

IGN
Instituto Geográfico Nacional
REPÚBLICA ARGENTINA

Ministerio de Defensa
Presidencia de la Nación



The impact of the UN-GGRF in developing countries

The National Geographic Institute of Argentina

Outline



- ▶ Geodesy in Argentina (late 1980s until early 2000s)
- ▶ Current state of Geodesy in Argentina
- ▶ GGRF in Argentina
- ▶ International collaboration
- ▶ NGI South-South Cooperation
- ▶ Impact of future UN-GGRF conventions

Geodesy in Argentina (late 1980s – early 2000s)

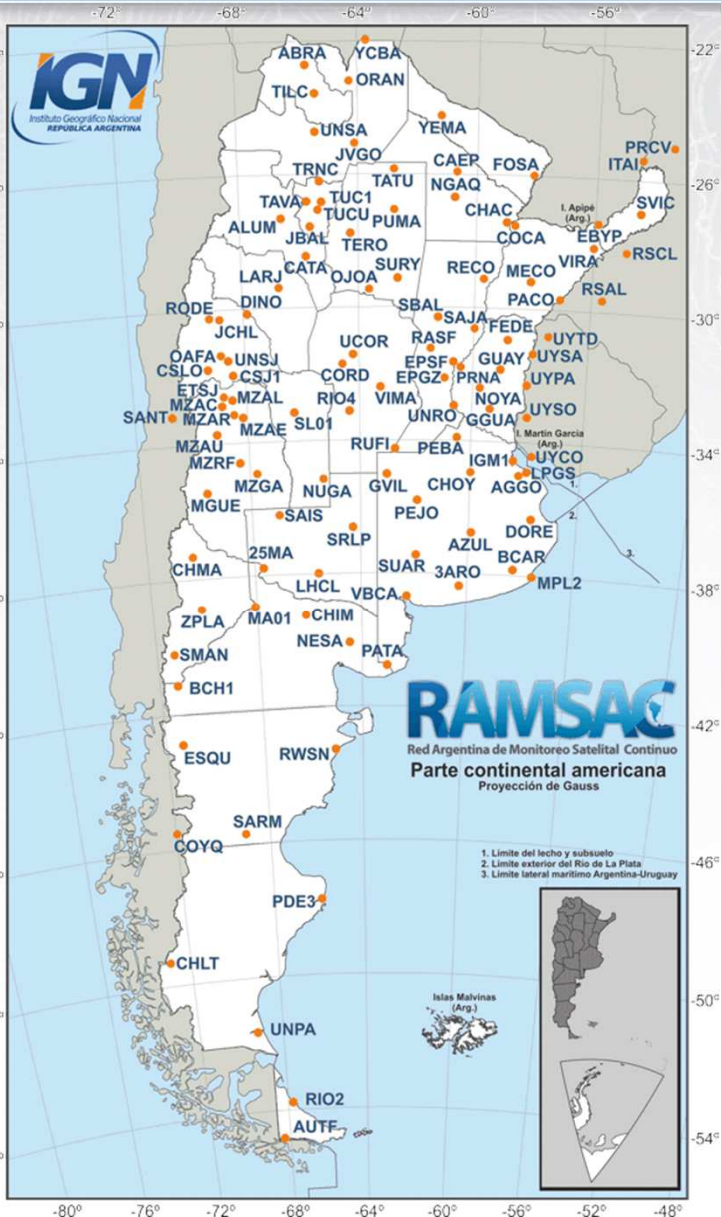


- ▶ Late **1980s** until early **2000s**
 - ▶ In 1994, NGI materialized its first geocentric datum called POSGAR 94 using GPS receivers in collaboration with **national** and **international universities**.
 - ▶ NGI started managing the **GPS network** (called RAMSAC) in **1998**
 - ▶ **No specific government funding** for RAMSAC
 - ▶ **No governance mechanisms** to facilitate NGI's mission

