Bundesamt für
Kartographie und Geodäsie

BKG
Wir geben Orientierung.

Objective 1.2 Maintain current accuracy and reliability of geodetic products Examples of long-term agreements for the operational and maintenance of infrastructure.

Johannes Bouman

Two examples of long-term agreements

1. Center on Orbit Determination Europe (CODE)
2. Argentine German Geodetic Observatory (AGGO)

Center on Orbit Determination Europe (CODE)

- Since 1992 the Astronomical Institute of the University of Bern (AIUB) operates the Center for Orbit Determination in Europe (CODE)
- It is a consortium of
  - Astronomical Institute of the University of Bern (AIUB, Switzerland)
  - Swiss Federal Office of Topography (swisstopo, Switzerland)
  - Federal Agency for Cartography and Geodesy (BKG, Germany)
  - Ingenieurinstitut für Astronomische und Physikalische Geodäsie, TU Munich (IAPG/TUM, Germany)
- CODE is an IGS Global Analysis Center
  - Consistent processing of the measurements of the operational GNSS with different latency: final, rapid and ultra-rapid series (latency of two weeks, 18 hours and 3 hours respectively)
  - Generated on regular basis: Orbits, Earth rotation parameters, satellite and receiver clock corrections, station coordinates, troposphere and ionosphere models
  - Reprocessing of the entire interval of IGS data → Self-consistent long time series of GNSS products

Advantages for BKG, arrangements

- Long-term contract between BKG and AIUB
- Separate contracts for tailored developments (SLR, VLBI)

- BKG needs and uses CODE products; the operational production is guaranteed
- Participation of the BKG in CODE ensures close cooperation and exchange between scientific institutions and the operational users of the Bernese GNSS software.
- Individual user concerns can be taken into account during software development.

Argentine German Geodetic Observatory (AGGO)

A brief history, TIGO (2002 – 2014):

- Transportable Integrated Geodetic Observatory (TIGO)
- SLR, VLBI, GNSS, superconducting gravimeter, clocks
- Proposed in the late 80s by the German Research Group on Satellite Geodesy (FGS)
- Development and testing by BKG from 1992 – 1999
- After preparations for the shipment, site preparation, etc., TIGO became operational in 2002 in Concepción, Chile

TIGO becomes AGGO

- Maule 8.8 Mw earthquake of 27 February, 2010
- Funds of Chilean partner institutes were reduced
- New location in La Plata, Argentina was found
- Project partners are CONICET and BKG

Agreement BKG – CONICET: Responsibilities

BKG

- Provide and maintain instruments
- Contribute personnel resources (VLBI, SLR, Capacity Development)
- Technical assistance from Germany (VLBI, SLR, gravimetry, clocks)

CONICET

- Contribute personnel resources
- Operators for VLBI and SLR, guard
- Infrastructure (at the site, road, electricity, internet, …)
- Scientific exploitation in collaboration with BKG

Agreement BKG – CONICET and spin-off

2013: BKG – CONICET

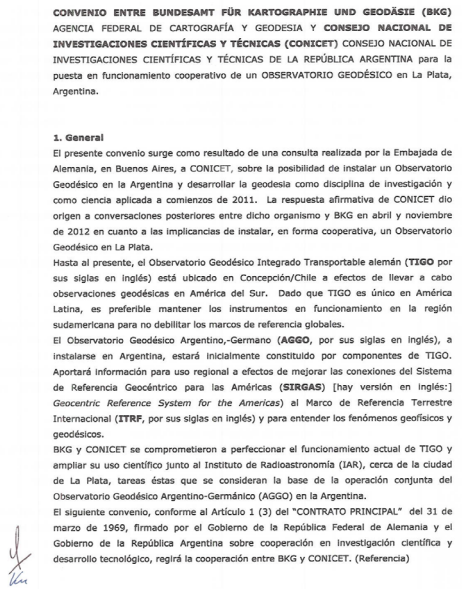
2019: CONICET and the Ministry of Defense → Operators

2022: BKG – CONICET for a 10 year period

2025: BKG – CONICET → VGOS Telescope (in preparation)

MOU

- 2017: BKG – CONICET – IGN (National Geographical Institute)
- 2019: BKG – CONICET – SHN (Hydrographical Service)



CONVENIO ENTRE BUNDESAMT FÜR KARTOGRAPHIE UND GEODÄSIE (BKG) AGENCIA FEDERAL DE CARTOGRAFÍA Y GEODESIA Y **CONSEJO NACIONAL DE INVESTIGACIONES CIENTÍFICAS Y TÉCNICAS (CONICET)** CONSEJO NACIONAL DE INVESTIGACIONES CIENTÍFICAS Y TÉCNICAS DE LA REPÚBLICA ARGENTINA para la puesta en funcionamiento cooperativo de un OBSERVATORIO GEODÉSICO en La Plata, Argentina.

1. General

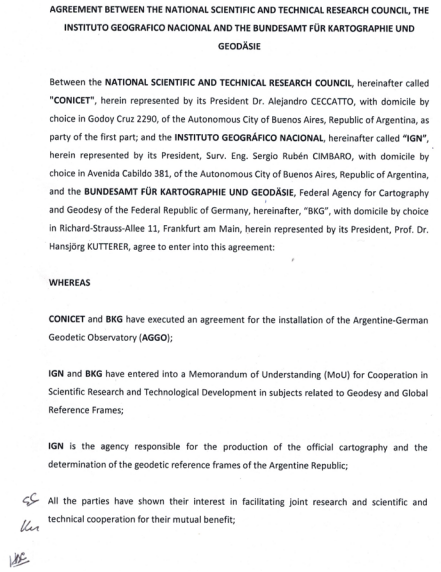
El presente convenio surge como resultado de una consulta realizada por la Embajada de Alemania, en Buenos Aires, a CONICET, sobre la posibilidad de instalar un Observatorio Geodésico en la Argentina y desarrollar la geodesia como disciplina de investigación y como ciencia aplicada a comienzos de 2011. La respuesta afirmativa de CONICET dio origen a conversaciones posteriores entre dicho organismo y BKG en abril y noviembre de 2012 en cuanto a las implicancias de instalar, en forma cooperativa, un Observatorio Geodésico en La Plata.

