



IGS

I N T E R N A T I O N A L G P S

S E R V I C E

F O R

G E O D Y N A M I C S

1999
TECHNICAL
REPORTS

N O V E M B E R 2 0 0 0

IGS Central Bureau

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California U.S.A.
<http://igscb.jpl.nasa.gov/>

This publication was prepared by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not constitute or imply its endorsement by the United States Government, the National Aeronautics and Space Administration, or the Jet Propulsion Laboratory, California Institute of Technology.

Edited by Ken Gowey, Ruth Neilan, Angelyn Moore, JPL/IGS Central Bureau, 11/2000.

Abstract

Applications of the Global Positioning System (GPS) to Earth Science are numerous. The International GPS Service (IGS), a federation of government agencies and universities, plays an increasingly critical role in support of GPS-related research and engineering activities. Contributions from the IGS Governing Board and Central Bureau, analysis and data centers, station operators, and others constitute the 1999 Technical Reports. This report has a companion publication, the 1999 Annual Report. Hard copies of each volume can be obtained by contacting the IGS Central Bureau at the Jet Propulsion Laboratory. Electronic versions can be viewed at <http://igs.cb.jpl.nasa.gov/overview/pubs.html>

Contents

1	Executive Reports	
	Perspective of the IGS Governing Board	3
	<i>Ch. Reigber</i>	
	Central Bureau Annual Report 1999	7
	<i>R. Neilan</i>	
2	Analysis Center Reports	
	1999 Analysis Coordinator Report	15
	<i>T. Springer, J. Kouba, Y. Mireault</i>	
	Analysis Centers	
	CODE IGS Analysis Center Technical Report 1999	59
	<i>U. Hugentobler, et al.</i>	
	The ESA/ESOC IGS Analysis Centre	71
	<i>J. M. Dow, T.J. Martin-Mur, J. Feltens, C. Garcia, I. Romero, R. Kahle</i>	
	GFZ Analysis Center of IGS - Annual Report for 1999	77
	<i>G. Gendt</i>	
	JPL IGS Analysis Center Report, 1999	85
	<i>D. Jefferson</i>	
	GPS Orbit and Earth Orientation Parameter Production at NOAA for the International GPS Service for 1999	91
	<i>W. Kass, M. Schenewerk, B. Leonard</i>	
	NRCan IGS Analysis Centre Report for 1999	95
	<i>P. Tétreault</i>	
	Scripps Orbit and Permanent Array Center 1999 Global Analysis Center Report	99
	<i>P. Fang, M. van Domselaar, Y. Bock</i>	
	Associate Analysis Centers	
	<u>Rapid Service and Prediction</u>	
	U.S. Naval Observatory: Center for Rapid Service and Predictions	117
	<i>J. R. Ray, D. McCarthy</i>	
	<u>GNAACs</u>	
	The Newcastle GNAAC Annual Report for 1998-1999	125
	<i>K. Nurutdinov, et al</i>	
	MIT T2 Associate Analysis Center Report	131
	<i>T. Herring</i>	

	GNAAC Coordinate Comparisons at JPL for GPS Weeks 813-1054	137
	<i>M. Heflin, et al</i>	
	<u>RNAACs</u>	
	The EUREF RNAAC: 1999 Bi-Annual Report	143
	<i>M. Becker, C. Bruyninx, D. Ineichen</i>	
	AUSLIG RNAAC – 1999 Annual Report	151
	<i>G. Luton</i>	
	GSI RNAAC Technical Report 1999	153
	<i>A. Yamagiwa</i>	
	Annual Report 1999 of RNAAC SIRGAS	155
	<i>W. Seemueller, H. Drewes</i>	
	<i>IERS Contributions</i>	
	The International Terrestrial Reference Frame	161
	<i>Z. Altamimi</i>	
3	Data Center Reports	
	<u>Global Centers</u>	
	CDDIS 1999 Global Data Center Report	169
	<i>C. Noll</i>	
	Scripps Orbit and Permanent Array Center 1999 Global Data Center Report	185
	<i>Y. Bock, B. Gilmore, et al</i>	
	<u>Regional/Operations Centers</u>	
	BKG Regional IGS Data Center Report 1999	203
	<i>H. Habric, K. Herzberger</i>	
4	Network and Station Reports	
	<u>Global, Regional, and Local Networks</u>	
	Meeting the Challenges of 1999	211
	<i>A. Moore</i>	
	Australian Regional GPS Network - 1998 Report	217
	<i>J. Steed, R. Twilley</i>	
	The GPS Receiver Network of ESOC	223
	<i>C. Garcia-Martinez, J. M. Dow, I. Romero</i>	
	Technical Improvements of the IGS Stations Monitored by GFZ	225
	<i>J. Neumeyer, R. Galas, et al</i>	
	NASA-Sponsored Global GPS Network Activities	227
	<i>J. Zumberge, D. Stowers, et al</i>	