Current state of Geodesy in Argentina



- ▶ Starting in **~2005**, the **Defence Ministry** identified **NGI** as **strategic**: opportunity to grow
- ▶ **Project for the improvement of geodetic infrastructure**: government budget for geodetic activities
- ▶ **NGI begins to deploy its own equipment**, expanding the measurements and processing
- ▶ **Argentina signed the Feb 26 2015 GGRF resolution in the General Assembly of the United Nations**, which formalized the importance of the projects and goals shown in this presentation



RAMSAC

Red Argentina de Monitoreo Satelital Continuo

► CORS network (RAMSAC)

- Started in **1998**
- **>110 CORS** (including 3 CORS in Antarctica)
- ~7 new stations/year
- Collaboration with multiple national and international organizations

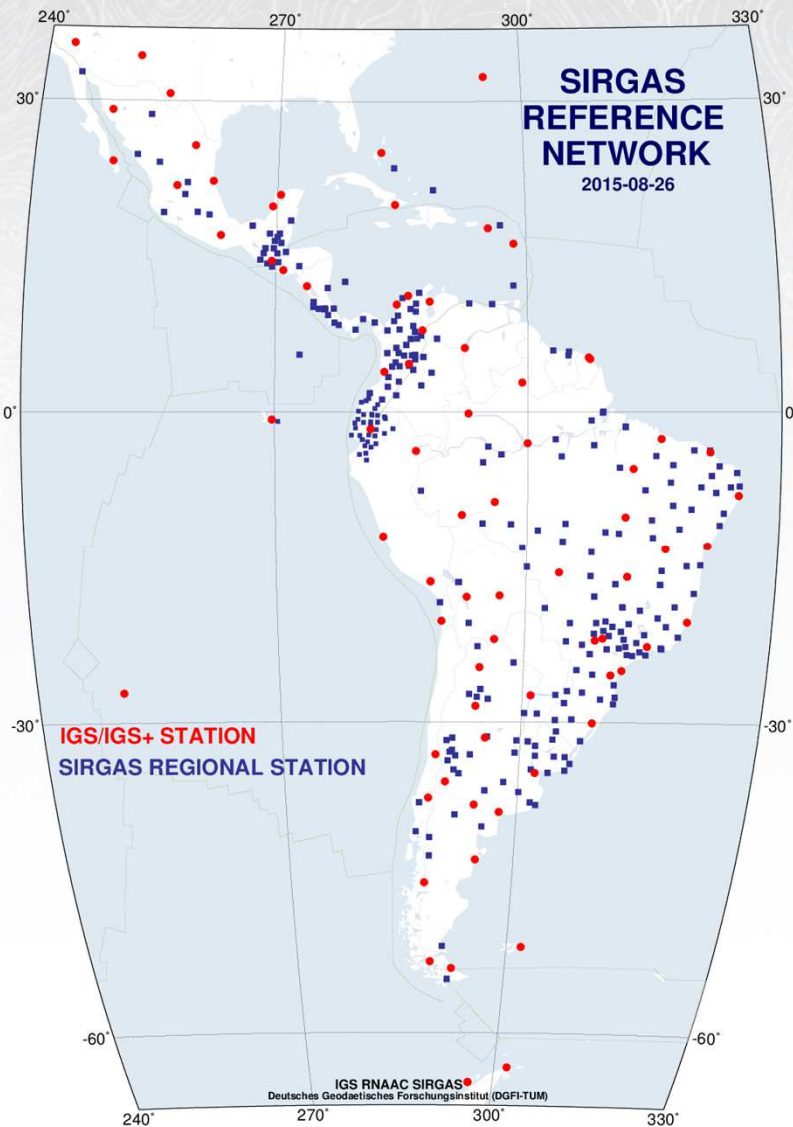
GGRF in Argentina (cont.)



RAMSAC NTRIP

Red Argentina de Monitoreo Satelital Continuo

- ▶ **NTRIP service (RAMSAC-NTRIP)**
 - ▶ Started in **2010**
 - ▶ **>70 CORS**
 - ▶ Free-service
 - ▶ BKG Professional Caster in use
 - ▶ Will incorporate as many of the **CORS** from **RAMSAC** as possible



Centro de Procesamiento Científico de datos GPS de Argentina

GPS processing data centre (CPC-Ar)

- ▶ Started in **2005**
- ▶ **GAMIT / GLOBK** software (MIT, USA)
- ▶ **New processing platform developed in collaboration with The University of Memphis and Ohio State University**
- ▶ Future research: New realization of the National Geodetic Reference Frame using a **Dynamic Reference Frame**

GGRF in Argentina (cont.)



