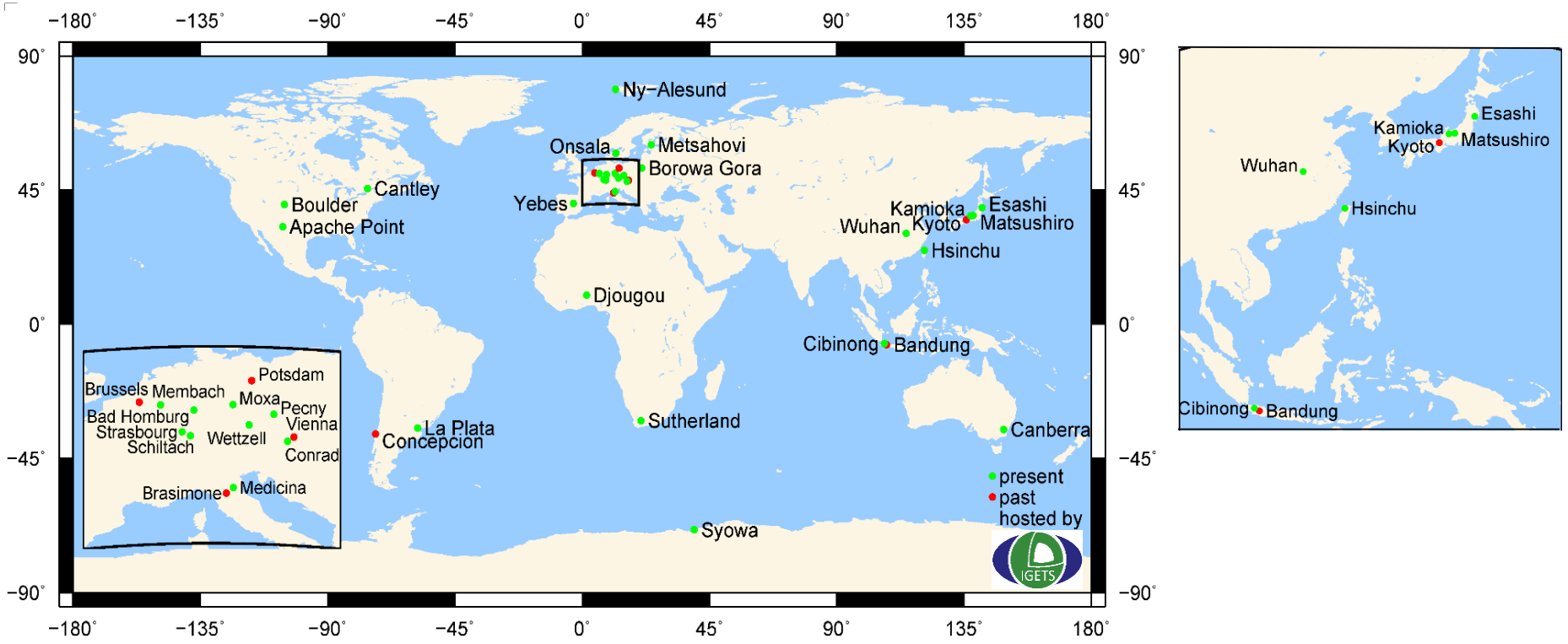
IGETS Data Base – Status Report

Christian Voigt, Christoph Förste

IGETS Business Meeting at the
IAG-IASPEI Joint Scientific Assembly,
Kobe, Japan, 3 August 2017

35 stations (⊙ present, ⊙ past)



