



Contributions of BKG to Core Geodetic Infrastructure

Torben Schüler, Christian Plötz, Johannes Bouman, Hayo Hase
BKG, Geodetic Observatory Wettzell



Geodetic Observatory Wettzell, Germany

3 VLBI Radio Telescopes,
2 Satellite Laser Ranging Systems,
Local + Regional GeoSensor Stations



AGGO Modular Observatory, La Plata, Arg.

VLBI Radio Telescope
Satellite Laser Ranging System
GNSS Reference Stations



Receiving Station O'Higgins, Antarctica

German receiving station of DLR for remote
sensing satellites; operated by BKG for
Geodetic VLBI + GNSS Reference Stations



A global view on

Global Geodetic

Infrastructure

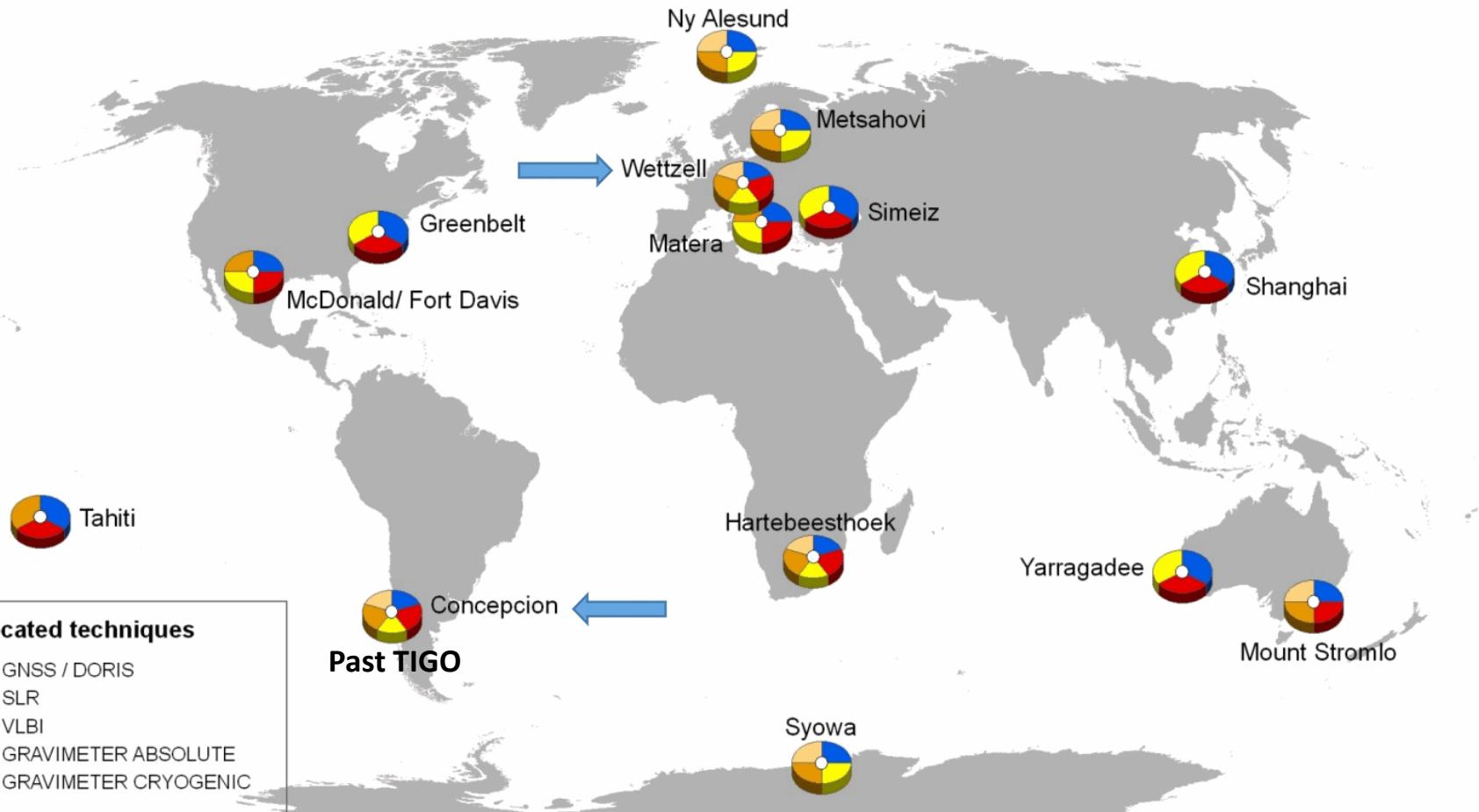
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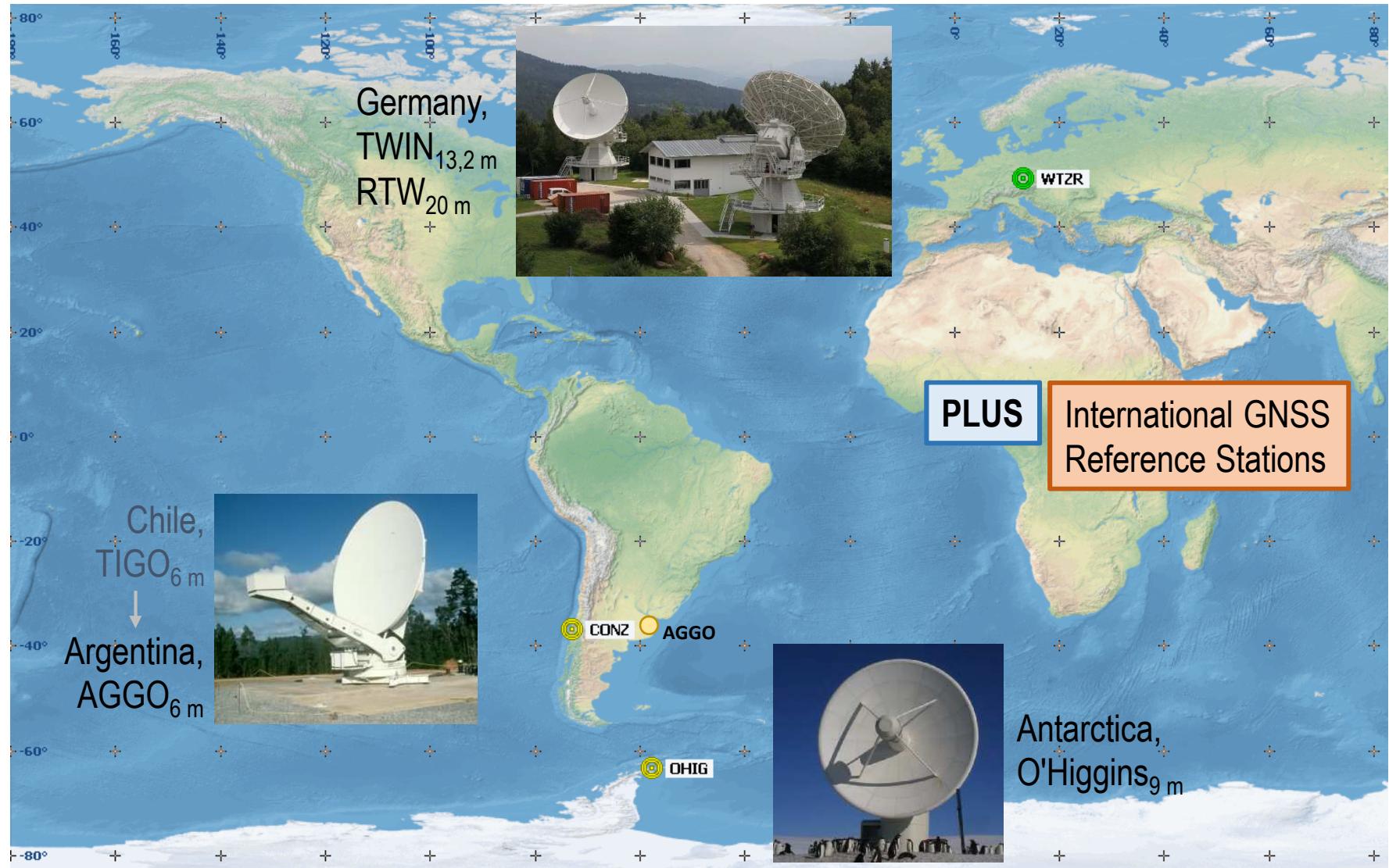
CURRENT GLOBAL DISTRIBUTION OF GEODETIC CORE SITES FOR ITRF