▶ Spirit-levelling network (RN-Ar)

▶ Started in **1911**

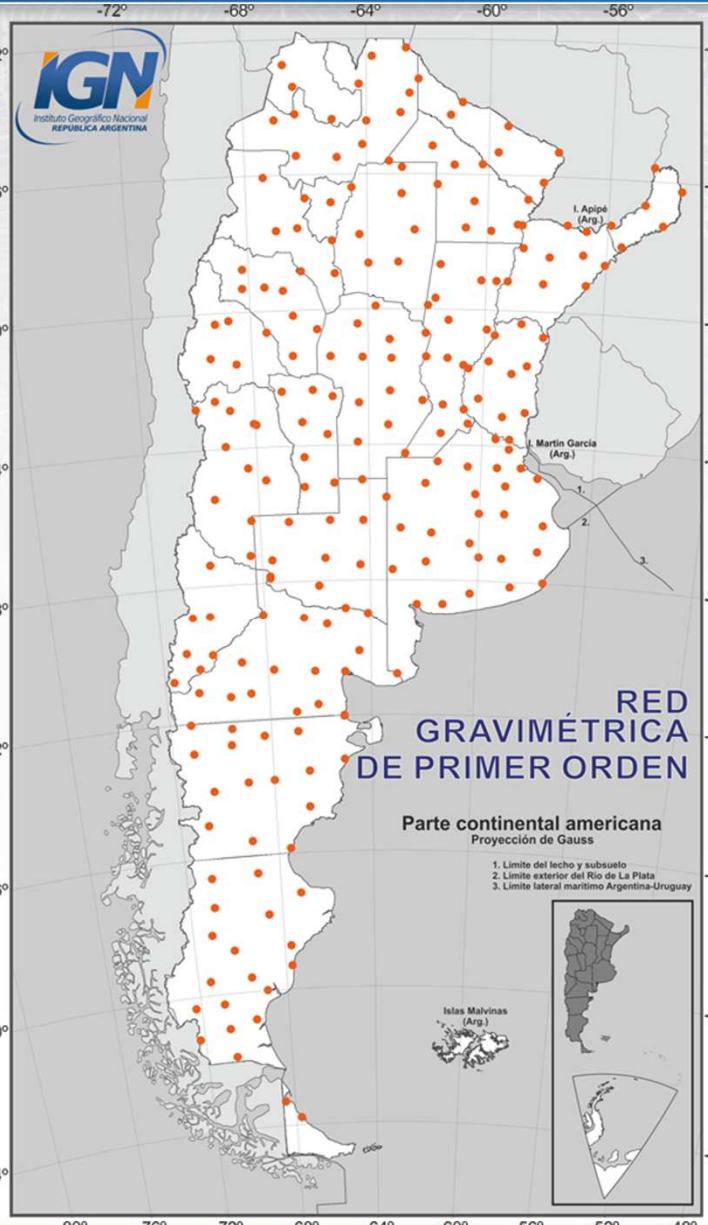
First-order network	Second-order network	Third-order network
396 levelling lines	329 levelling lines	1298 levelling lines
~18,000 benchmarks	~8,000 benchmarks	~8,000 benchmarks
~59,000 km levelled	~32,000 km levelled	~52,000 km levelled

▶ In **2010**, a **new project to readjust the levelling network** and compute the **orthometric heights (Mader 1954)** of all the benchmarks started.

▶ In **2017**, the new Height System was officialised.



GGRF in Argentina (cont.)



