron 10S aspectos relacionados con la monumentaci6n del punto principal y de las referencias, acordandose que el grupo de trabajo enviara una circular con las especificaciones correspondientes.

Se acord6 que el representante de cada pais en el comité SIRGAS enviará a la breveda-d posible al grupo de trabajo la información correspondiente a:

- Descripción de las estaciones incluyendo coordenadas aproximadas
- Nombre completo y dirección de las instituciones participances en el pais

3. Compatibilidad y disponibilidad de instrumentos

De acuerdo ala discusión presentada se aceptó la compatibilidad de 10S siguientes instruments:

- Ashtech Z12 - Leica 200 - Trimble SSE - Turbo Rogue

siendo posible la incorporación de cualquier otro tipo cuya compatibilidad con 10S antes mencionados sea debidamente comprobada.

Se evaluó la disponibilidad de instruments por parte de cada pais, formulandose una lists provisional de 10S equipos a ser utilizados en cada punto, contandose con el ofrecimiento de varies organisms colaboradores. La institución responsible del trabajo en cada estación deberá asegurar la disponibilidad del instrument correspondiente.

Se acord6 recomendar a cada pais asegurar la disponibilidad de uno o varies instruments de repuesto para cubrir cualquier eventualidad, este ó estos equipos podrán medir en lugares excentricos mientras no se requieran su utilización en una estación principal.

4. Detalles logísticos de la campaña

Se fijo la fecha de la campaña GPS SIRGAS del 26 de mayo de 1.995, 0 horas TU hasta el 4 de junio de 1.995, 24 horas TU (10 alias). Las estaciones mediran simultaneamente durante las 24 horas.

Se discutió acerca de otros aspectos logistics y tecnicos relacionados con las mediaones. El grupo de trabajo se encargará de remitir a cada pais las especificaciones correspondientes.

5. Centros de datos y de procesamiento

Se acordó seleccionar un centro de dates por cada pais, 10S cuales remitirán las mediciones a 10S centros globales. Se designaron como centros globales de dates el DGFI/I en Munich/Alemania y el IBGE en Rio de Janeiro/Brasil. El contenido de 10S dos bancos de dates será idéntico por intercambio continuo de la information.

Las f unciones de 10S centros de dates nacionales son las siguientes:

- Coleccionar 10S dates de todas las estaciones del pais antes del 30.06.95.
- Verificar fisicamente 10S diskettes, revisar hojas de campo, etc.
- Hater por 10 menos una copia de 10S dates y conservarla.
- Enviar 10S dates por Internet ó por correo a 10S centros de dates globales a la brevedad posible y antes del 30.07.95.

Pais	Comunicación	Institución responsible
Argentina	Internet	Observatorio de La Plate
Bolivia		(IGM Bolivia)
Brasil	Internet	IBGE
Chile		(IGM Chile)
Colombia		(Agustin Codazzi)
Ecuador		(IGM Ecuador)
Guyana		
Guiana	Internet	IGN Paris
Paraguay		(DSGM)
Peru		(IGN Peru)
Suriname		
Trinidad		
Uruguay	Internet	Univ. de la Republics
Venezuela		DCN