http://igets.gfz-potsdam.de

Recently added stations and sensors

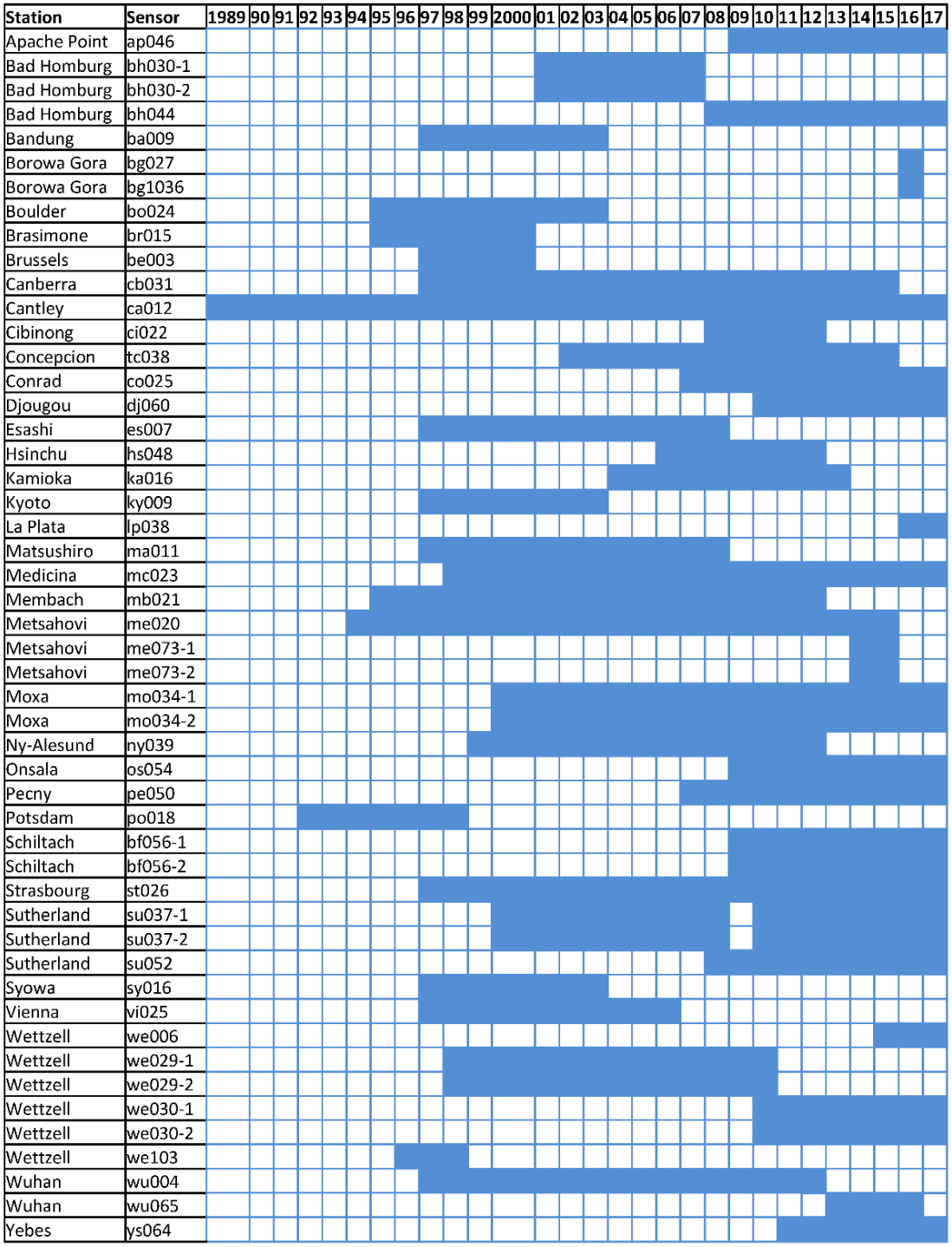
Date	Station	Sensor	Begin of data
2016-10-18	La Plata, Argentina	SG038	2016-01
2017-01-09	Borowa Gora, Poland	iGrav027, LaCoste&Romberg 1036	2016-05
2017-01-24	Wuhan, China	SG065	2013-03
2017-03-31	Djougou, Benin	SG060	2010-07
2017-06-09	Wettzell, Germany	iGrav006	2015-03

SG038 at La Plata

iGrav027 at Borowa Gora

Temporal coverage

- 35 stations
- 50 sensors
- time spans of 20 years and more (Cantley)



Station	Sensor	1989	90	91	92	93	94	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
Apache Point	ap046																													
Bad Homburg	bh030-1																													
Bad Homburg	bh030-2																													
Bad Homburg	bh044																													
Bandung	ba009																													
Borowa Gora	bg027																													
Borowa Gora	bg1036																													
Boulder	bo024																													
Brasimone	br015																													
Brussels	be003																													
Canberra	cb031																													
Cantley	ca012																													
Cibinong	ci022																													
Concepcion	tc038																													
Conrad	co025																													
Djougou	dj060																													
Esashi	es007																													
Hsinchu	hs048																													
Kamioka	ka016																													
Kyoto	ky009																													
La Plata	lp038																													
Matsushiro	ma011																													
Medicina	mc023																													
Membach	mb021																													
Metsahovi	me020																													
Metsahovi	me073-1																													
Metsahovi	me073-2																													
Moxa	mo034-1																													
Moxa	mo034-2																													
Ny-Alesund	ny039																													
Onsala	os054																													
Pecny	pe050																													
Potsdam	po018																													
Schiltach	bf056-1																													
Schiltach	bf056-2																													
Strasbourg	st026																													
Sutherland	su037-1																													
Sutherland	su037-2																													
Sutherland	su052																													
Syowa	sy016																													
Vienna	vi025																													
Wettzell	we006																													
Wettzell	we029-1																													
Wettzell	we029-2																													
Wettzell	we030-1																													
Wettzell	we030-2																													
Wettzell	we103																													
Wuhan	wu004																													
Wuhan	wu065																													
Yebes	ys064																													