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GEODETIC OBSERVATORIES OPERATED UNDER RESPONSIBILITY OF WETTZELL (BKG)





A local view on the **Geodetic Observatory Wettzell (GOW)**

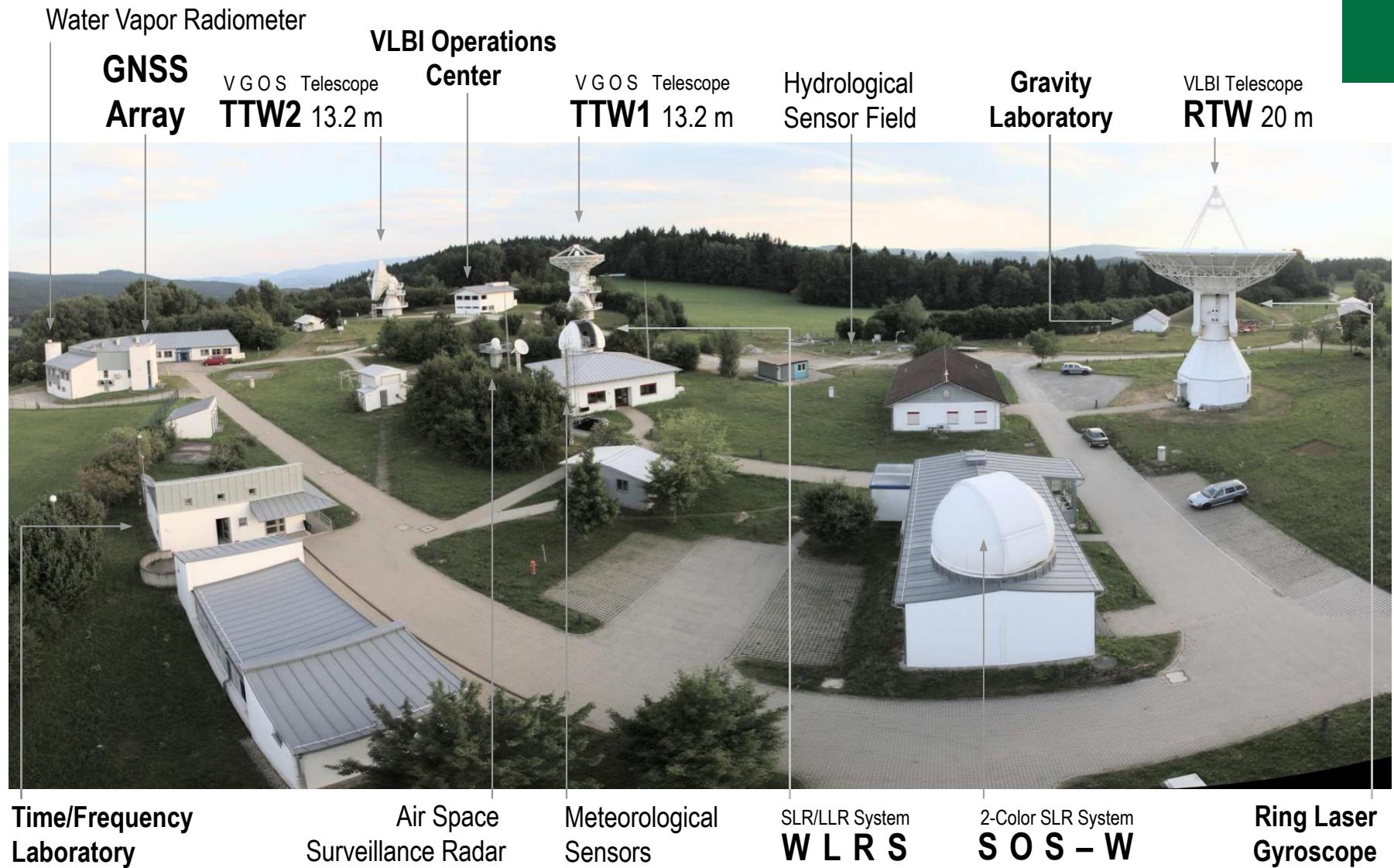
– *a Global Asset* –