RG-Ar Red Gravimétrica Argentina

- ▶ **Absolute gravity network (RAGA)**
 - ▶ **42 sites**
 - ▶ Accuracy < **0.020 mgal**
- ▶ **First-order gravity network**
 - ▶ **227 sites**
 - ▶ Accuracy < **0.025 mgal**





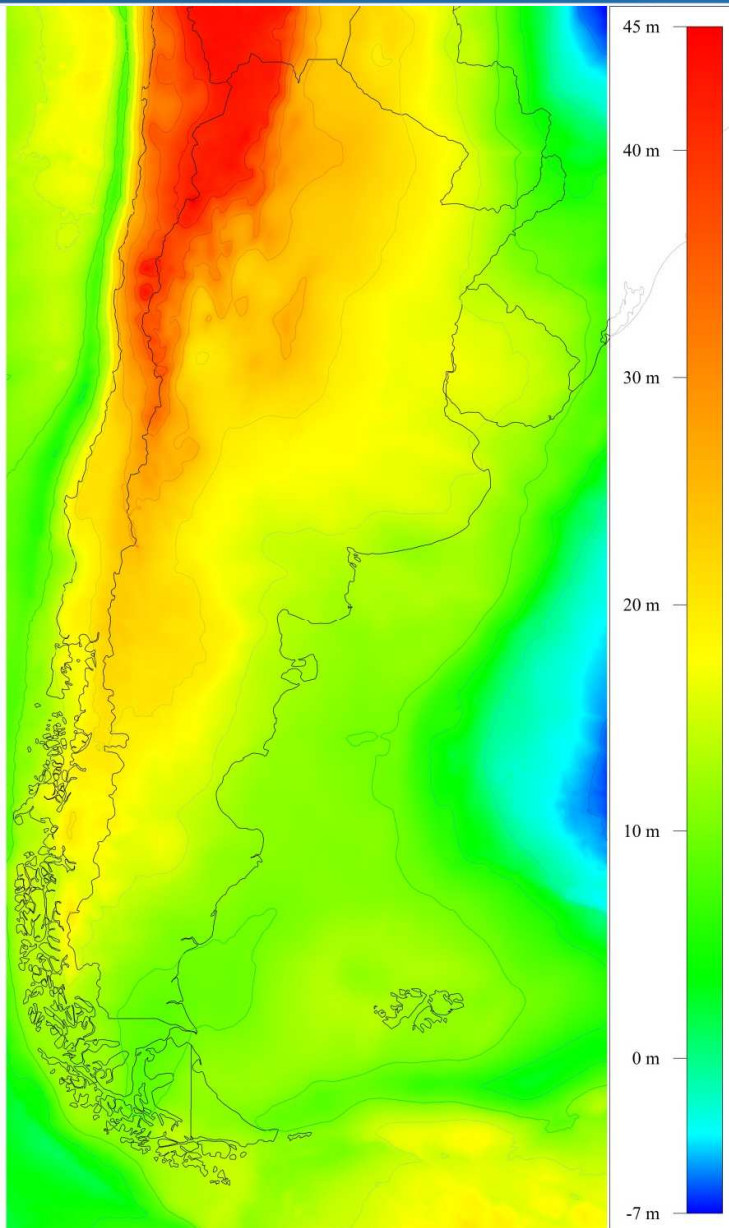
Bureau
International des
Poids et
Mesures

▶ Atomic time scale

- ▶ New Precise Time Scale System
- ▶ New cesium clock
- ▶ Contribution with the **International Bureau of Weights and Measures** (BIPM) to maintain the **International Atomic Time** (TAI)
- ▶ Local materialization of **UTC**