Data products

- Level 1:
  - raw data as recorded without preprocessing and downsampled to 1 min resolution,
  - after filling gaps or spikes shorter than 10 seconds by linear interpolation,
  - provided by the station operators.
- Level 2:
  - pre-processed data, i.e. elimination of gaps, spikes, steps and earthquakes,
  - ready for tidal analysis
  - provided by the station operators or by the University of French Polynesia (or by both).
- Level 3 (*new product in progress*):
  - residual gravity data after reducing Level 2 gravity data for modeled tidal and non-tidal gravity variations,
  - tidal models specific for each station covering the effects of solid Earth tides and ocean loading effects, obtained from harmonic analysis of the level 2 records,
  - Earth rotation effects (polar motion and length-of-day variations) based on the EOP C04 series of IERS,
  - non-tidal loading effects due to atmospheric, oceanic and hydrological mass-redistributions reduced according to the products provided by EOST Loading Service and Atmospheric Attraction Computation Service (ATMACS).

New data sets

Level	Files	Content
1	GGP	1 s gravity and pressure data (Apache Point, Djougou, Strasbourg, Sutherland and Yebes)
1	CAL	One calibration file for each sensor according to IGETS conventions (Apache Point, Conrad and Sutherland)

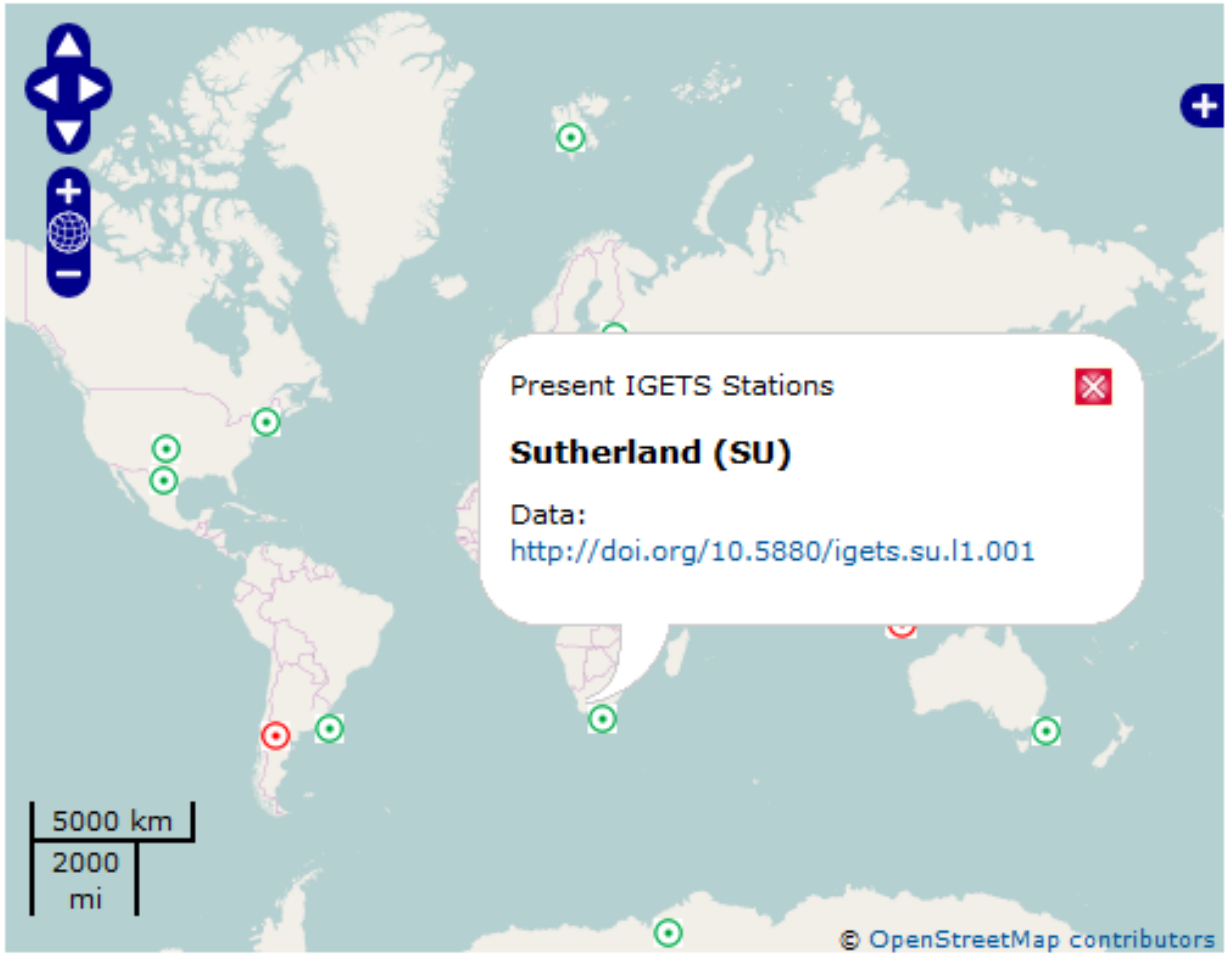
Data Publication and Citation with DOIs

DOI (Digital Object Identifier) assignments already established for the Level 1 data sets of BKG, EOST and GFZ:

- BKG: Bad Homburg http://doi.org/10.5880/igets.bh.l1.001
  Concepcion http://doi.org/10.5880/igets.tc.l1.001
  La Plata http://doi.org/10.5880/igets.lp.l1.001
  Medicina http://doi.org/10.5880/igets.mc.l1.001
  Wettzell http://doi.org/10.5880/igets.we.l1.001
- EOST: Djougou http://doi.org/10.5880/igets.dj.l1.001
  Strasbourg http://doi.org/10.5880/igets.st.l1.001
- GFZ: Potsdam http://doi.org/10.5880/igets.po.l1.001
  Sutherland http://doi.org/10.5880/igets.su.l1.001
  GFZ@Wettzell http://doi.org/10.5880/igets.we.gfz.l1.001

Data Publication and Citation with DOIs

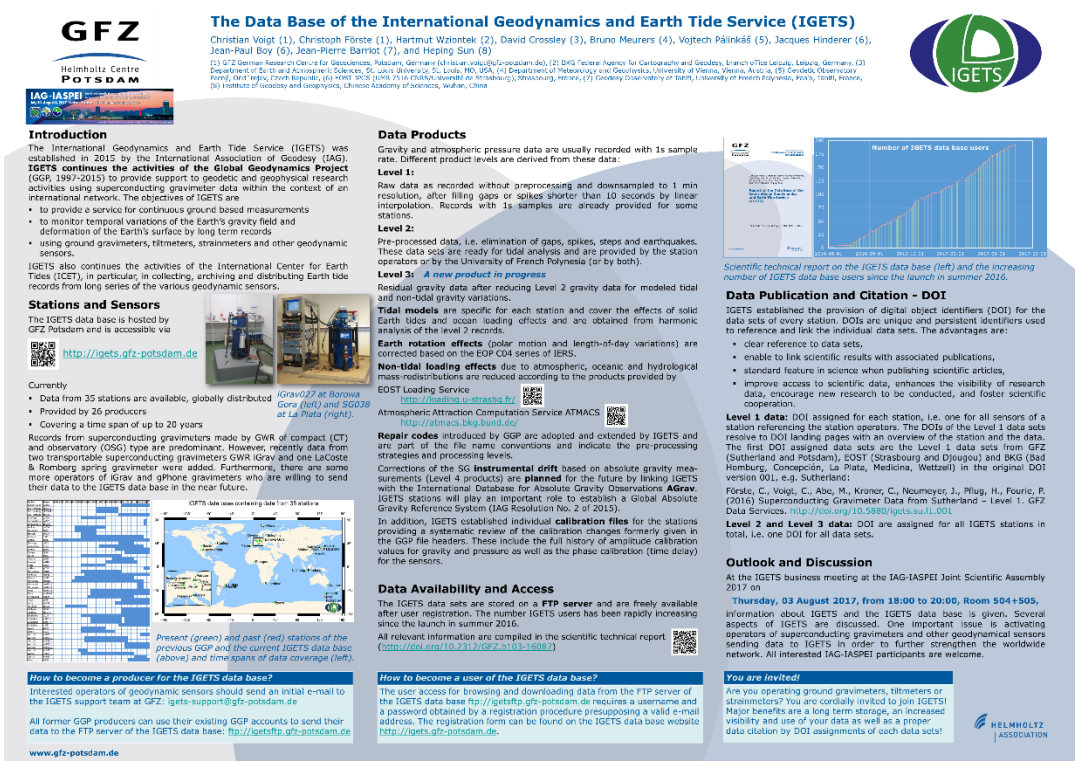
http://igets.gfz-potsdam.de



DOI landing page for Sutherland

- **data download**
- **link to data base report**
- **reference to related publications**
- **introduction**
- **contact**
- **official keywords and meta data**
- **geographical position**