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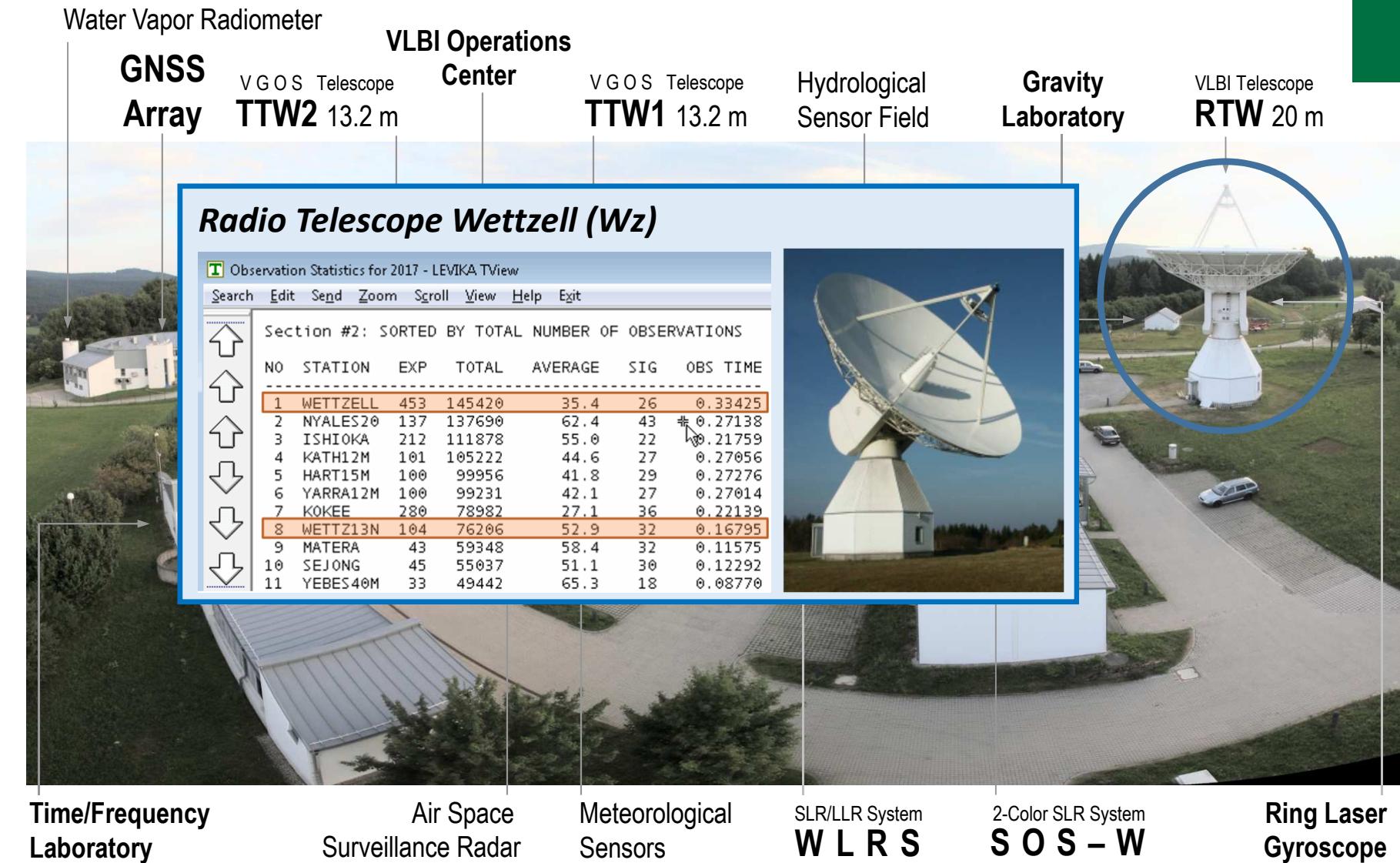
GEODETIC OBSERVATORY WETZELL



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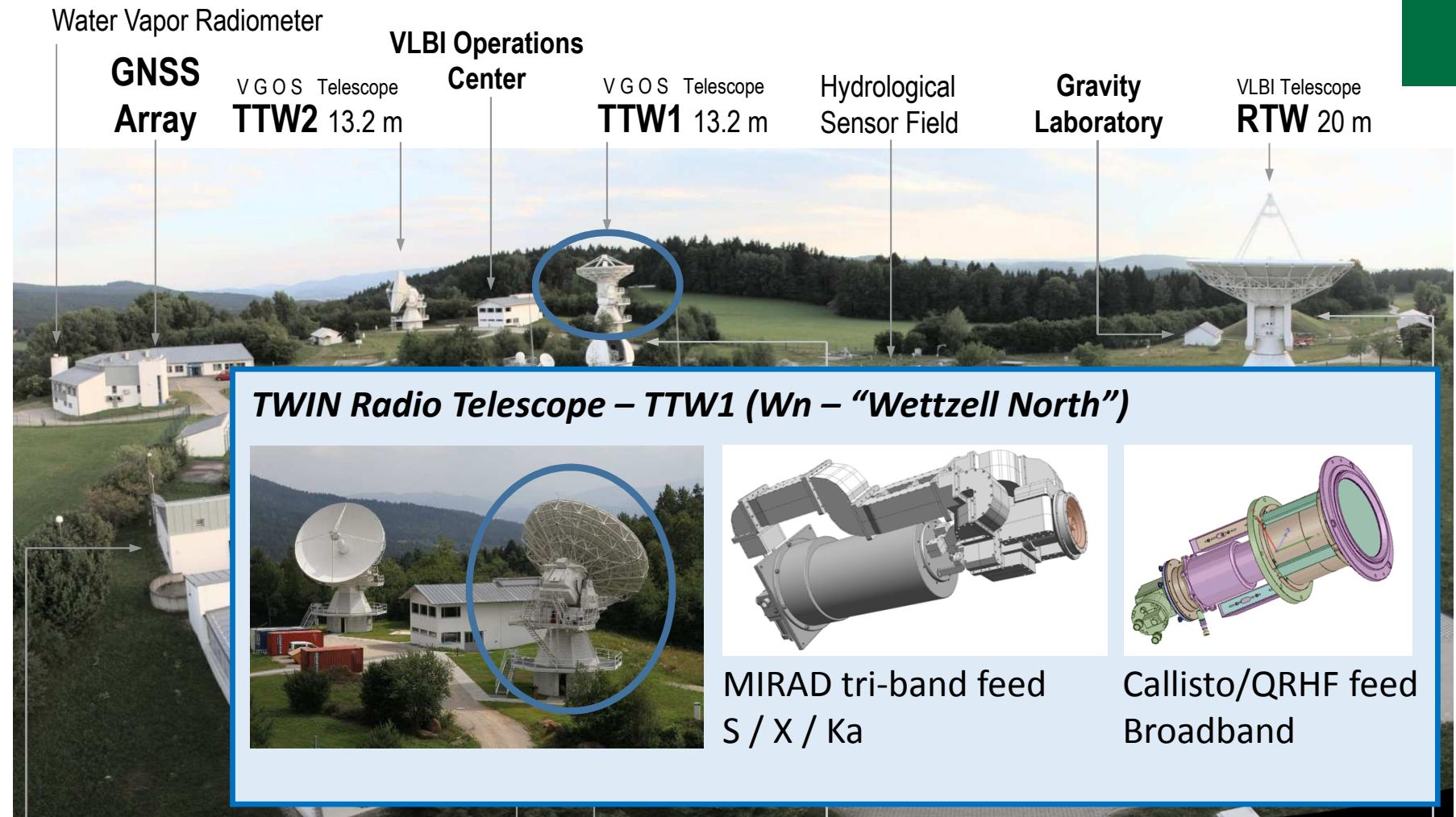
GEODETIC OBSERVATORY WETZELL



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GEODETIC OBSERVATORY WETZELL