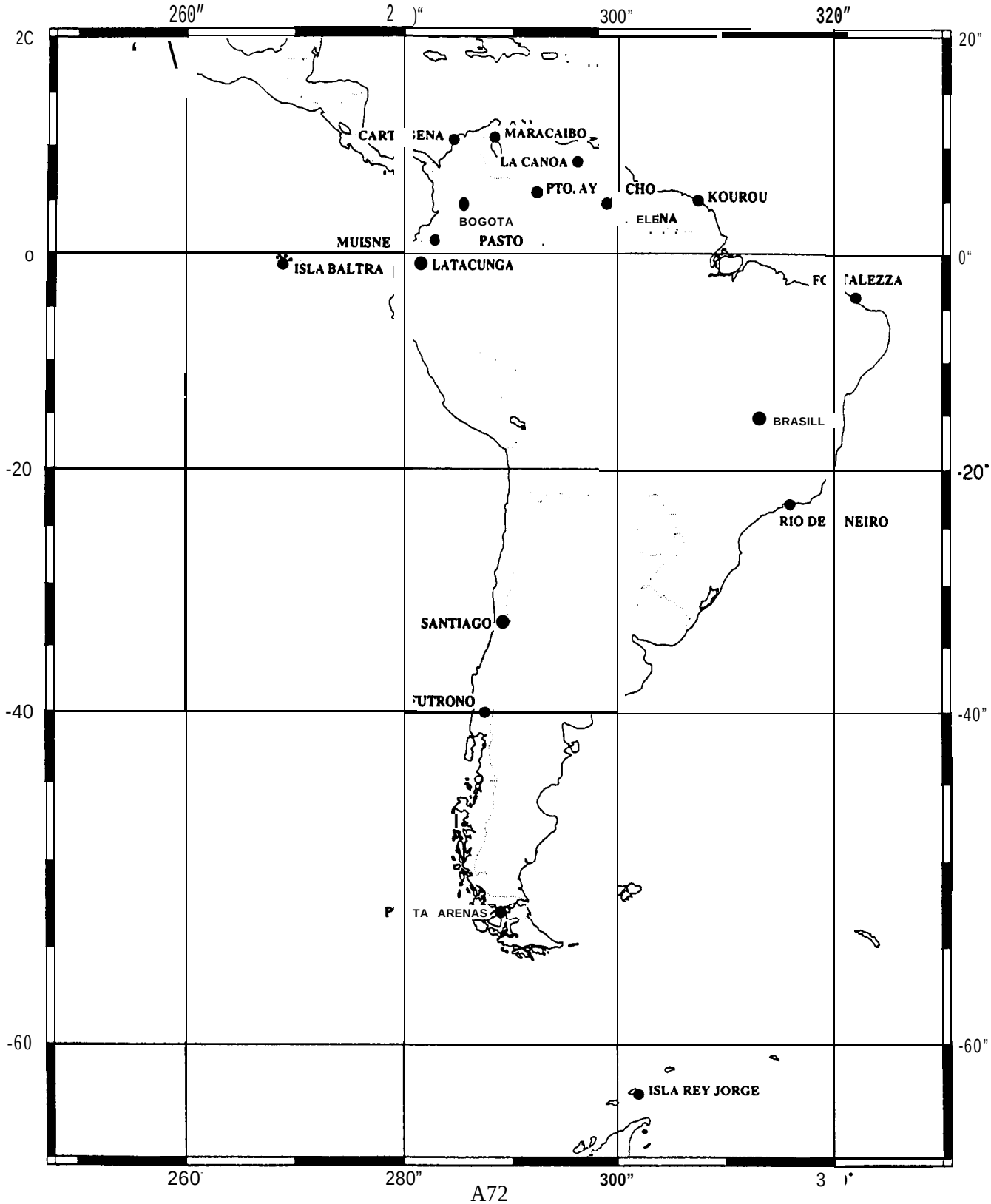
Las instituciones escritas en paréntesis estan sujetas a confirmation.

Queda entendido que la institución responsible de la medición en cada estación deberá envier 10S dates al centro national de manera que este disponga de la información antes del 30.06.95.