Documentation



The Data Base of the International Geodynamics and Earth Tide Service (IGETS)

Christian Voigt (1), Christoph Förste (1), Hartmut Wziontek (2), David Crossley (3), Bruno Meurers (4), Vojtech Pálinkáš (5), Jacques Hinderer (6), Jean-Paul Boy (6), Jean-Pierre Barriot (7), and Heping Sun (8)

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Introduction

The International Geodynamics and Earth Tide Service (IGETS) was established in 2015 by the International Association of Geodesy (IAG). **IGETS continues the activities of the Global Geodynamics Project** (GGP, 1997-2015) to provide support to geodetic and geophysical research activities using superconducting gravimeter data within the context of an international network. The objectives of IGETS are

- to provide a service for continuous ground based measurements
- to monitor temporal variations of the Earth's gravity field and deformation of the Earth's surface by long term records
- using ground gravimeters, tiltmeters, strainmeters and other geodynamic sensors.

IGETS also continues the activities of the International Center for Earth Tides (ICET), in particular, in collecting, archiving and distributing Earth tide records from long series of the various geodynamic sensors.

Stations and Sensors

The IGETS data base is hosted by GFZ Potsdam and is accessible via

http://igets.gfz-potsdam.de

IGrav027 at Borowa Gora (left) and SG038 at La Plata (right).

Currently

- Data from 35 stations are available, globally distributed
- Provided by 26 producers
- Covering a time span of up to 20 years

Records from superconducting gravimeters made by GWR of compact (CT) and observatory (OSG) type are predominant. However, recently data from two transportable superconducting gravimeters GWR iGrav and one LaCoste & Romberg spring gravimeter were added. Furthermore, there are some more operators of iGrav and gPhone gravimeters who are willing to send their data to the IGETS data base in the near future.

Present (green) and past (red) stations of the previous GGP and the current IGETS data base (above) and time spans of data coverage (left).

Data Products

Gravity and atmospheric pressure data are usually recorded with 1s sample rate. Different product levels are derived from these data:

Level 1:

Raw data as recorded without preprocessing and downsampled to 1 min resolution, after filling gaps or spikes shorter than 10 seconds by linear interpolation. Records with 1s samples are already provided for some stations.

Level 2:

Pre-processed data, i.e. elimination of gaps, spikes, steps and earthquakes. These data sets are ready for tidal analysis and are provided by the station operators or by the University of French Polynesia (or by both).

Level 3: ***A new product in progress***

Residual gravity data after reducing Level 2 gravity data for modeled tidal and non-tidal gravity variations.

Tidal models are specific for each station and cover the effects of solid Earth tides and ocean loading effects and are obtained from harmonic analysis of the level 2 records.

Earth rotation effects (polar motion and length-of-day variations) are corrected based on the EOP C04 series of IERS.

Non-tidal loading effects due to atmospheric, oceanic and hydrological mass-redistributions are reduced according to the products provided by

EOST Loading Service
http://loading.u-strasbg.fr/

Atmospheric Attraction Computation Service ATMACS
http://atmacs.bkg.bund.de/

Repair codes introduced by GGP are adopted and extended by IGETS and are part of the file name conventions and indicate the pre-processing strategies and processing levels.

Corrections of the SG **instrumental drift** based on absolute gravity measurements (Level 4 products) are **planned** for the future by linking IGETS with the International Database for Absolute Gravity Observations **AGrav**. IGETS stations will play an important role to establish a Global Absolute Gravity Reference System (IAG Resolution No. 2 of 2015).

In addition, IGETS established individual **calibration files** for the stations providing a systematic review of the calibration changes formerly given in the GGP file headers. These include the full history of amplitude calibration values for gravity and pressure as well as the phase calibration (time delay) for the sensors.

Data Availability and Access

The IGETS data sets are stored on a **FTP server** and are freely available after user registration. The number IGETS users has been rapidly increasing since the launch in summer 2016.

All relevant information are compiled in the scientific technical report (http://doi.org/10.2312/GFZ.b103-16082)

Scientific technical report on the IGETS data base (left) and the increasing number of IGETS data base users since the launch in summer 2016.