Time/Frequency
Laboratory

Air Space
Surveillance Radar

Meteorological
Sensors

SLR/LLR System
W L R S

2-Color SLR System
S O S – W

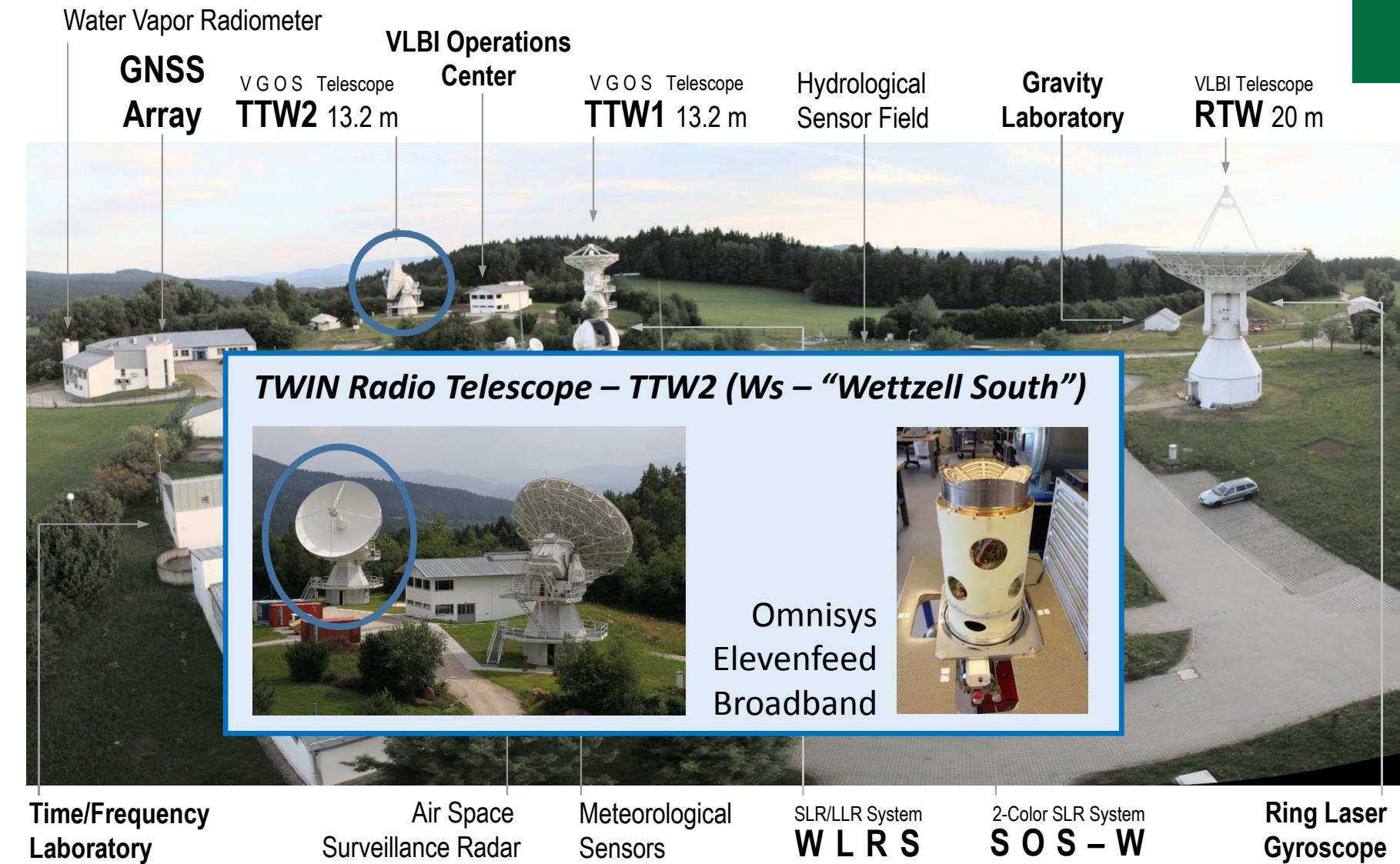
Ring Laser
Gyroscope



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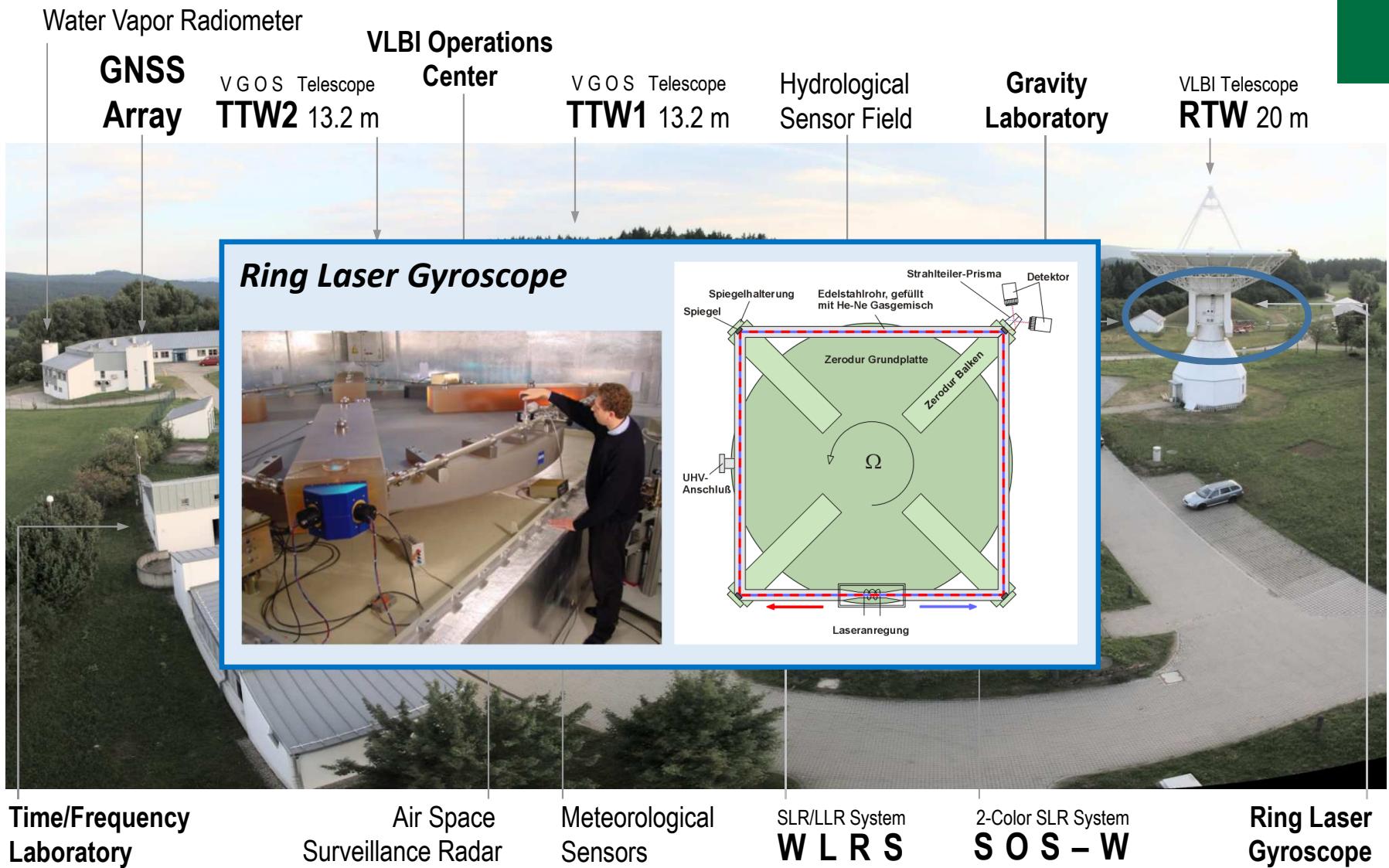