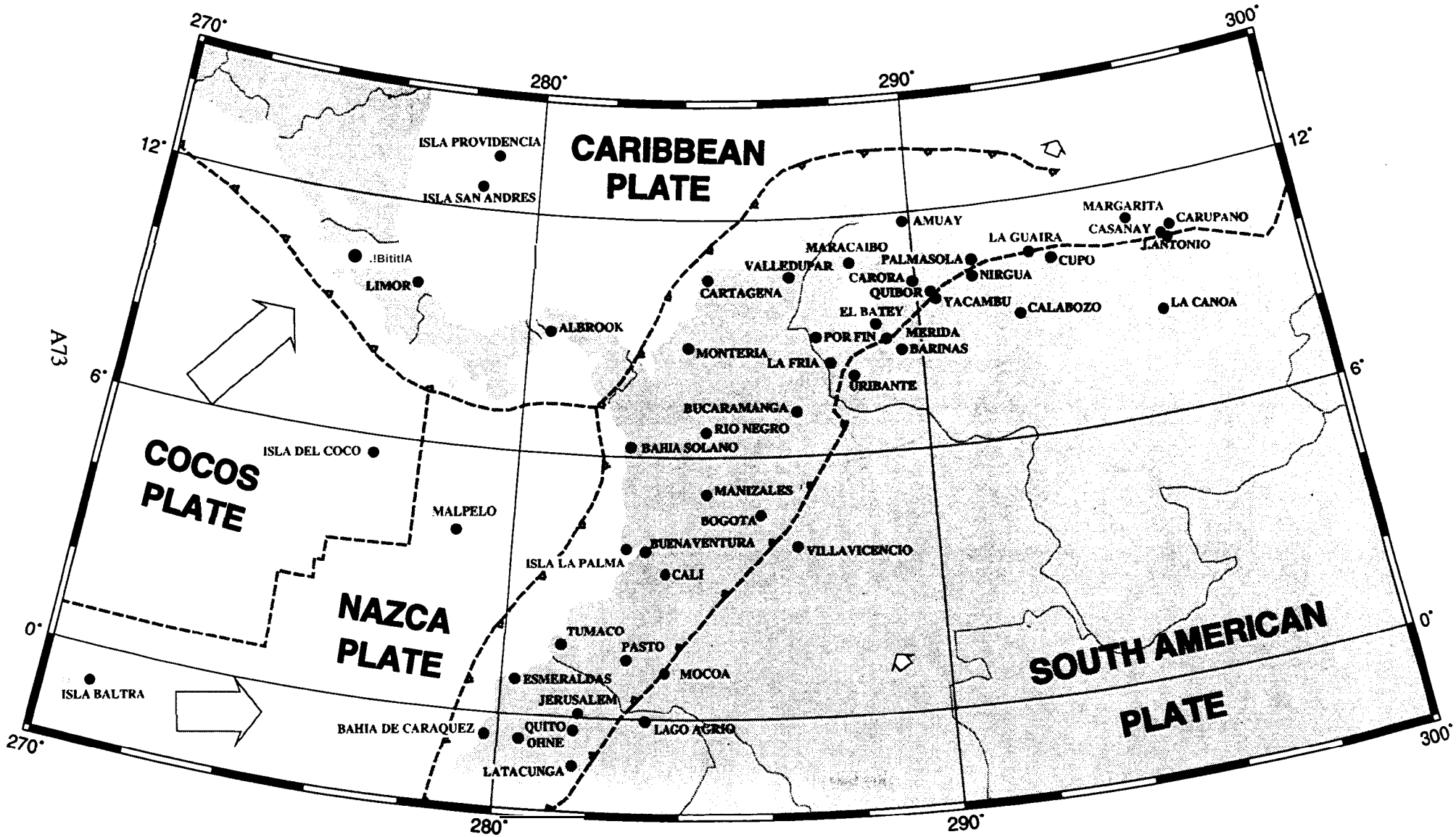
Con *respecto al* procesamiento se solicitó a las instituciones DGFI/I, If E (Hannover/Alemania), DMA (EE. UU.), GSD Canada servir como centros principales del proyecto, recomendandose a cada país participar en el procesamiento de acuerdo a sue posibilidades. Asi mismo se planted la conveniencia de utilizer diferentes softwares en el cálculo con la finalidad de tener controles independientes.

Se acordó que ninguna persona ó institución podrá presentar ó publicar resultados parciales o totales de cálculos de la red SIRGAS antes de que el comité SIRGAS asi 10 autonce.

SIRGAS GPS Feb.94



CASA - GPS Network (M=I :25Mio)



Other Contributions to Position Paper 1 Appendix

JAN JOHANSSON

Onsala Space Observatory

SWEPOS: History

1990	Independent conceptions of a permanent GPS network for technical development, geophysical studies, and reference network
1991	Coordinated proposals submitted to U.S. and Swedish funding agencies
1991-1992	Proposals accepted. Network and site design begin
1992	Establishment of first sites and performance of test experiments
1993	All monuments and cabins ready. 15 Osborne TurboRogue and 5 Ashtech Z-12 GPS receivers installed Establishment of temporary operational and data archive center at Onsala Space Observatory (0S0)
1993-1994	Evaluation of network hardware, software, and procedures