Data Publication and Citation - DOI

IGETS established the provision of digital object identifiers (DOI) for the data sets of every station. DOIs are unique and persistent identifiers used to reference and link the individual data sets. The advantages are:

- clear reference to data sets,
- enable to link scientific results with associated publications,
- standard feature in science when publishing scientific articles,
- improve access to scientific data, enhances the visibility of research data, encourage new research to be conducted, and foster scientific cooperation.

Level 1 data: DOI assigned for each station, i.e. one for all sensors of a station referencing the station operators. The DOIs of the Level 1 data sets resolve to DOI landing pages with an overview of the station and the data. The first DOI assigned data sets are the Level 1 data sets from GFZ (Sutherland and Potsdam), EOST (Strasbourg and Djougou) and BKG (Bad Homburg, Concepción, La Plata, Medicina, Wettzell) in the original DOI version 001, e.g. Sutherland:

Förste, C., Voigt, C., Abe, M., Kroner, C., Neumeyer, J., Pflug, H., Fourie, P. (2016) Superconducting Gravimeter Data from Sutherland – Level 1. GFZ Data Services. http://doi.org/10.5880/igets.su.l1.001

Level 2 and Level 3 data: DOI are assigned for all IGETS stations in total, i.e. one DOI for all data sets.

Outlook and Discussion

At the IGETS business meeting at the IAG-IASPEI Joint Scientific Assembly 2017 on

Thursday, 03 August 2017, from 18:00 to 20:00, Room 504+505,

information about IGETS and the IGETS data base is given. Several aspects of IGETS are discussed. One important issue is activating operators of superconducting gravimeters and other geodynamical sensors sending data to IGETS in order to further strengthen the worldwide network. All interested IAG-IASPEI participants are welcome.

How to become a producer for the IGETS data base?

Interested operators of geodynamic sensors should send an initial e-mail to the IGETS support team at GFZ: igets-support@gfz-potsdam.de

All former GGP producers can use their existing GGP accounts to send their data to the FTP server of the IGETS data base: ftp://igetsftp.gfz-potsdam.de

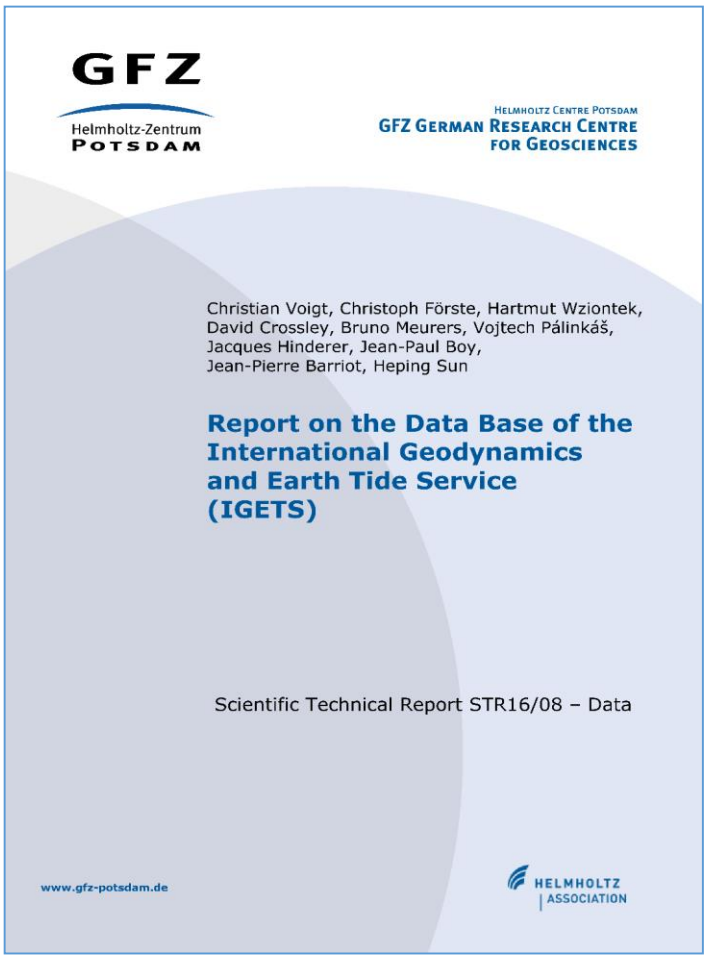
How to become a user of the IGETS data base?

The user access for browsing and downloading data from the FTP server of the IGETS data base ftp://igetsftp.gfz-potsdam.de requires a username and a password obtained by a registration procedure presupposing a valid e-mail address. The registration form can be found on the IGETS data base website http://igets.gfz-potsdam.de.

You are invited!