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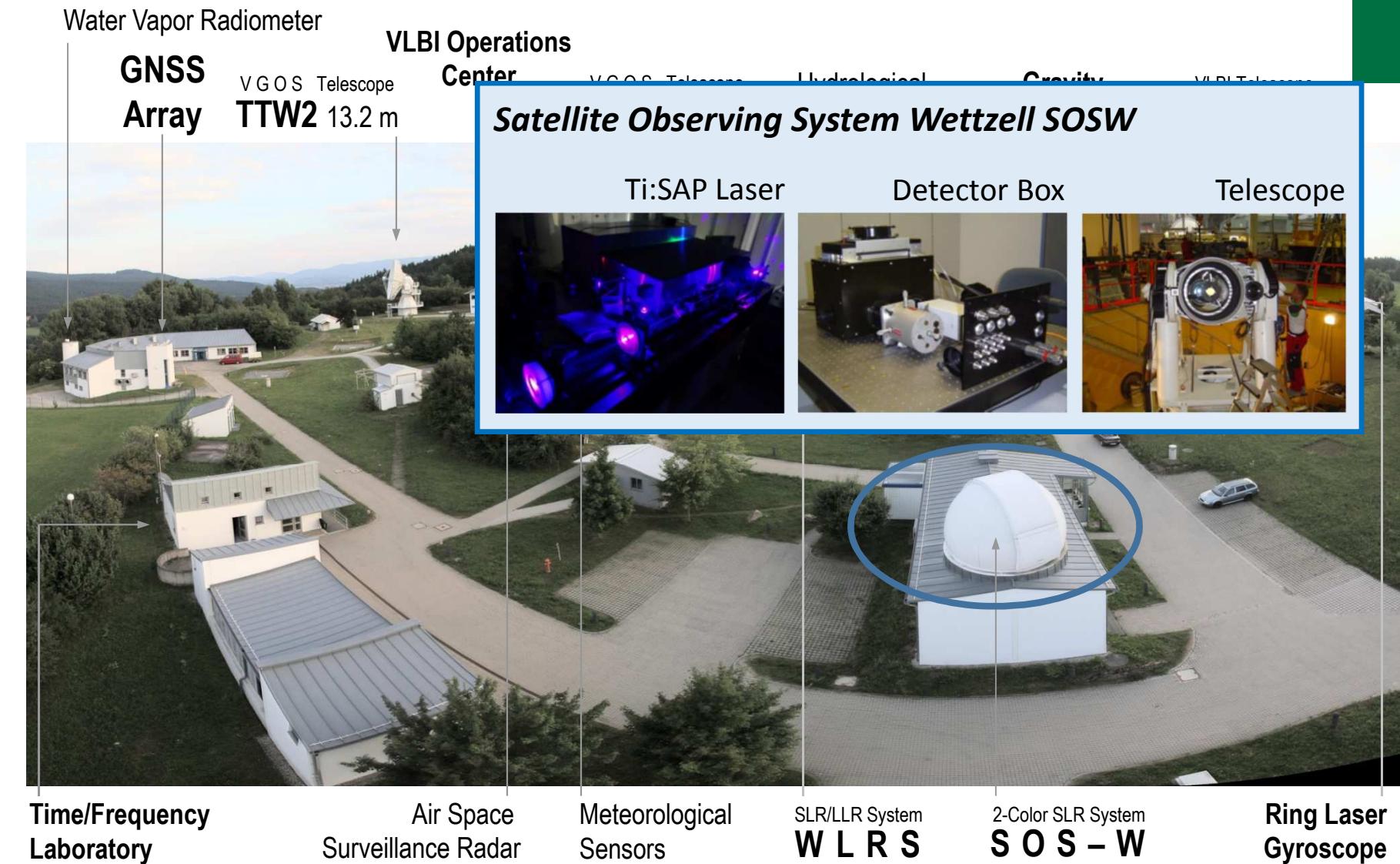
R & D: RING LASER GYROSCOPE



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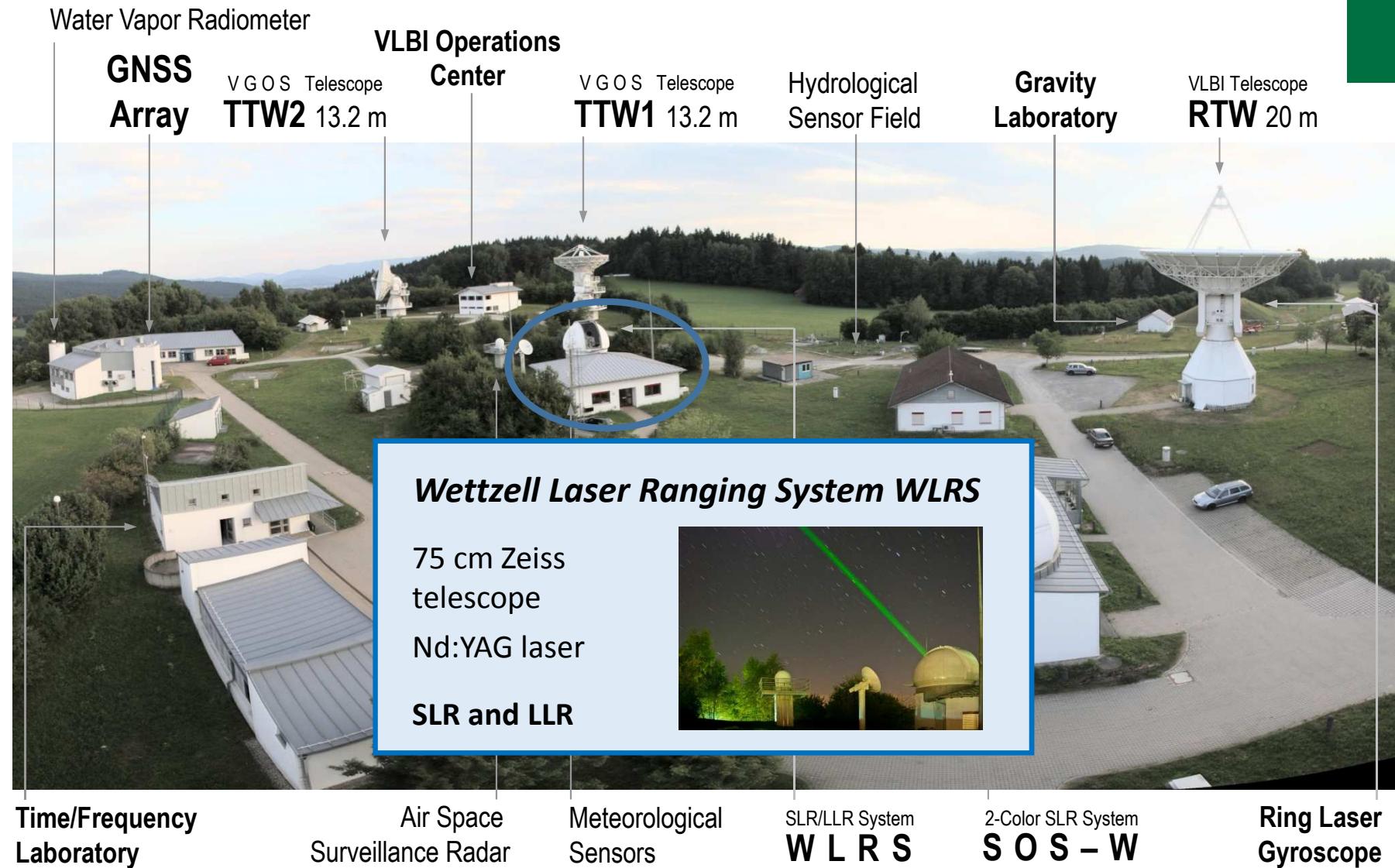
SATELLITE LASER RANGING



