INSTITUTO DE ASTRONOMIA, GEOFÍSICA E CIÊNCIAS ATMOSFÉRICAS

IAG/USP:
Astronomia, Geofísica e Meteorologia

Instituto de Astronomia, Geofísica e Ciências Atmosféricas (IAG)
Universidade de São Paulo
www.iag.usp.br/

- Director: Ricardo Trindade
- Vice-director: Beatriz Barbuy

IAG is among the oldest institutes at USP:

1886 – Creation of the Comissão Geográfica e Geológica 1887 – Section of Botanics and Meteorology

1893 – Astronomy & Mechanics – E.Politécnica/E. Normal

1927 – Creation of Service of Meteorology & Astronomy

1930 – Subordinação à Escola Politécnica, 1931 - IAG reintegrated to Secretaria de Agricultura, Indústria e Comércio, merging with Service Geográfico-Geológico

1934 – Complementary Instituto to USP

1946 – Incorporation as Institute at USP

1972 – IAG transformed in independente Institute at USP

Graduate studies at IAG

Programas:

- **Astronomia**
  - Criado em 1973 (Mestrado) **GRADE 7 since 1976!**
  - Ativação do Doutorado em 21/11/1974
  - Constituição da CCP: 04/11/2008

- **Geofísica** **GRADE 6**
  - Criado em 1975 (Mestrado)
  - Ativação do Doutorado em 31/05/1979
  - Constituição da CCP: 07/11/2008

- **Meteorologia** **GRADE 7**
  - Criado em 1975 (Mestrado)
  - Ativação do Doutorado em 03/10/1984
  - Constituição da CCP: 07/11/2008

- **Mestrado Profissional em Ensino de Astronomia**
  - Criado em 2012
  - Início de atividades em 2013
  - Constituição da CCP: 1º semestre de 2013

Graduate studies at IAG

- Since 1974, a total of
  - Master: 481
  - PhD: 830

Astronomy concluded 294 master and 251 PhD degrees.

- Since 2015, the Master on Professional Astronomy concluded 43 Master degrees.

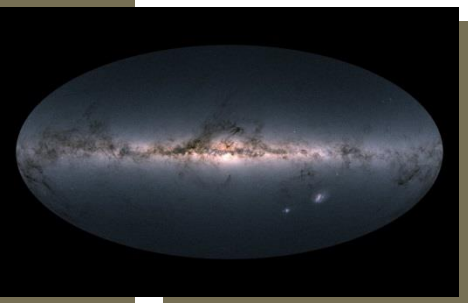
Science in Astronomy

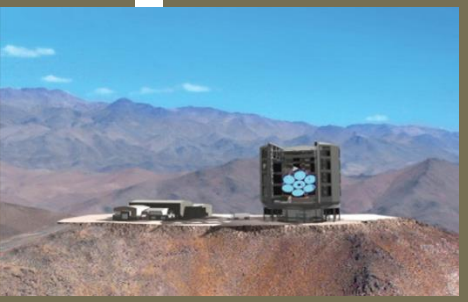
Astrometry, Celestial Mechanics, Solar System, Stellar Astrophysics, Interstellar Medium, Galaxies, AGNs, Black Holes, Supernovae, Large Scale Structure, Cosmology, High Energies & Plasma, Radioastronomy, Instrumentation, Astrobiology (interdisciplinary).

- 35 Staff e 60 students post-grad, ~100 undergrad

100 scientific papers/yr in high impact journals

Astronomical instruments





Participação atuante nos projetos científicos de satélites:

Missão Espacial PLATO - procura de planetas

Missão Espacial Gaia - precisão de movimentos de estrelas

Missão Espacial Fermi - Objetos compactos

Grandes telescópios:

Projeto Giant Magellan Telescope - SP com 4%

Projeto LLAMA - radiotelescópio nos Andes

Astri Mini-Array e CTA - Antenas para altas energias

Participação no espectrógrafo MOSAIC para o Extremely Large Telescope (ESO)

Projetos Instrumentais:

GMT: GMACS, G-CLEF, MANIFEST e outros

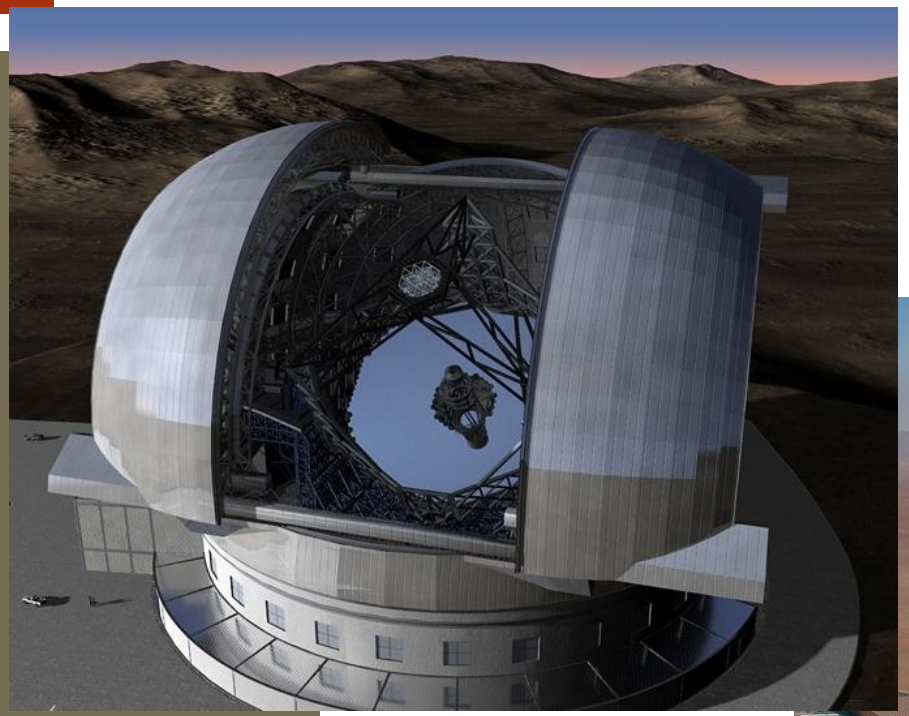
CUBES para o Very Large Telescope (Chile), MOSAIC@ELT

PFS para o SUBARU (Hawaii)

Outros:

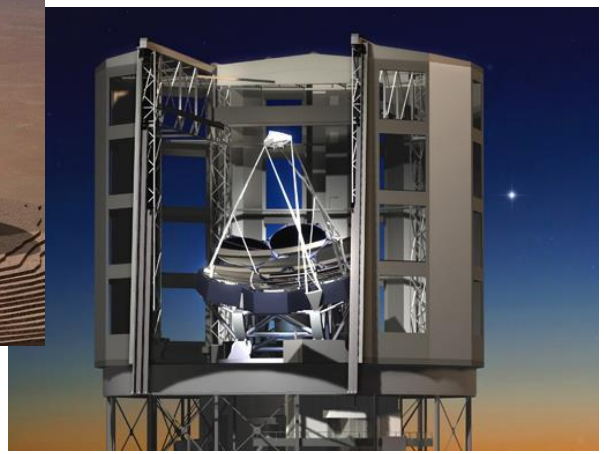
S-PLUS - telescópio robótico (Chile), Inteligência Artificial

Giant Telescopes of next years



ELT
39m (Chile)

TMT
30m (Havaí)



GMT
24m (Chile

Future of students in Astronomy

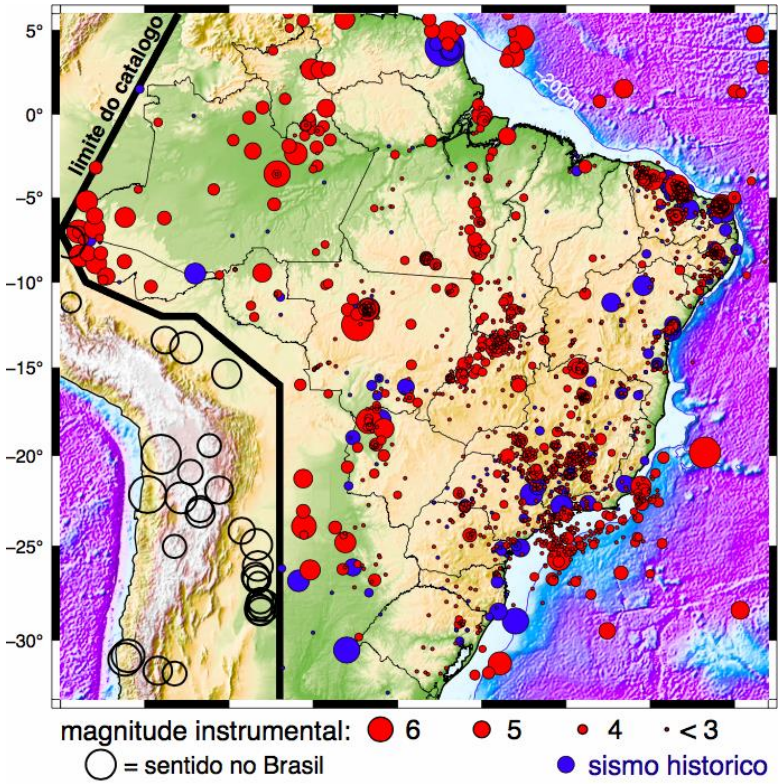
PERIOD 2004 – 2019: 117 PhDs – 27women/TOTAL

Post-grad IAG: 12, Staff IAG: 3
Staff other Universities: 39

Other:
2: Police Inteligence, 2 Financial Market,
3: Data Science, Software 1: analist IBGE,
7: Secondary school, 1: Founder of Software company
1: CEO
30: Abroad – Chile, Argentina, Equador, Ireland, Poland, Germany, France, UK, USA