	NRCan - GSC Western Canada Deformation Array GPS Network 1999 Report	229
	<i>M. Schmidt, H. Dragert, et al</i>	
	Operation and Densification of Continuous GPS Stations in Russia	237
	<i>G. Steblou, M. Kogan</i>	
	<u>Individual Stations</u>	
	The BOR1 IGS Station	245
	<i>M. Lehmann, L. Jaworski</i>	
	Status of the IGS Stations Operated by the Main Astronomical Observatory	247
	<i>Ya.Yatskiv and O.Khoda</i>	
5	Working Groups/Pilot Projects/Committees	
	IGS/BIPM Time Transfer Pilot Project	251
	<i>J. Ray</i>	
	IGS Reference Frame Pilot Project	257
	<i>R. Ferland</i>	
	1999 IGS Activities in the Area of the Ionosphere	263
	<i>J. Feltens</i>	
	Troposphere (See Section 7 - AC Workshop)	
	LEO Working Group (See Section 6 - Low Earth Orbiter Workshop)	
	International GLONASS Experiment (IGEX-98)	269
	<i>J. Slater</i>	
	IGEX Analysis	273
	<i>R. Weber</i>	
6	Low Earth Orbiter Missions (LEO) Workshop (March 9 - 11, 1999), GeoForschungsZentrum Potsdam, Germany	
	Summary Recommendations	281
	Agenda	285
	List of Participants	289
	Use of LEO Satellites for Ionospheric Research and Monitoring	299
	<i>N. Jakowski</i>	
	Distribution of IGS Data	307
	<i>C. Noll</i>	
	Radio Wave Propagation Effects In Radio Occultation Measurements	315
	<i>A. G. Pavelyev, O. I. Yakovlev, S. S. Matyugov, A. I. Kucherjavenkov, V. A. Anufriev</i>	

	4-D Distribution of the Ionospheric Electron Density Using LEO and Ground TEC Data	321
	<i>G. Ruffini, A. Flores, A. Rius, E. Cardellach, L. Cucurull</i>	
	CHAMP S/C Telemetry, Data Flow and Products	327
	<i>P. Schwintzer, Ch. Förste, W. Köhler</i>	
	CHAMP Atmosphere/Ionosphere Processor	337
	<i>J. Wickert, A. Wehrenpfennig, N. Jakowski, K. Hocke</i>	
7	Analysis Center (AC) Workshop (June 8-10, 1999), Scripps Institute of Oceanography (SIO), La Jolla, CA	
	Recommendations	341
	Agenda	347
	Participants	351
	ITRF97 and Quality Analysis Of IGS Reference Stations	353
	<i>Z. Altamimi, C. Boucher, P. Sillard</i>	
	Real-Time Data Validation, Compression and Communication in the Dutch Permanent GPS Array AGRS.NL	361
	<i>K. de Jong</i>	
	Operational Water Vapor Estimation in a Dense German Network	375
	<i>G. Dick, G. Gendt, Ch. Reigber</i>	
	Ocean Loading Corrections: Do We Need Them? A Case Study at the WCDA Site Holberg	385
	<i>H. Dragert, T. James, A. Lambert</i>	
	IGS Realization of ITRF	387
	<i>R. Ferland</i>	
	Site Densification	389
	<i>R. Ferland, D. Hutchison</i>	
	Moving IGS Products Towards Real-Time	391
	<i>G. Gendt, P. Fang, J. Zumberge</i>	
	Status Report of Troposphere Working Group	405
	<i>G. Gendt</i>	
	Real and Near-Real-Time Products and Applications: Ground-Based GPS Meteorology	415
	<i>S. Gutman</i>	
	Efficient Densification and Long Term Accuracy	417
	<i>M. Hefflin, D. Jefferson, Y. Bar-Sever, F. Webb, J. Zumberge</i>	

Comparisons of IGS and AC ERP/ERP Rate Solutions with Atmospheric and Oceanic Angular Momentum.....419
J. Kouba

New IGS Station and Satellite Clock Combination421
J. Kouba

The Effects of Site Specific and Troposphere Errors on Sub-daily Results423
A. Niell

In-Situ Site Calibration and Procedures425
A. Niell

IGS/BIPM Pilot Project to Study Time and Frequency Comparisons Using GPS Phase and Code Measurements.....427
J. Ray, G. Petit

Recommendations for Handling Non-Rogue Data.....445
J. Ray, H. Dragert, J Kouba

Optimal Geometry of IGS Stations in Eurasia453
G. Steblov, M. Kogan

Report on the Status of the International GLONASS Experiment (IGEX).....455
R. Weber

