



# **SOUTH AMERICAN GEOCENTRIC REFERENCE SYSTEM**

## **SIRGAS**

### **NEWSLETTER #1**

*September 1994*



## TABLE OF CONTENTS

EDITORIAL

LANGUAGES

STRUCTURE OF THE PROJECT

COMPOSITION OF THE PROJECT

COMMITTEE

WORKING GROUP I: REFERENCE SYSTEM

WORKING GROUP II: GEOCENTRIC DATUM

SCIENTIFIC COUNCIL

INFORMATION ON WORKING GROUPS

WORKING GROUP I: REFERENCE SYSTEM

1994 Activities

1995 Activities

Themes of Discussions Proposed for the Foreseen Meetings

Preparatory Meeting for Evaluation of Activities

Preparatory Meeting Previous to Measurements

Meeting for Evaluation of Results

WORKING GROUP II: GEOCENTRIC DATUM

Recommendations and Resolutions of the 1st Meeting



## **EDITORIAL**

It is with a great pleasure that I introduce to readers the first edition of the SIRGAS Project Newsletter. The purpose of this publication is to disseminate, in the South American community and in the other continents, activities developed within this project of great importance to the countries of our continent. Being sure of the benefits that could come of an ample reflection of this project, through comments and suggestions, or through the knowledge of geodetic information's user community, the reproduction and distribution of this communication vehicle is strongly stimulated.

The SIRGAS Project was created during the International Conference for Definition of a South American Geocentric Datum, during the period 4 through 7 October 1993, in Asuncion, Paraguay, by an invitation of the sponsoring entities: International Association of Geodesy - IAG, Pan-American Institute of Geography and History - PAIGH and United States Defense Mapping Agency - DMA. Representatives of each sponsoring entity and of almost all South American countries participated in that Conference.

The objectives established for the project are the following: to define a reference system for South America; to establish and maintain a reference network; and to define and establish a geocentric datum. The goals to be achieved are: to reach the defined objectives in 1997, coinciding with the General Meeting of the International Association of Geodesy, with the exception of maintenance that has a permanent character; to promote and coordinate the work of each South American country in order to get the defined objectives; to establish a high precision GPS network, in accordance with the objectives of Resolution No. 2 of the 10th Meeting of the Directors of South American Geographic Institutes (DIGSA), held in La Paz, Bolivia, in 1993; to concentrate the attention at the beginning on the Horizontal Datum; and to facilitate the connection of pre-existing networks.

Objectives related to the definition of the reference system and of the geocentric datum for the continent have been achieved in the Asuncion Conference, the plenary having chosen the following:

- SIRGAS reference system: IERS (International Earth Rotation Service) Terrestrial Reference Frame (ITRF);
- geocentric datum: coordinated axes based on the SIRGAS reference system and parameters of "Geodetic Reference System (GRS) of 1980" ellipsoid.

The development of the SIRGAS Project encompasses the activities needed for the adoption on the continent of a reference network of precision compatible with the up to date positioning techniques, mainly those associated with the Global Positioning



System (GPS). Considering the proliferation of GPS utilization, to tie these new surveys to an existing geodetic structure, basically carried out by the use of classical methods (triangulation, traverse, trilateration, etc.), whose precision is at least ten times worse than that easily obtained with the GPS, implies at least a waste of resources. Besides, the multiplicity of classical geodetic systems, adopted by the South American countries, makes the solution of technically simple problems, such as the definition of international borders, very difficult. On the other hand, the adoption of the ITRF as reference system, besides guaranteeing the homogenization of the results internally to the continent, will allow the consistent integration with the networks of other continents, contributing more and more to the effective developing of a "global" geodesy.

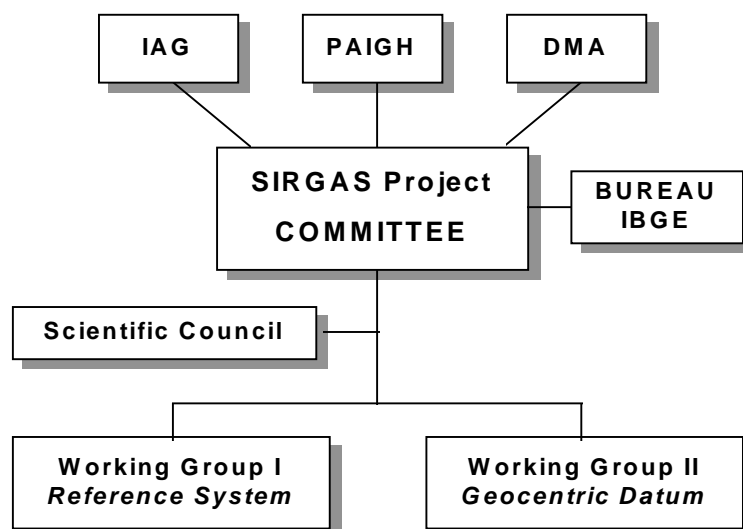
LUIZ PAULO SOUTO FORTES  
President of Committee

## LANGUAGES

Considering the distribution of this newsletter to other continents besides South America, the edition is made in two versions: one in Portuguese/Spanish and another in English.