Are you operating ground gravimeters, tiltmeters or strainmeters? You are cordially invited to join IGETS! Major benefits are a long term storage, an increased visibility and use of your data as well as a proper data citation by DOI assignments of each data sets!

www.gfz-potsdam.de



Helmholtz-Zentrum Potsdam

Helmholtz Centre Potsdam
GFZ German Research Centre for Geosciences

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Report on the Data Base of the International Geodynamics and Earth Tide Service (IGETS)

Scientific Technical Report STR16/08 – Data

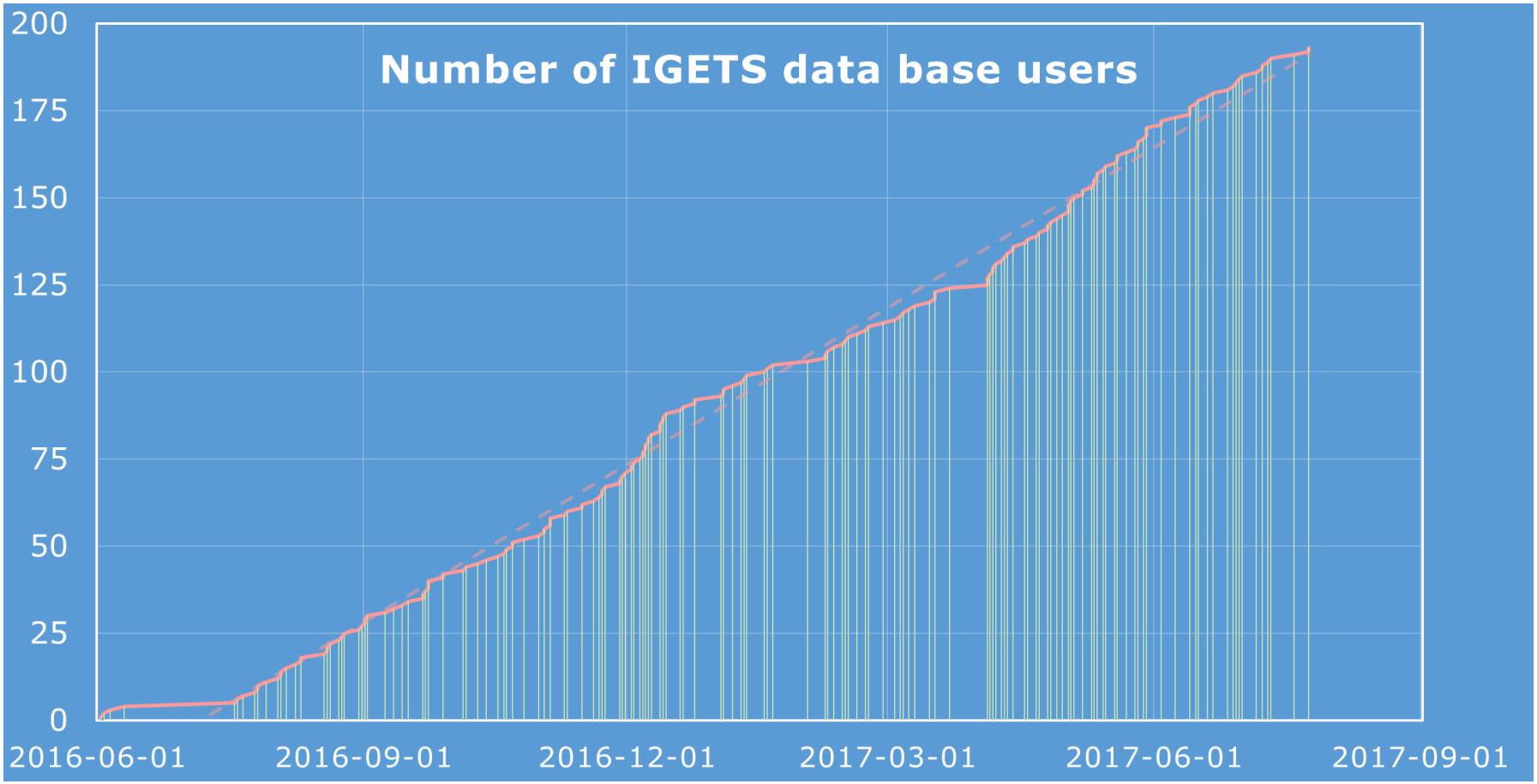
www.gfz-potsdam.de

HELMHOLTZ ASSOCIATION

Poster G07-P-06 of IAG-IASPEI Joint Scientific Assembly 2017 and GFZ Scientific Technical Report both available in "Documentation" of