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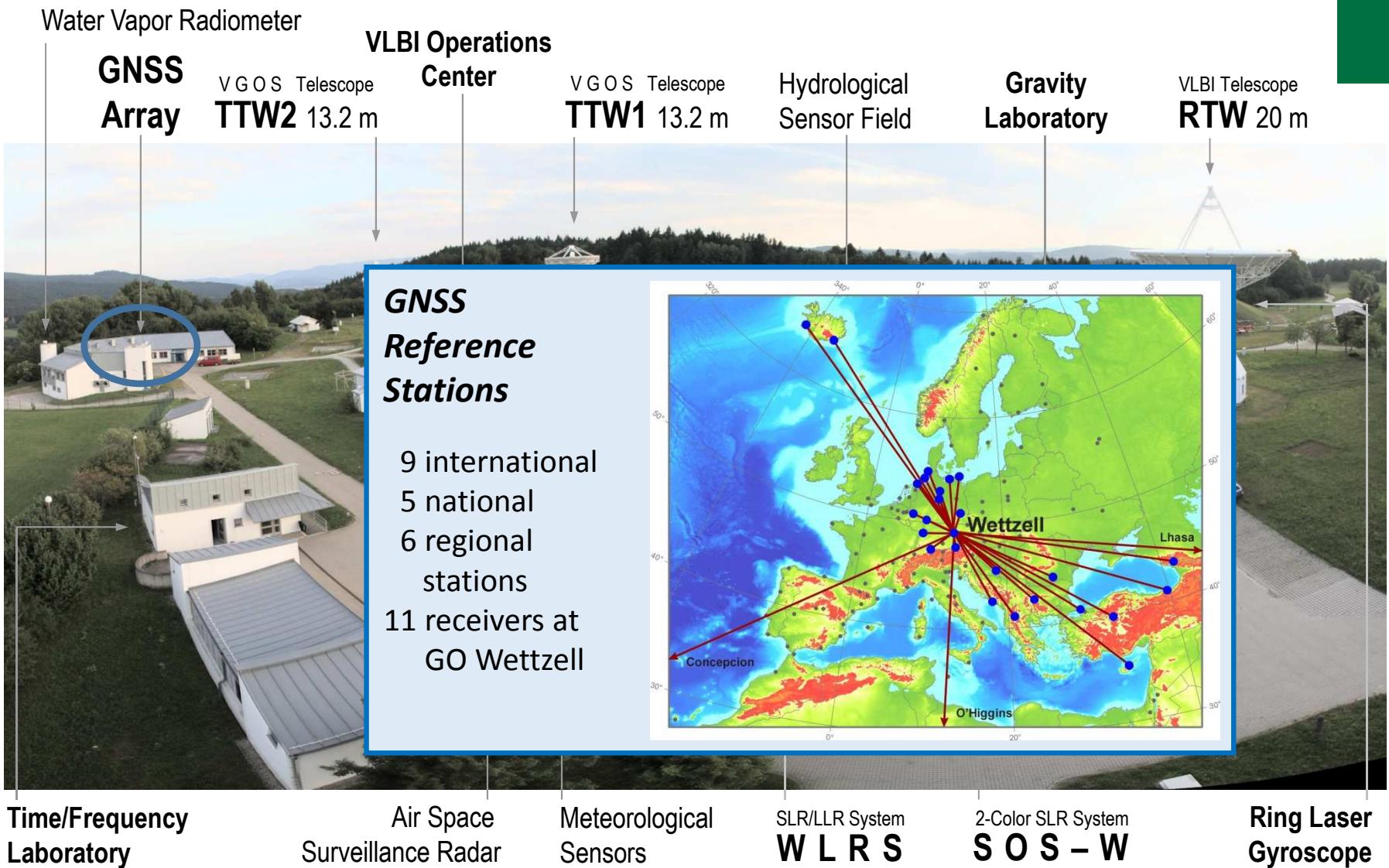
SATELLITE AND LUNAR LASER RANGING