## STRUCTURE OF THE PROJECT

The structure for the project's functioning is described in the following sketch:





In the previous structure, the committee is composed by a representative of each country of the continent and one of each sponsoring entity, having the responsibility of establishing the directions and analyzing the results obtained by the working groups. The Bureau works as the committee headquarters, furnishing support to the president in accomplishing his tasks. The Scientific Council is composed of eminent professionals in geodesy of the international community, and is in charge of assisting the committee in its analysis and decisions, as well as the activities of the working groups.

## **COMPOSITION OF THE PROJECT**

### **COMMITTEE**

The moment now is specially important, as **all** South American countries and sponsoring entities have already appointed representatives to the committee, except Suriname, which has a *correspondent* for collaborating on the project's development in the meantime. The appointment of PAIGH representative will be ratified in the next meeting of the Institute, next November. The committee's composition represents the first necessary step towards the success of this project that will certainly be of great benefit to all South American countries.

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## **SCIENTIFIC COUNCIL**

Besides the working group consultants, listed in previous sections, it is foreseen the participation of scientific consultants to assist the committee. The formation of this respective council is not finished, since first efforts have been concentrated in the composition of the project committee. Up to now, the following consultant assists the committee:

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## **INFORMATION ON WORKING GROUPS**

**WORKING GROUP I: REFERENCE SYSTEM** (Information supplied by the President, Prof. Melvin Hoyer)

The objective of this working group is to establish the Reference System for the continent. Therefore, the establishment of a high precision GPS network is expected, which requires definitive selection of the stations to be measured, in each country, and adequate materialization of them, if they have not yet been materialized.

In the following graphic, it may be seen the pre-selected stations in some countries of the continent, due to their condition of being observation sites already existing, or in preparation, for Laser, VLBI, DORIS, IGS or GPS. However, it is necessary to complete the minimum number of planned stations for each country, in accordance with the table below:



Argentina	6
Bolivia	4
Brazil	10
Chile	4
Colombia	4
Ecuador	3
French Guiana	1
Guyana	1
Paraguay	2
Peru	4
Suriname	1
Uruguay	2
Venezuela	4
Island Countries	2
<b>Total</b>	<b>48</b>



These additional stations should be selected in accordance with the following criteria:

- Equidistance in distribution;
- Access and possibility of GPS observation;
- Coincidence with the basic control network of the respective country;
- Materialization in accordance with standards of permanence (communications apart).

In order to achieve the mentioned objectives, a letter was sent to the representatives of each country on the committee, requesting the following:

- Information on selected stations in each country, with indication of location, name, approximate coordinates — to the minute of arc — and selection criteria;
- Availability of GPS instruments;
- Materialization plan.

### 1994 ACTIVITIES

- To make official the definitive composition of the working group;



- To define and approve a working plan for 1994 and 1995;
- To define the definitive number of stations to be measured in a joint campaign to be held in 1995;
- To define specifications for selection, materialization, measurement and maintenance of the stations referred in the previous item;
- To define computation procedures, data center(s) and processing center(s);
- To promote the necessary materialization, by each country, of the stations to be measured in the campaign of next year;
- To hold a preparatory meeting of the working group, to evaluate the execution of items above, from 24 through 28 October 1994, in La Plata, Argentina, simultaneously to the 18th Scientific Meeting of the Argentina Association of Geophysicists and Geodesists;
- Evaluation of results of the working group meeting;
- To execute other activities requested by the committee.

### **1995 ACTIVITIES**

- To continue with the planning of the joint measurement campaign (provisional date of the campaign: May - June 1995);
- Preparatory meeting of the working group and national representatives on the committee, previous to the measurement campaign (provisional date: February - March 1995);
- Execution of the joint measurement campaign;
- Evaluation of the measurement campaign, in national and continental scope;
- Execution of the observations processing;
- To hold a meeting of the working group and national representatives to evaluate results (provisional date: November - December 1995);
- Planning of activities for 1996, if it is the case;
- To execute other activities requested by the committee.

### **THEMES OF DISCUSSIONS PROPOSED FOR THE FORESEEN MEETINGS**

#### **Preparatory meeting for evaluation of activities (date: 24-28 October 1994)**

- Evaluation of activities executed by the working group;
- Revision of concepts and theoretical background;
- To clarify and conclude details on selection and materialization of stations to be measured;
- To evaluate instrument availability and compatibility;
- To define details of logistics preceding and during measurements;
- To start discussions on processing centers and procedures;



### **Preparatory meeting previous to measurements (provisional date: February - March 1995)**

- Revision of concepts and theoretical background;
- Information from each country on the status of preparation for the campaign;
- Joint analysis of the status of the project (Working Group: Reference System);
- To finish discussion on the following details:
  - ✓ Measurements;
  - ✓ Processing;
  - ✓ Evaluation of results.