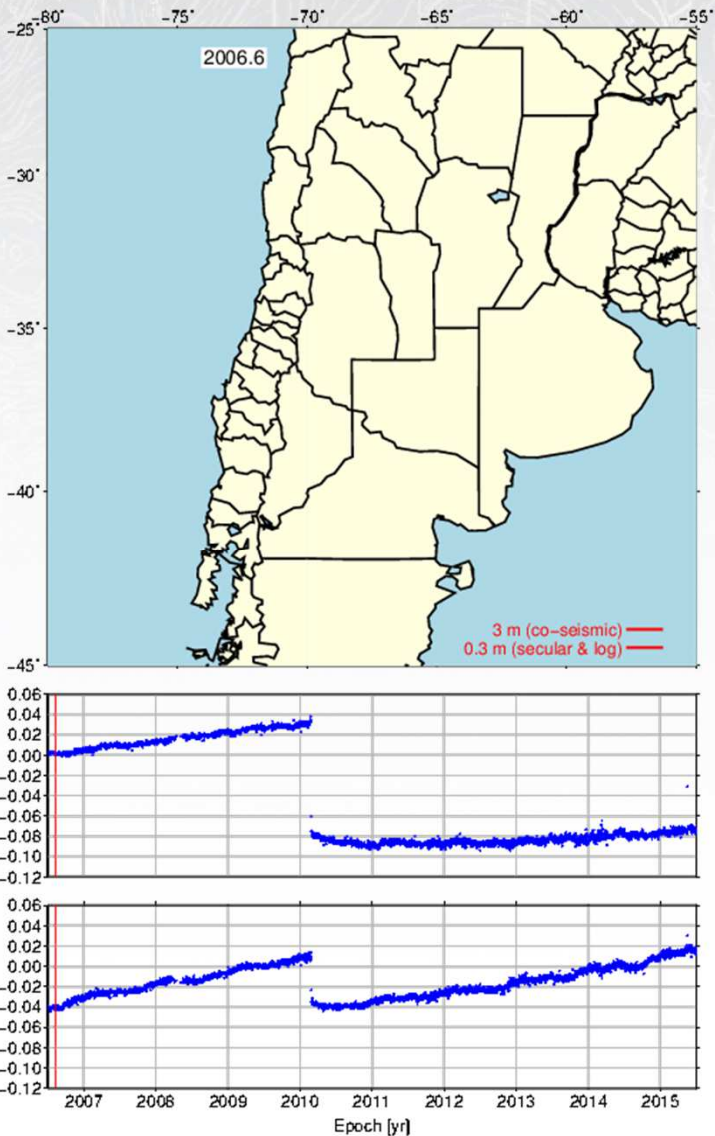
GGRF in Argentina (cont.)



▶ Geoid model (GEOIDE-Ar16)

- ▶ Determined between **2014** and **2016**
- ▶ New **gravimetric observations (2016-2018)** → ~**1200** measurements per year
- ▶ New co-located GPS-levelling observations (**2010-2018**) → ~**400** benchmarks per year

GGRF in Argentina (cont.)



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▶ Non-linear trajectory model (VEL-Ar)

- ▶ Argentinean **Geodetic Reference Frame** (called **POSGAR07 (epoch 2006.632)** and based on **IGS05**) was released in **2009**
- ▶ The 27th of February 2010 a **8.8 Mw earthquake** struck Concepcion (**Chile**)
- ▶ **VEL-Ar** will incorporate other **recent great magnitude earthquakes**



- ▶ **Scientific research agreement** signed in **2016** between **NGI** and **BKG**
- ▶ **VLBI training course** at **BKG** (Leipzig, Germany)
- ▶ Involvement in the **Argentine-German Geodetic Observatory** (AGGO)
 - ▶ Collaboration in the determination of the **orthometric height**
 - ▶ Collaboration in the determination of the **absolute gravity**





- ▶ **SIRGAS** collaboration
 - ▶ **SIRGAS 2018 Workshop** on Vertical Reference System (NGI-staff instructors)
- ▶ **GAMIT / GLOBK course** organized by NGI for Spanish speaking countries
 - ▶ Open to **Mapping Agencies** and **Universities**
 - ▶ ~ **30 participants**
 - ▶ Participating countries: Argentina, Bolivia, Chile, Colombia, Costa Rica, Mexico, Peru



- ▶ **NGI's** experience: **slow evolution** to modern geodetic infrastructure without political support
- ▶ The **UN-GGRF conventions** can help mapping agencies from developing countries by providing a **governance mechanism** to:
 - ▶ achieve dense, **homogeneously-distributed geodetic infrastructure**
 - ▶ ensure **open-access** data
 - ▶ guarantee **data communication services** for geodetic activities



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MUCHAS GRACIAS