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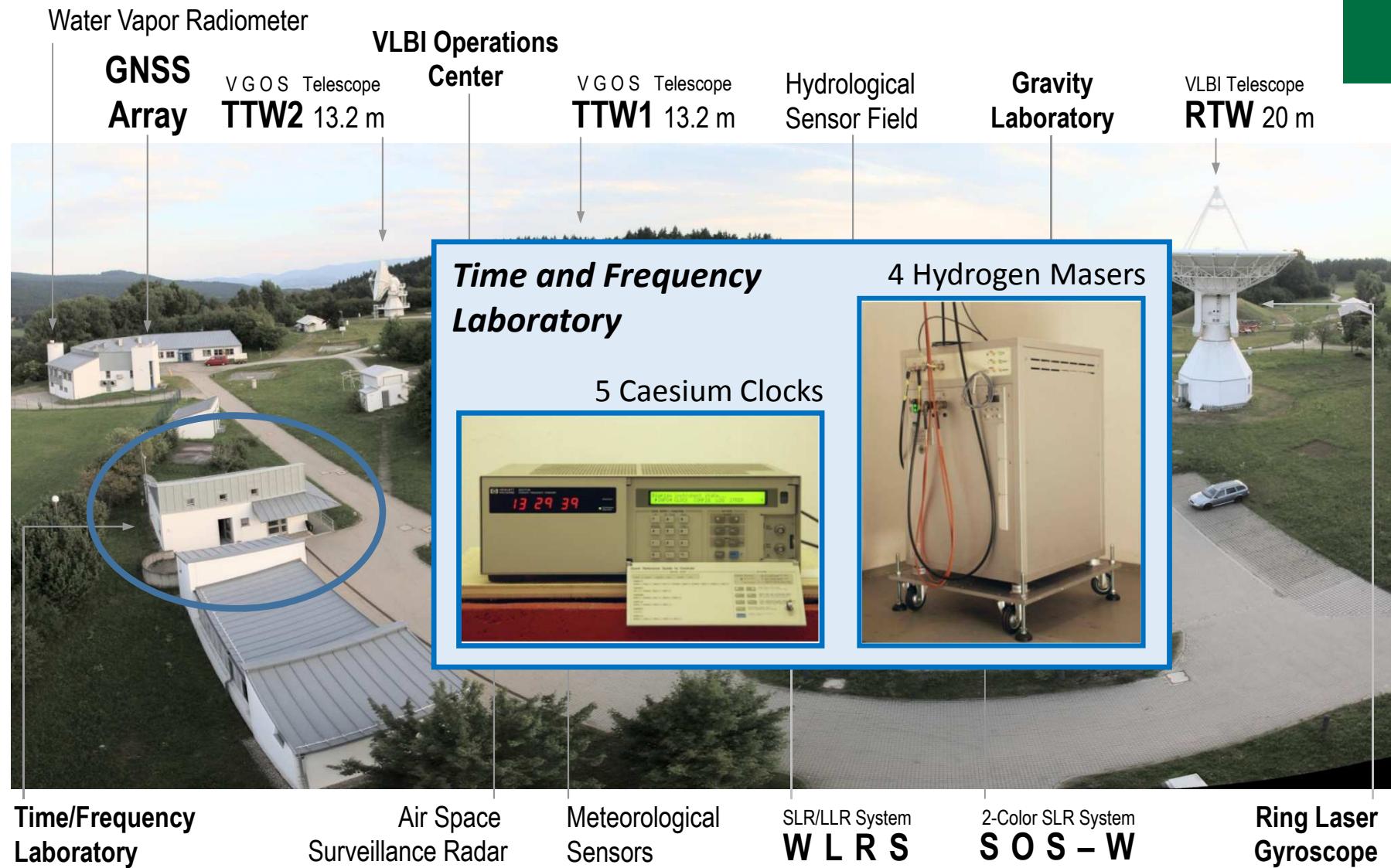
GNSS REFERENCE STATION(S)



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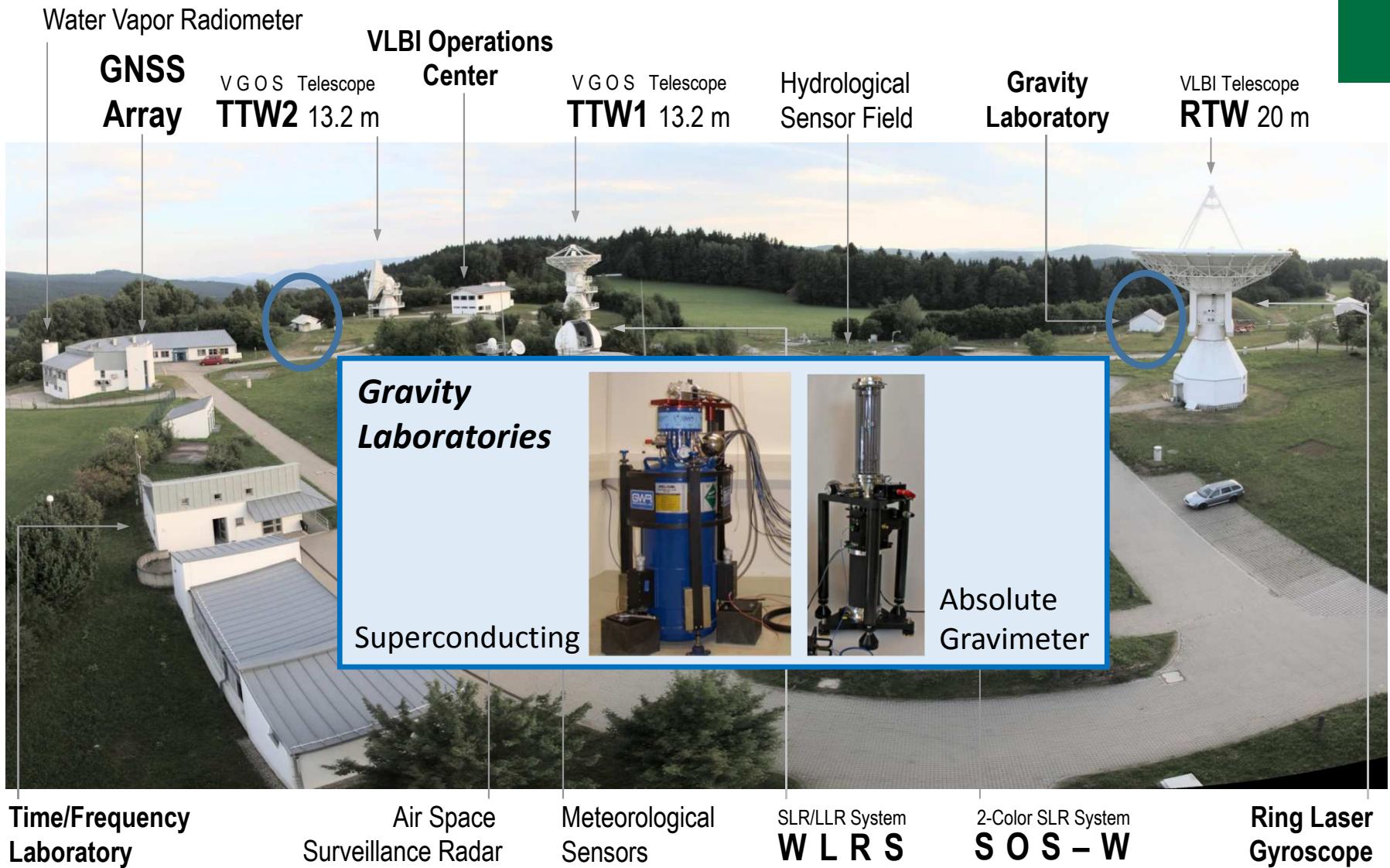
BASIC INFRASTRUCTURE



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GEODETIC OBSERVATORY WETZELL



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ARCHITECTURAL ELEMENTS OF WETTZELL LINKED TO THE UN-GGRF KEY AREAS



DATA SHARING

How did we address these key aspects at Wettzell, starting about 5 decades years ago?

EDUCATION AND CAPACITY BUILDING

A feature inherent to Wettzell; actively promoted by close link to universities (esp. FGS – Research Group on Satellite Geodesy).

GEODETIC INFRA-STRUCTURE

Instruments kept up-to-date. Joint operation as well as developments with TU Munich.

COMMUNICATION AND OUTREACH

Is addressed in various ways. Also typically more than 15 groups of students per year.

GOVERNANCE

Existing mechanisms.



A quick view on the **German Antarctic Receiving Station O'Higgins**



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GARS O'HIGGINS GERMAN ANTARCTIC RECEIVING STATION

View to the Antarctic Peninsula – O'Higgins in front



Red buildings:
Chilean army station
since 1948

80% DLR
(satellite comm.)

