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CODE 95 P 01, 02

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CODE, the Center for Orbit Determination in Europe, is a joint venture of four European Institutions. It is located at the University of Bern, the computations are performed on a cluster of VAX/ALPHA processors. The software used is the Bernese GPS Software Version 3.6, which is continuously improved to meet the steadily growing demands of the IGS processing.

Markus Rothacher is the head of the CODE processing and development team, Robert Weber is responsible for the CODE solutions since July 1993. We refer to (Rothacher *et al*, 1994) for a general description of the processing at the CODE processing center. Here we only present the development which took place in 1994.

Again the number of stations included in our processing was considerably growing (from 38 stations at the end of 1993 to 49 stations at the end of 1994). The fact that 17 of "our" 49 stations lie in Europe underlines that CODE puts the emphasis on Europe in its contribution to the ITRF. The ERP series and the coordinates sent to the IERS in 1995 are based on the ITRF93. The same 13 stations were kept fixed in 1994 as in 1993 to produce the ERPs results (Rothacher *et al.*, 1994).

The program ADDNEQ, our routine stacking normal equations (Rothacher *et al*, 1994) was considerably generalized in 1994. Today it is the central tool of the CODE processing center of the IGS:

- ADDNEQ may now be used to form n-day arcs, n >= 2, from one-day arcs (Beutler *et al*, 1995). This new development saves many hours of CPU in the daily routine.

- More troposphere parameters (12 per station and day) are set up in the one-day solutions. ADDNEQ allows it to produce solutions based on 2-, 4- ,6- ,12-, and 24-hour troposphere intervals (per station and day).

- ADDNEQ may now handle nutation parameters: First derivatives of $d\varepsilon$ and $d\psi$ may be extracted from ADDNEQ. Time series are (internally) available since 1 January 1994.

- The capabilities to change the reference frame (e.g. from ITRF92 to ITRF93) are now fully implemented and active. As soon as a new reference frame becomes available new solutions (coordinates, orbits, etc) may be extracted easily from ADDNEQ back to day 200 of year 1993.

It is also worth mentioning that since 1 January 1994 the troposphere parameters are stored in a user-friendly form. They are available for atmosphere studies.

Ambiguity resolution on long baselines was studied by Mervart (1994), a solution based on about 70%-80% fixed ambiguities is produced in a fully automatic way in parallel to our official solutions since October 1994.

The orbit model was studied already in 1993 (Beutler *et al.*, 1994). The program ORBIMP, using an improved radiation pressure model, is used for the long arc analysis by the IGS analysis center coordinator (Beutler *et al.*, 1993). At present we are systematically analysing the mean orbital elements, the series of radiation pressure parameters, and the series of stochastic parameters generated since mid 1992. We expect that this analysis will contribute to a new IGS radiation pressure model in 1995.

References

Beutler, G., Brockmann, E., Gurtner, W., Hugentobler, U., Mervart, L., Rothacher, M., Verdun, A., 1994: Extended Orbit Modelling Techniques at the CODE Processing Center of the IGS: Theory and Initial Result, *Manuscripta Geodaetica,* **19**, 367-386.

Beutler, G., Brockmann, E., Hugentobler, U., Mervart, L., Rothacher, M., Weber, R., 1995: Combining n Consecutive One-Day-Arcs into one n-Days-Arc, Submitted for publication to *Manuscripta Geodaetica,* October 1994.

Beutler, G., Kouba, J., Springer, T., 1993: Combining the Orbits of IGS Processing Centers, *Proceedings of the IGS Analysis Center Workshop,* October 12-14, 1993, J. Kouba (ed.), NRCan, Ottawa, Canada, p. 20-56, also in *Bulletin Geodesique* (accepted for publication).

Mervart, L., 1995: Ambiguity Resolution Techniques in Geodetic and Geodynamic Applications of the Global Positioning System, Ph.D. Thesis, Druckerei der Universitaet Bern.

Rothacher, M., Beutler, G., Brockmann, E., Gurtner, W., Mervart, L., Weber, R., Wild, U., Wiget, A., Seeger, H., Boucher, C., 1994: Annual Report of the CODE Analysis Center for 1993, *IERS Technical Note 17,* Observatoire de Paris, Paris, p. P-1 - P-14.