SWEPOS: Present Status

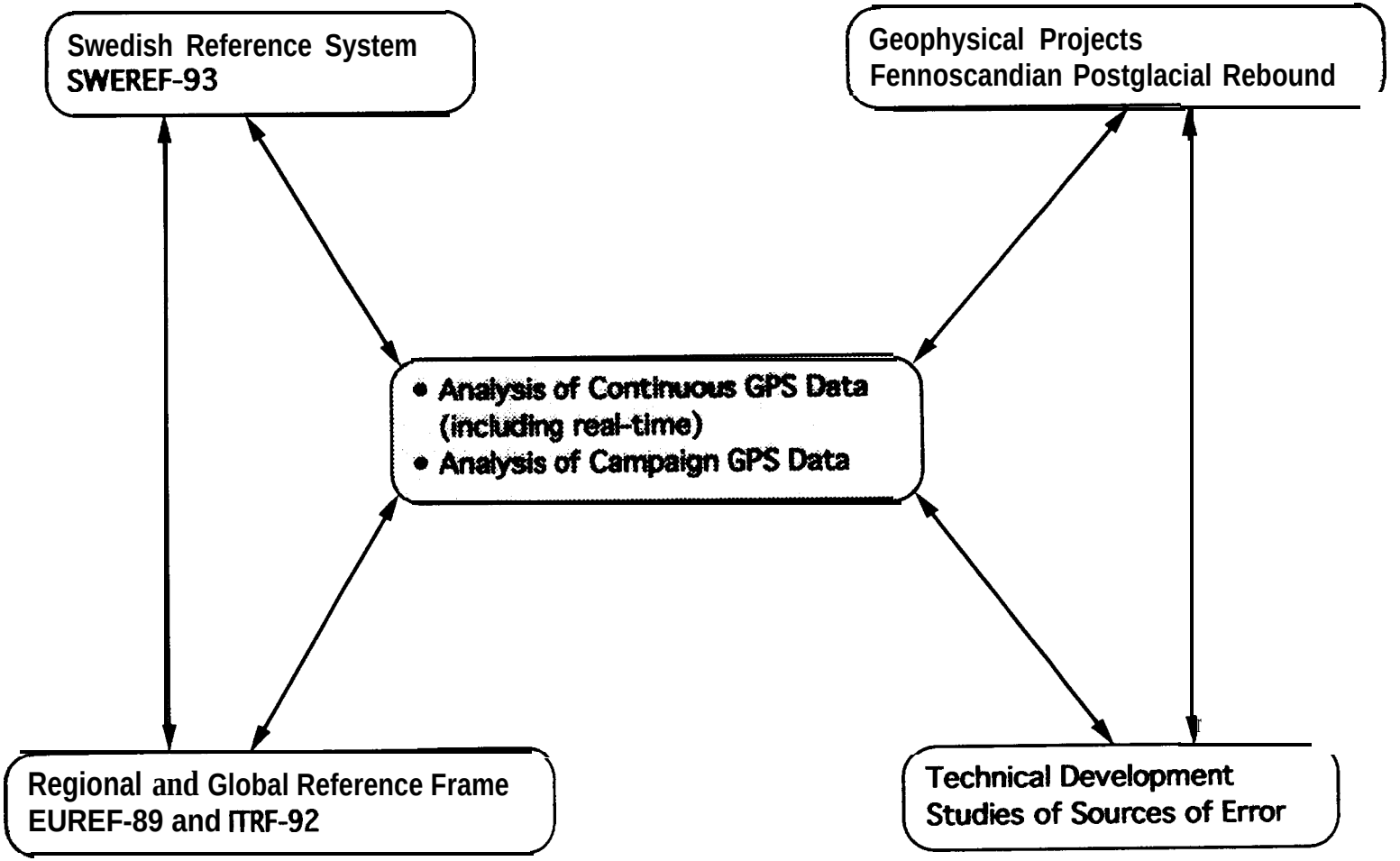
1994 Dec 5 — operational and data archive center at National Land Survey of Sweden (NLS)