White buildings:
GARS O'Higgins
since 1993



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GARS O'HIGGINS FACTS

9 m radio telescope at O'Higgins



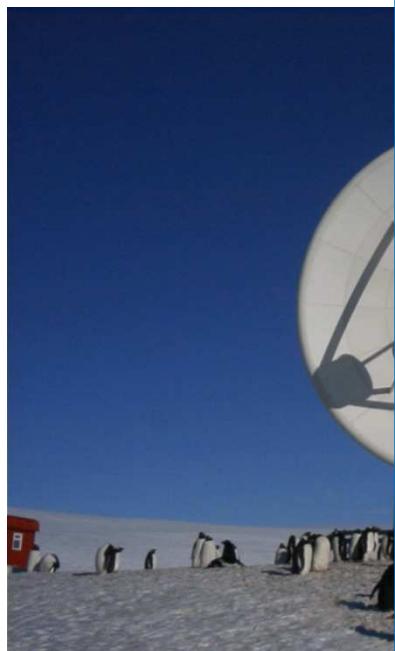
- Diameter main reflector: 9 m
- VLBI receiver frequencies
 - S-Band (2.1 – 2.3) GHz
 - X-Band (8.1 – 8.9) GHz

- Aerodynamic form resists wind speeds up to 300 km/h
- Compact and stable antenna
- Tilted elevation axis
- High (VGOS-like) slew rate
 - Azimuth: 11° per second
 - Elevation: 6° per second

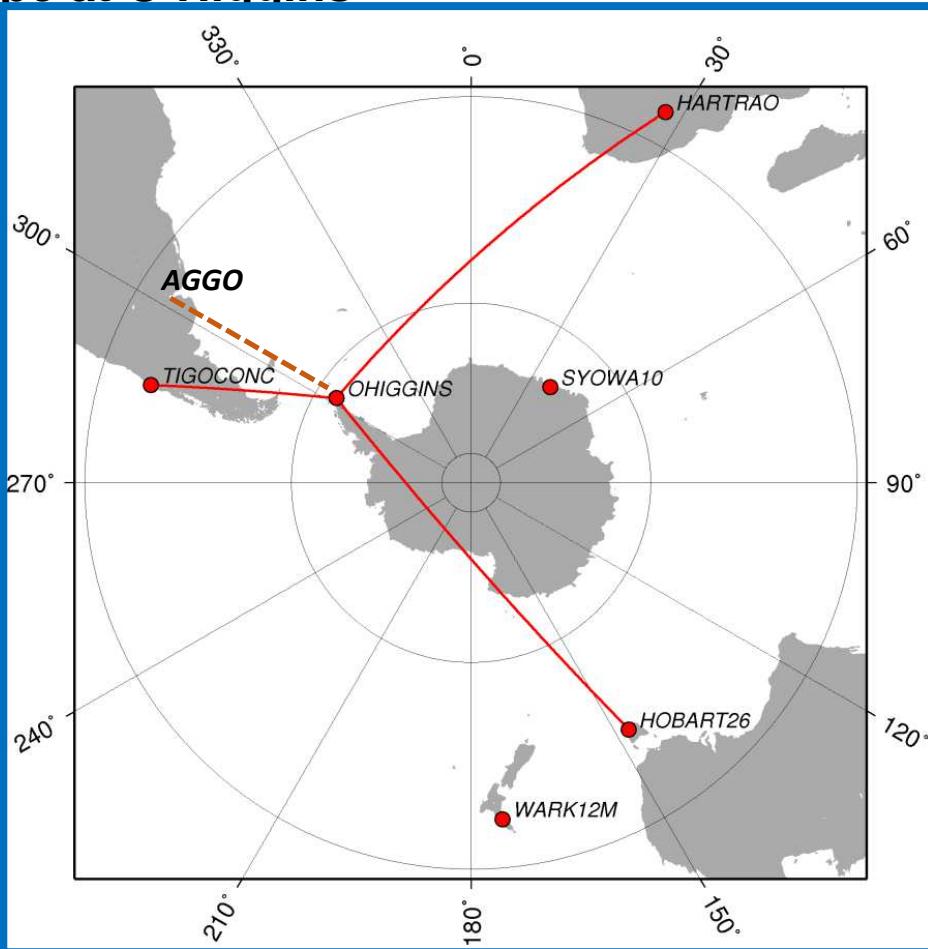


GARS O'HIGGINS: SURROUNDING IVS NETWORK STATIONS

9 m radio telescope at O'Higgins



- Diameter main reflector 9 m
- VLBI receiver frequencies
 - S-Band (2.1 – 22 GHz)
 - X-Band (8.1 – 8.4 GHz)



Form resists wind
100 km/h
stable antenna
on axis
(\pm) slew rate
1° per second
6° per second





... and an initial view on the **TIGO / AGGO** **Observatory**

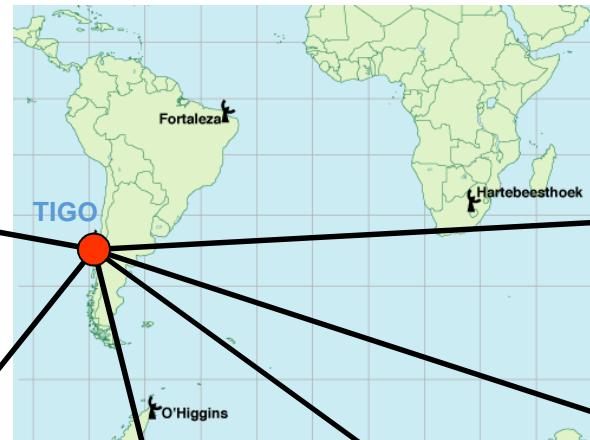
for Latin America



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TIGO: TRANSPORTABLE INTEGRATED GEODETIC OBSERVATORY



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TIGO IN SHORT

- A fully featured geodetic fundamental station.
- Concept follows tightly that of Wettzell, not just technically, but also in terms cooperation (e.g. joint operation of observatory with Chilean institutions).
- More than 10 years of successful operation at Concepción (Chile).
- The TIGO transportable VLBI telescope with 6 m was among the 3 most used radio telescopes in the IVS network!
- A neat yet very suitable SLR system.
- Decision to move the station to Argentina was taken in 2013.



FROM TIGO TO AGGO: ARGENTINEAN GERMAN GEODETIC OBSERVATORY



- AGGO is operated by Argentinean institutions with support from BKG.
- SLR currently in renewal phase and expected to become operational in 2020.



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Concluding Remarks



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CONCLUDING REMARKS

- Contributions to four major observing sites:
 - GO Wettzell (since 1972)
 - O'Higgins (since 1993)
 - TIGO (2002 – 2014)
 - AGGO (inauguration in 2015)
- Management of 8 international and 13 national GNSS sites.
- Maintaining, operating, supporting and developing these sites is a resource challenging task – also for BKG.
- Efforts undertaken by UN Committees to strengthen global geodetic infrastructure are highly appreciated.