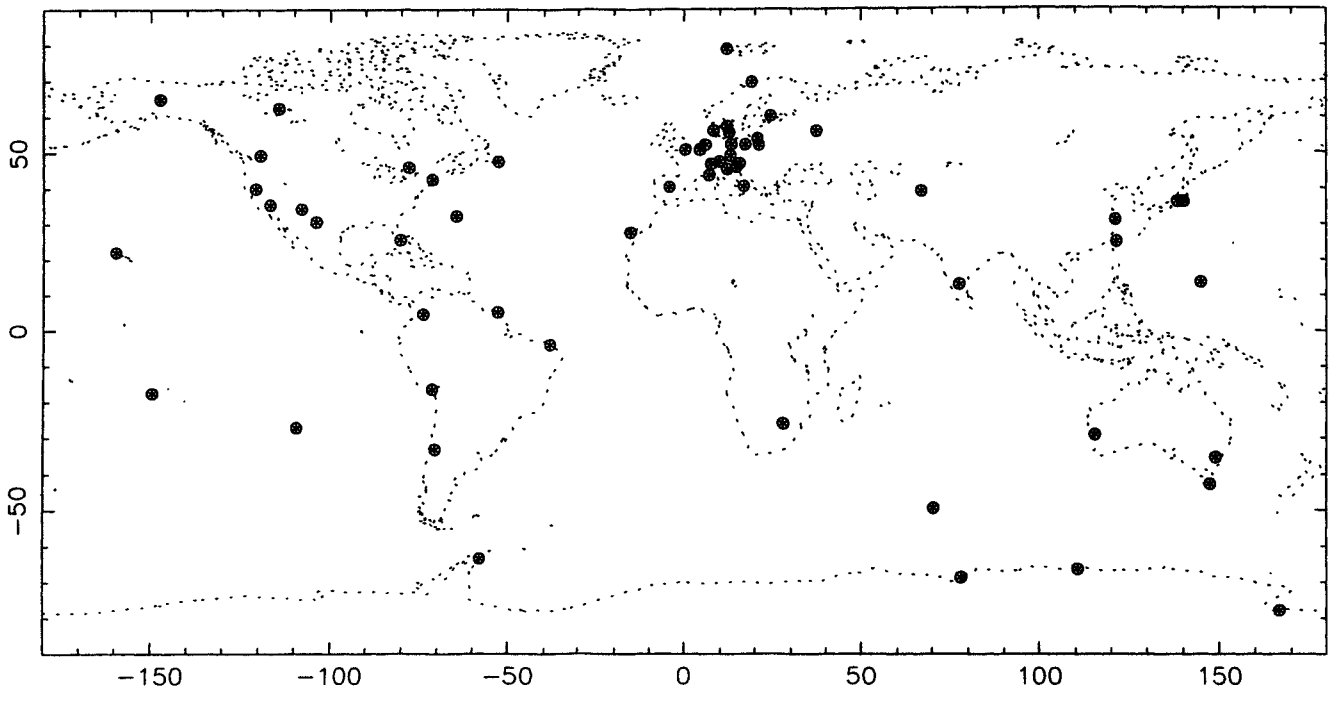
Technical description of solution CODE 95 P 01

1 - Technique:	GPS
2 - Analysis Center:	CODE
3 - Software used:	Bernese GPS Software Version 3.6
4 - Data span:	19 July 1993 (doy 200) - 1 March 1995
5 - Celestial Reference Frame:	
a - Nature:	dynamical
b - Definition of the orientation:	---
6 - Terrestrial Reference Frame:	SSC(IERS) 94 C 02
a - Relativity scale:	Local Earth
b - Velocity of light:	299792458 m/s
c - Geogravitational constant:	398.6004415 10^{12} m^3/s^2
d - Permanent tidal correction:	yes
e - Definition of origin:	origin of ITRF93
f - Definition of orientation:	non-rotation constraint
g - Reference epoch:	---
h - Tectonic plate model:	ITRF93 velocity field
i - Constraint for time evolution:	ITRF93 velocity field
7 - Earth orientation:	EOP(CODE) 95 P 01
a - A priori nutation model:	IAU 1980
b - Short-period tidal variations in x, y, UT1:	none
8 - Estimated Parameters:	
a - Celestial Frame:	---
b - Terrestrial Frame:	coordinates of free stations

