

AMIGO Memorandum of Understanding  
(August 15, 1998)

Memorandum of Understanding

among

*L'École Mohammadia d'Ingénieurs, Université Mohamed V, Morocco (EMI);  
A Faculdade de Ciências da Universidade de Lisboa, Portugal (FCUL);  
El Institut Cartogràfic de Catalunya, Spain (ICC);  
El Institut d'Estudis Espacials de Catalunya, Spain (IEEC);  
The Massachusetts Institute of Technology, USA (MIT);  
and  
El Real Instituto y Observatorio de la Armada en San Fernando, Spain (ROA).*

Concerning membership in the AMIGO (Atlantic and Mediterranean Interdisciplinary Global Positioning System Observations) project for geodetic and geophysical coordination, cooperation, and collaboration.

Gathered:

Dr. Driss Ben Sari, Professor and Head of the École Mohammadia d'Ingénieurs, Université de Mohamed V (EMI),

Dr. Joaquim Pagarete, Professor and Coordinator of the Geographic Engineering Academic Unit, Faculdade de Ciências da Universidade de Lisboa (FCUL),

Mr. Julià Talaya, Head of the Geodetic Department, Institut Cartogràfic de Catalunya (ICC),

Dr. Antonio Rius, Head of the Department of Space and Earth Sciences, Institut d'Estudis Espacials de Catalunya, Consejo Superior de Investigaciones Científicas (IIEC),

Dr. Robert Reilinger, Principal Research Scientist, Massachusetts Institute of Technology (MIT),

and

CC. José Martín Dávila, Professor-Head of the Geophysical Department of the Real Instituto y Observatorio de la Armada (ROA) en San Fernando, on behalf of the ROA Director,

and acting as representatives of the institutions listed above, agree to form a collaborative research group to study a wide range of interdisciplinary scientific and technical problems in the East Atlantic and West Mediterranean regions using a combined network of geodetic GPS receivers. This collaboration is strictly of scientific content and does not bear any economic responsibility for the institutions involved.

# AMIGO Project

## Objectives:

The purpose of this memorandum is to establish the basis for collaborative research using the Navstar Global Positioning System (GPS) satellites in the region of southwest Europe and northwest Africa bordering the East Atlantic and West Mediterranean. The researchers involved in GPS activities in this region agree to form a collaboration that will enhance the scientific return relative to that obtained from separate efforts. The collaborators will provide help and support to one another to develop proposals and to use the data from this combined GPS network to address a wide range of interdisciplinary scientific and technical problems.

The scientific objectives of the collaboration will generally fall into three categories:

- To complement existing European regional GPS networks;
- To establish a scientific regional GPS network to study the crustal deformation field, the ionosphere, the neutral atmosphere, local reference frame, sea level, volcanism, etc., within the proposed region; and
- To develop a coherent picture of the tectonics of the entire Mediterranean by combining the GPS-geodynamic studies of this western network (including the east Atlantic region between the Azores Islands and the Strait of Gibraltar) with the results from ongoing research in the eastern Mediterranean and neighboring regions (including northern Europe, the Middle East, and East Africa).

(The description of the objectives above does not exclude any other application.)

## Interdisciplinary Nature of the Collaboration:

The Eurasian and African tectonic plates meet along a boundary of approximately 6000 km length, linking the Azores triple junction on the Mid-Atlantic Ridge with the Dead Sea and Anatolian Faults in the eastern Mediterranean and beyond. This boundary adjoins a large number of countries in which exist a significant number of continuously operating ground-based GPS receivers.

A fundamental objective of this collaboration is to investigate the deformation pattern along the African-Eurasian plate boundary, from the Azores, Madeira, and Canary Islands, through the Strait

of Gibraltar and the Alboran Sea, into the western, and ultimately eastern, Mediterranean. These investigations require extensive space geodetic measurements. Coordinated GPS observations from a permanent network spanning this region and periodic GPS campaigns will allow investigators to determine the relative kinematics between these tectonic structures. In addition, these observations will provide a regional reference frame to support more densified surveys of specific tectonic zones, such as the three-dimensional deformation field in the Azores triple junction or the dynamics associated with the volcanic activity in some of the islands and with the seismic activity in the whole region.

The GPS observations will enhance investigations in several other fields of geophysics as well as promote entirely new scientific and technological applications such as atmospheric and sea level studies. Investigators interested in atmospheric research will use the combined GPS observations to study the ionosphere and to derive integrated water vapor data for numerical weather prediction, and for meteorological and climatological models. These GPS observations will also enable investigators to separate sea level fluctuations in the Mediterranean from vertical crustal movements and climate processes and to connect, geodetically, tide gauges between the islands (both Atlantic and Mediterranean) and the continent. The GPS data will be used to establish the connection among the local reference frames in Spain, Portugal and Morocco and thus between Africa and Europe.