http://igets.gfz-potsdam.de

User statistics

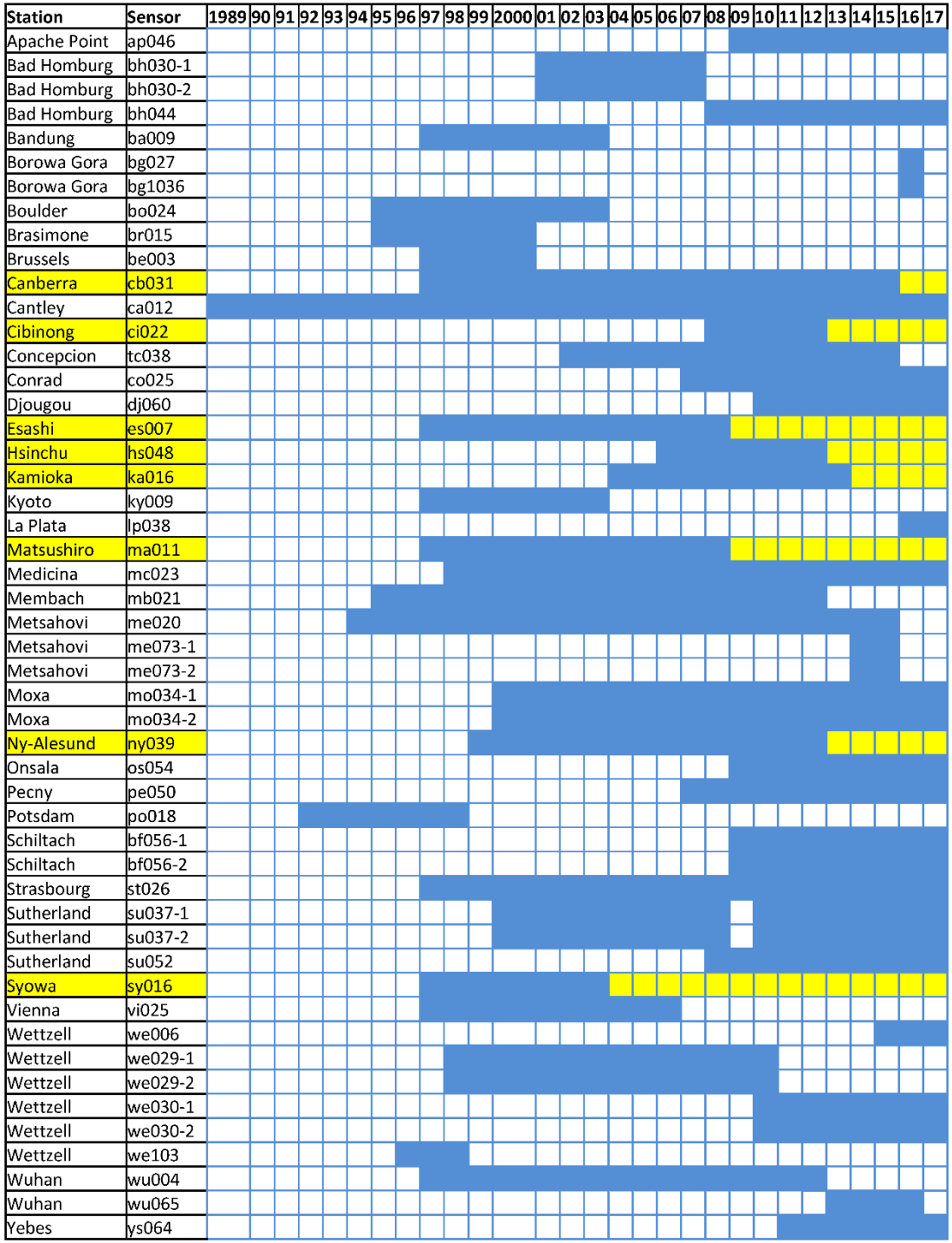


193 users at 2017-07-24 (1 user registration every 2 days)

Missing data

- Former GGP stations (*to be reactivated*)
  - Canberra (Australia, Japan)
  - Cibinong (Indonesia)
  - Esashi (Japan)
  - Hsinchu (Taiwan)
  - Kamioka (Japan)
  - Matsushiro (Japan)
  - Ny-Alesund (Norway, Japan)
  - Syowa (Antarctica, Japan)

- Further stations (*to be added*)
  - Ghuttu (India)
  - Gujarat (India)
  - Jangbogo (Antarctica, South Korea)
  - Lhasa (China)
  - Lijiang (China)
  - MunGyung (South Korea)



GFZ
Helmholtz Centre
POTSDAM

Participation

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