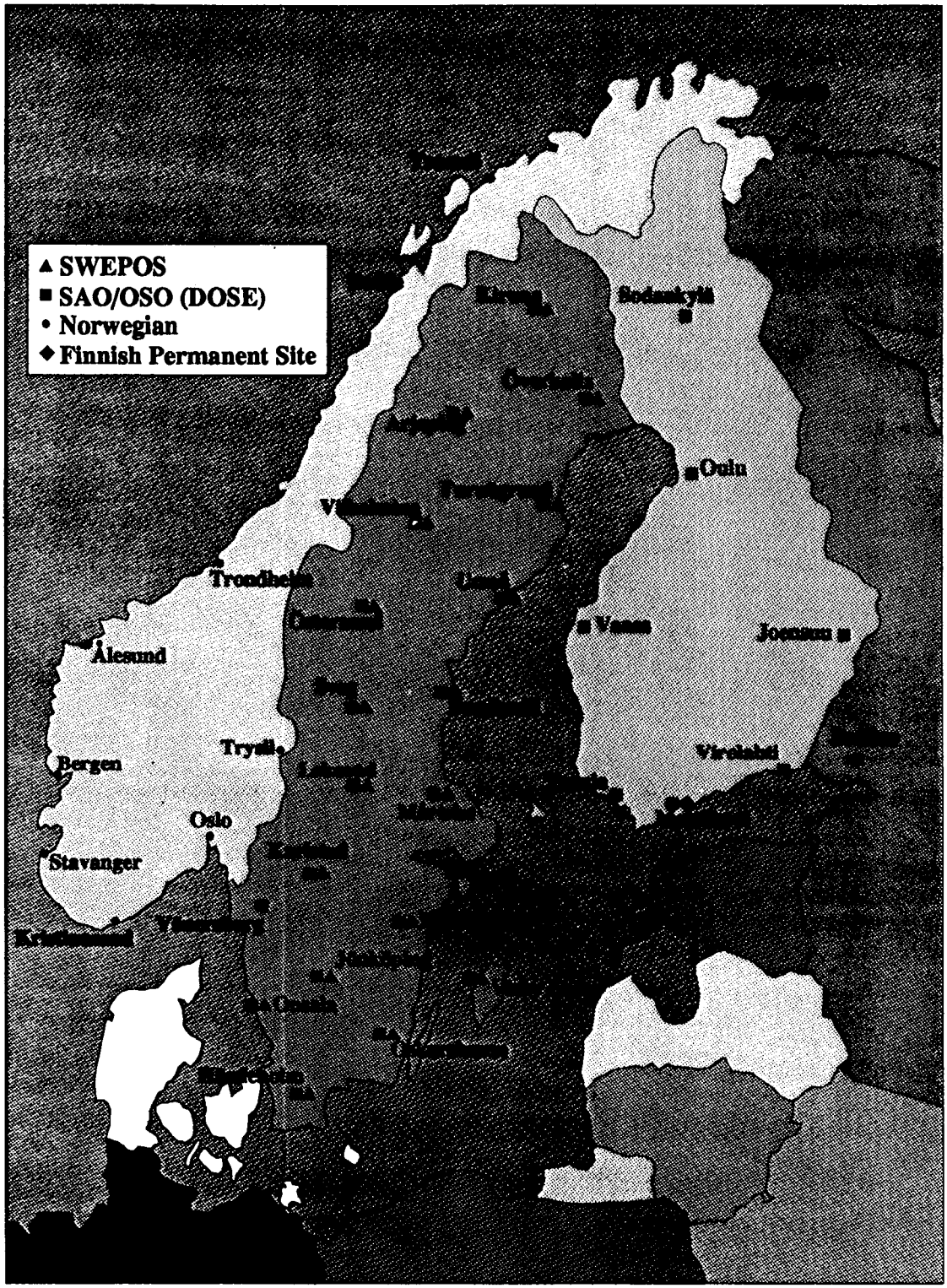
A total of 16 TurboRogue and 12 Ashtech Z-12 GPS receivers installed

Dorne-Margolin antennas at 17 sites (soon to be 20)

Differential GPS (DGPS) corrections broadcasted via FM Radio (RDS channel)

Geodesy and Geophysics: Links to GPS Analysis




▲ SWEPOS
■ SAO/OSO (DOSE)
• Norwegian
◆ Finnish Permanent Site
Oulu
Vaasa
Joensuu
Trondheim
Ålesund
Bergen
Oslo
Stavanger