#### Partnership Founding Members:

An international effort is required to address the practical tasks that entail the achievement of these goals. The institutions founding and currently involved in this collaboration are listed below, alphabetically by institution:

- EMI: École Mohammadia d'Ingénieurs, Université de Mohamed V, Morocco
- FCUL: Faculdade de Ciências da Universidade de Lisboa, Portugal
- ICC: Institut Cartogràfic de Catalunya, Spain
- IIEC: Institut d'Estudis Espacials de Catalunya, Spain
- MIT: Massachusetts Institute of Technology, USA
- ROA: Real Instituto y Observatorio de la Armada en San Fernando, Spain

Each institution will appoint one or two investigators (hereafter “AMIGO INVESTIGATORS”, “AI” for short), each of whom is a scientist engaged in research with the other AI and who, among the scientists within the AMIGO institutions, derives the primary scientific benefit from the AMIGO collaboration.

The AI at the time of founding this collaboration are: Prof. Driss Ben Sari (EMI), Dr. José Martín Dávila (ROA), Dr. Pedro Elósegui (IIEC and Smithsonian Astrophysical Observatory (SAO)), Dr. Jorge Gárate (ROA), Mr. Virgilio Mendes (FCUL), Dr. Joaquim Pagarete (FCUL), Dr. Robert Reilinger (MIT), Dr. Antonio Rius (IIEC), and Mr. Julià Talaya (ICC).

Any change in the AI for an AMIGO institution is effected by the institution withdrawing from the collaboration and requesting new membership.

The collaboration would further like to benefit from the extensive experience at SAO with permanent regional GPS networks and would therefore like to link them to this collaboration. Much of the GPS data processing philosophy of our collaboration will be based on the expertise acquired and the tools developed at SAO over the years. The two investigators linked to this collaboration are Drs. Richard Bennett and James Davis.

#### Agreements and Obligations:

The GPS data acquired within this collaboration will be shared among all the AI with the purpose of having these data processed in a coherent and consistent manner. The products of this processing will be distributed to all AI for their particular scientific application. The institution(s) where the data will be processed and the results combined will be decided by mutual agreement of all AI. Any use of the data or data products resulting from data of the AMIGO project should be discussed first with, and have the approval of all of the AI, and the potential user of the data must give appropriate acknowledgment of the AMIGO project effort and the sponsoring agencies. Users of AMIGO data are obligated by scientific ethics to respect the scientific goals of the AI. Use of data from the AMIGO project will constitute recognition and acceptance of these obligations. With the agreement of all the AI, data from an AMIGO site may be passed on to a third party (non-AI) as long as you notify him/her of the source of the data and their user obligations. A third party may not pass on AMIGO data to other third parties. Data from AMIGO sites which are IGS sites are, of course, already in the public domain. Furthermore, this agreement does not affect other agreements for data exchange made by any AI prior to the existence of the AMIGO project. Adherence to the AMIGO agreements and obligations and other policies will be a condition of membership.

#### End of the Agreement:

This Memorandum of Understanding will remain valid during a time period of one year, starting on the date of signature, and will be automatically, and indefinitely, renewed at the end of the year for one year time periods. Although all the parties entering this agreement wish to have a joint long-term and fruitful collaboration, any of the institutions involved may withdraw from AMIGO by notification to the other institutions in writing, no less than 2 months before the date of withdrawal.

### Archiving and Availability of Data and Data Products:

All data generated within the AMIGO project shall be archived in a designated institution of the collaboration and shall be made available for use by all the AI. The main data product of this collaboration, however, will be the combined solution obtained by the coherent processing of the GPS data. The products of this processing will be distributed in quasi-real time to all the AI.

### Scientific Results:

The participants of the collaboration will hold an annual meeting, which will serve to discuss the data processing, the combination of results, the publication of papers, etc., and will serve to assess the overall progress of the project. The collaboration will probably result in several publications across different scientific disciplines. These publications shall include all the AI, unless an individual AI gives permission to omit his/her name. The sequence of authors for any specific publication is yet to be determined and shall be based on individual efforts and interests.

### AMIGO Communications:

A secretary will be elected to facilitate communication among the AI. The appointment will be made for one year terms, and will be elected by vote of the AI.

### AMIGO Membership Applications:

Our collaboration will consider the linking of other investigators and groups, as well as full membership of other institutions. Research individuals and/or organizations that are currently engaged in, or interested in undertaking, interdisciplinary research using GPS in the East Atlantic and/or West Mediterranean region may apply for membership to AMIGO by submitting a request for membership. To apply for membership, an email and/or letter of application should be sent to the AMIGO secretary. The application should include the full address of the applicant and a brief description of specific interest and use, or intended use, of GPS for research in this region. The request will be handled by the secretary, who will communicate the request to the other AI and organize voting. New institutions will be admitted to the AMIGO collaboration by a vote of 2/3 of all AI, where each of the votes is weighted so that each AMIGO institution has one vote total. Once a membership request has been approved, a Memorandum of Understanding between the new member (or appropriate institutional official) and the AMIGO secretary must be signed.

Resolution of issues within AMIGO:

All issues requiring agreement by the AI, except as noted, will be resolved by majority vote of the AI. Voting in all cases will be done by a combination of electronic mail and direct vote at the annual meetings.