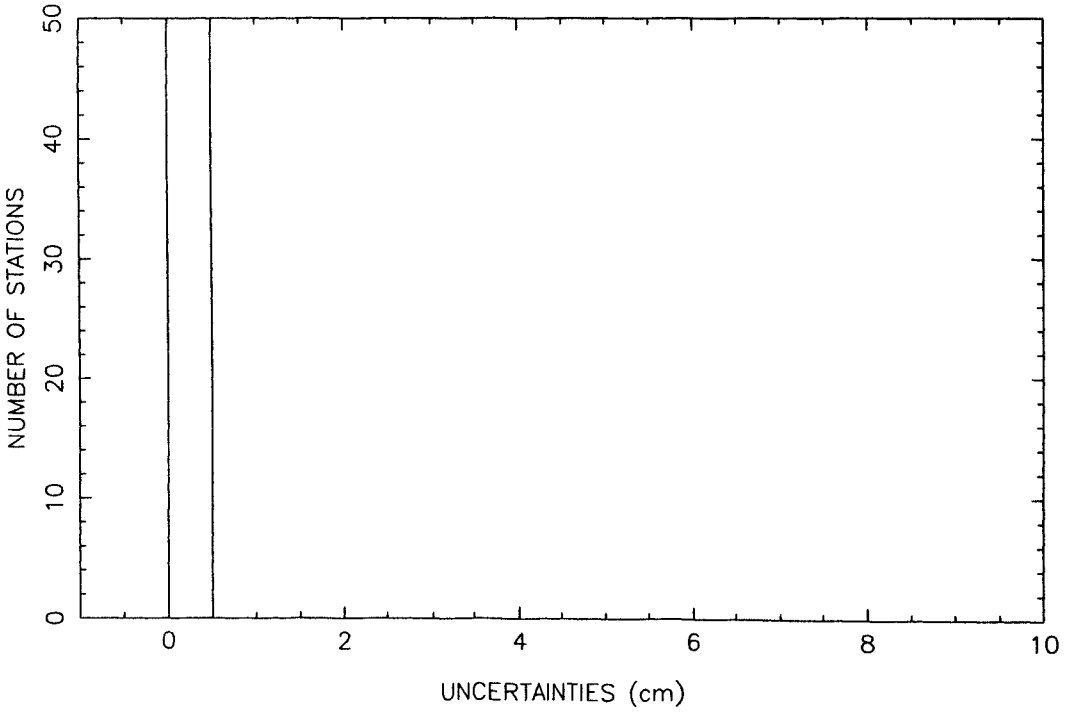
c - Earth Orientation:	x, y, UT1-UTC drift, and drifts in x, y
d - Others:	zenith troposphere delays (4 per day and station), orbit parameters (8 per satellite), ambiguities, stochastic acceleration parameters for eclipsing satellites.

Technical description of solution CODE 95 P 02

1 - Technique:	GPS
2 - Analysis Center:	CODE
3 - Software used:	Bernese GPS Software Version 3.6
4 - Data span:	01 April 1993 (doy 091) - 1 March 1995
5 - Celestial Reference Frame:	
a - Nature:	dynamical
b - Definition of the orientation:	---
6 - Terrestrial Reference Frame:	SSC(CODE) 95 P 02
a - Relativity scale:	Local Earth
b - Velocity of light:	299792458 m/s
c - Geogravitational constant:	398.6004415 10^{12} m^3/s^2
d - Permanent tidal correction:	yes
e - Definition of origin:	origin of ITRF93
f - Definition of orientation:	non-rotation constraint
g - Reference epoch:	16 March 1994
h - Tectonic plate model:	horizontal component estimated, vertical component used from ITRF93
i - Constraint for time evolution:	WETT fixed on ITRF93 velocity, stations with a short observation period are constrained to ITRF93
7 - Earth orientation:	EOP(CODE) 95 P 02
a - A priori nutation model:	IAU 1980
b - Short-period tidal variations in x, y, UT1: none	
8 - Estimated Parameters:	
a - Celestial Frame:	---
b - Terrestrial Frame:	coordinates and velocities of all stations
c - Earth Orientation:	x, y, UT1-UTC drift, and drifts in x, y
d - Others:	zenith troposphere delays (4 per day and station), orbit parameters (8 per satellite), ambiguities, stochastic acceleration parameters for eclipsing,satellites.



Distribution of the 60 sites of the terrestrial frame SSC(CODE) 95 P 02.



Distribution of the uncertainties (quadratic mean of σ_x, σ_y, σ_z) for the 69 stations of the terrestrial frame SSC(CODE) 95 P 02.

EOP(CODE) 95 P 01 From Jul 1993 to Jul 1995

Number of measurements per year and median uncertainties
Units : 0.001" for X,Y; 0.0001s for UT1

YEAR	X		Y		UT1	
	Nb	Sigma	Nb	Sigma	Nb	Sigma
1993	166	0.04	166	0.04	166	0.03
1994	365	0.04	365	0.03	365	0.03
1995	210	0.02	210	0.03	210	0.02