### **Meeting for evaluation of results (provisional date: November - December 1995)**

- Revision of concepts and theoretical background;
- Presentation of updated results;
- Evaluation of updated results;
- Evaluation of the Working Group activities.

### **WORKING GROUP II: GEOCENTRIC DATUM** (Information supplied by the President, Maj. Walter Subiza)

The objective of this working group is to establish a Geocentric Datum, throughout the extension of the GPS SIRGAS Network and the integration of existing geodetic networks.

The first working group meeting was held during the period 20 - 22 April 1994, at the Instituto Geográfico "Agustín Codazzi", Bogotá. The April 23rd was reserved for some coordination, mainly with the Committee and Working Group I presidents. In this aspect, it may be said that it was possible to exchange ideas and to coordinate the progress of the project in a very profitable way.

Meeting participants:

- Walter Subiza (IGM, Uruguay)  
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- Sonia Maria Alves Costa (IBGE, Brazil)  
*Principal Member*



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*Principal Member*
- David Lehman (DMA, USA)  
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*Scientific Consultants*
- Luiz Paulo Souto Fortes (President of Committee), Melvin Hoyer (President of Working Group I) e Alberto Gonzalez (IGAC, Colombia)  
*Observers*

In relation to technical sessions, information on geodetic data sent by countries has been analyzed, and very distinct situations have been encountered. It was also decided to integrate, in a first step, GPS observations from each country, and to let the adjustment of classical networks to the interest of each country of the continent, considering the availability of time and adequate format for the respective geodetic data. In addition to that, GPS connections between countries were identified as already accomplished, being executed, and new ones have been coordinated.

In a brief way, the situation of different countries is the following:

**Brazil:** 10 GPS stations of the SIRGAS Network and 75 of the Basic Network; the totality of its classical network was recently adjusted;

**Colombia:** they are starting the establishment of a new basic network with GPS, and its end is foreseen for late 1995; they own 22 Leica receivers, double frequency; now they have 50 GPS stations established, however its distribution is inadequate (along a tectonic fault line).

**Ecuador:** they have a little more than 100 new GPS stations; they are interested in adjusting part of their classical network;

**French Guiana:** 2 stations (GPS and DORIS);



**Paraguay:** they have a new GPS network with about 150 stations, which will be adjusted and part of it (to be determined) integrated into the SIRGAS network;

**Uruguay:** now they do not have GPS stations, but will have 2 SIRGAS stations and 6 more to complete their GPS basic network; three ASHTECH Z-12 receivers have been acquired and will be received soon;

**Venezuela:** they have a GPS network at the south of the country with about 20 points, plus approximately 16 stations of the CASA Project; and will establish 4 stations more in order to optimize the coverage.

The estimated total of GPS stations to be adjusted to the SIRGAS reference system is about 800.

Countries with a representative (or correspondent) at the committee that have not sent information on their respective geodetic networks: **Argentina, Chile, Guyana** and **Suriname**; information on **Trinidad and Tobago** network was received after the Bogotá meeting and will be included in the next edition of this newsletter; **Bolivia** and **Peru** have not been contacted yet, as they were the last ones to integrate into the project.

During the meeting, the following resolutions and recommendations have been proposed and approved.



**WORKING GROUP II**  
**"GEOCENTRIC DATUM"**  
**SIRGAS PROJECT**

Working Group II of the SIRGAS Project met in Santa Fé de Bogotá, Colombia, and has made the following Recommendations and Resolutions:

**RECOMMENDATIONS**

1. That the participating countries of the SIRGAS Project interconnect their GPS Networks through existing projects and/or with the coordination of new ties where necessary.
2. That the SIRGAS Project Committee establish contact with those official entities and organizations that execute and support the various Geodynamic Projects in South America to the effect that such collaboration is required to carry out the aims of the SIRGAS Project.

**RESOLUTIONS**

1. That the SIRGAS Project Committee would establish contact with PAIGH and DIGSA to the effect required so that the members of these organizations, which have not yet been included, would do so to the best of their abilities.
2. To design a Basic Geodetic Network incorporating GPS observations and leaving free to each country the incorporation of their Classical Networks according to their interest and ability to provide the necessary geodetic data required in an adequate and timely format.
3. To define as confidential the GPS geodetic data of each country resulting from the establishment of this system and requiring the corresponding authorization (from each country) for publication.
4. To establish November 1994 and Montevideo, Uruguay, as the tentative date and place of the next meeting. *(Later it was confirmed for the period of 24-28 October 1994, in La Plata, Argentina, simultaneously to the 18th Scientific Meeting of the Argentina Association of Geophysicists and Geodesists, and to the Meeting of the Working Group I, when its activities will be evaluated)*
5. To thank the Instituto Geográfico "Agustín Codazzi" for having offered its hospitality and excellent organization in setting up this Meeting of the Working Group.

22 April 1994.