Hasta al presente, el Observatorio Geodésico Integrado Transportable alemán (**TIGO** por sus siglas en inglés) está ubicado en Concepción/Chile a efectos de llevar a cabo observaciones geodésicas en América del Sur. Dado que TIGO es único en América Latina, es preferible mantener los instrumentos en funcionamiento en la región sudamericana para no debilitar los marcos de referencia globales.

El Observatorio Geodésico Argentino,-Germano (**AGGO**, por sus siglas en inglés), a instalarse en Argentina, estará inicialmente constituido por componentes de TIGO. Aportará información para uso regional a efectos de mejorar las conexiones del Sistema de Referencia Geocéntrico para las Américas (**SIRGAS**) [hay versión en inglés:] *Geocentric Reference System for the Americas*) al Marco de Referencia Terrestre Internacional (**ITRF**, por sus siglas en inglés) y para entender los fenómenos geofísicos y geodésicos.

BKG y CONICET se comprometieron a perfeccionar el funcionamiento actual de TIGO y ampliar su uso científico junto al Instituto de Radioastronomía (IAR), cerca de la ciudad de La Plata, tareas éstas que se consideran la base de la operación conjunta del Observatorio Geodésico Argentino-Germánico (AGGO) en la Argentina.

El siguiente convenio, conforme al Artículo 1 (3) del "CONTRATO PRINCIPAL" del 31 de marzo de 1969, firmado por el Gobierno de la República Federal de Alemania y el Gobierno de la República Argentina sobre cooperación en investigación científica y desarrollo tecnológico, regirá la cooperación entre BKG y CONICET. (Referencia)



AGREEMENT BETWEEN THE NATIONAL SCIENTIFIC AND TECHNICAL RESEARCH COUNCIL, THE INSTITUTO GEOGRAFICO NACIONAL AND THE BUNDESAMT FÜR KARTOGRAPHIE UND GEODÄSIE

Between the **NATIONAL SCIENTIFIC AND TECHNICAL RESEARCH COUNCIL**, hereinafter called "**CONICET**", herein represented by its President Dr. Alejandro CECCATTO, with domicile by choice in Godoy Cruz 2290, of the Autonomous City of Buenos Aires, Republic of Argentina, as party of the first part; and the **INSTITUTO GEOGRÁFICO NACIONAL**, hereinafter called "**IGN**", herein represented by its President, Surv. Eng. Sergio Rubén CIMBARO, with domicile by choice in Avenida Cabildo 381, of the Autonomous City of Buenos Aires, Republic of Argentina, and the **BUNDESAMT FÜR KARTOGRAPHIE UND GEODÄSIE**, Federal Agency for Cartography and Geodesy of the Federal Republic of Germany, hereinafter, "BKG", with domicile by choice in Richard-Strauss-Allee 11, Frankfurt am Main, herein represented by its President, Prof. Dr. Hansjörg KUTTERER, agree to enter into this agreement:

WHEREAS

CONICET and **BKG** have executed an agreement for the installation of the Argentine-German Geodetic Observatory (**AGGO**);

IGN and **BKG** have entered into a Memorandum of Understanding (MoU) for Cooperation in Scientific Research and Technological Development in subjects related to Geodesy and Global Reference Frames;

IGN is the agency responsible for the production of the official cartography and the determination of the geodetic reference frames of the Argentine Republic;

All the parties have shown their interest in facilitating joint research and scientific and technical cooperation for their mutual benefit;

Challenges & Solutions

Challenge	Solution
AGGO came with legacy instruments • higher chances of failure • challenging to find spare parts	Instrument modernization • SLR shows good progress • VGOS telescope
High import taxes • shipment to Chile, transportation over land • time consuming	Import: diplomatic channel
AGGO located in rural environment → power supply is an issue	Uninterrupted Power Supply (?) Solar panels
Limited resources at BKG & CONICET for operations	Operators: agreement between CONICET and MINDEF

Patience, mutual understanding and close collaboration

Benefits (1/2)

- GGOS: reference frame accuracy ≤ 1 mm, stability ≤ 0.1 mm/a
- To meet the GGOS requirements, 20 Core Sites are needed that are globally distributed, use modern technology and operate routinely
- Requirements are not met, large data gaps Southern Hemisphere
  - The global network will require three core sites, well distributed in South America
  - This underlines the importance of AGGO and the relevance of modernizing the technology, which is ongoing
- Strategic interest
  - Operation of the Galileo satellite navigation system requires, among others, regular determination of dUT1 with short latency
  - Baseline GOW – AGGO allows in principle to do so

Benefits (2/2)

- UN General Assembly resolution on the Global Geodetic Reference Frame (GGRF) for sustainable development
  - Calls for commitments by Member States to improve national and global geodetic infrastructure as an essential means to enhance the GGRF
- The sustainable establishment of AGGO as a GGOS Core Site is part of the commitment by Argentina and Germany to the GGRF and its fundamental role in societal and scientific applications