Science in Geophysics

- Variations of geomagnetic field
- Sismicity of South-American plate
- Origin of life and its boom since the Cambrian
- Plumes of soil contamination and role of biomagnetism
- Recognition & modeling of igneus rocks
- Monitoring of dams (barragens)
- Paleogeography since the Arquean



Science in Geophysics

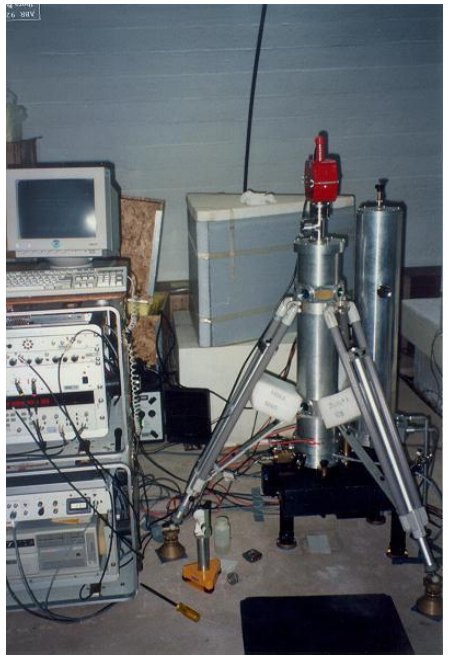
Main lines of research for students:

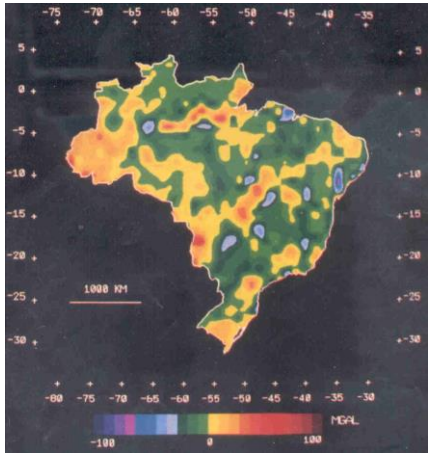
- Global Geodynamics & Tectonics
- Applied Geophysics
- Modeling, and big data Science in Geophysics

16 staff, 46 students post-grad, ~100 undergrad

fellowships CAPES, CNPq, FAPESP,

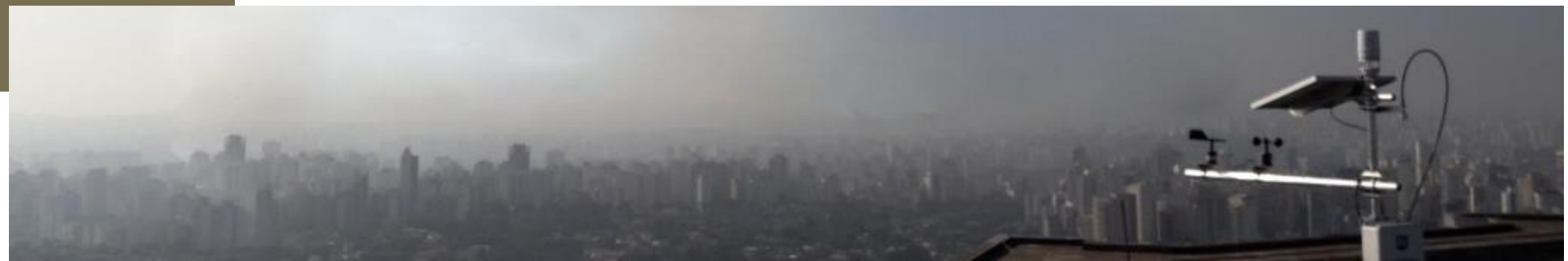
Petrobrás





Science in Meteorology

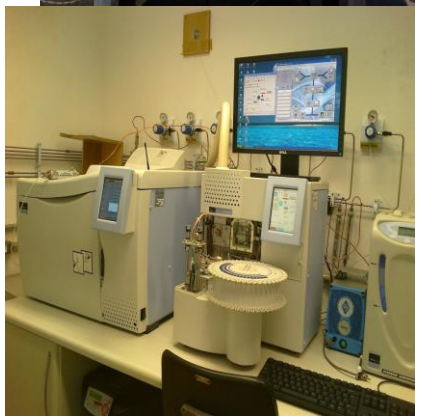
- Impact of Climate Change: Ambiental Governance of the Macrometropolis Paulista
- Rôle of oceans on Climate
- Study of gas emission of Greenhouse effect
- Paleo-climate
- Atmospheric Aerossols and their impacts
- Rôle of the Amazon on Climate
- Alerts of disasters: floods, landslides, intense heat
- Weather forecast
- Emission and transport of poluents



Graduate studies in Meteorology

Main Lines of research

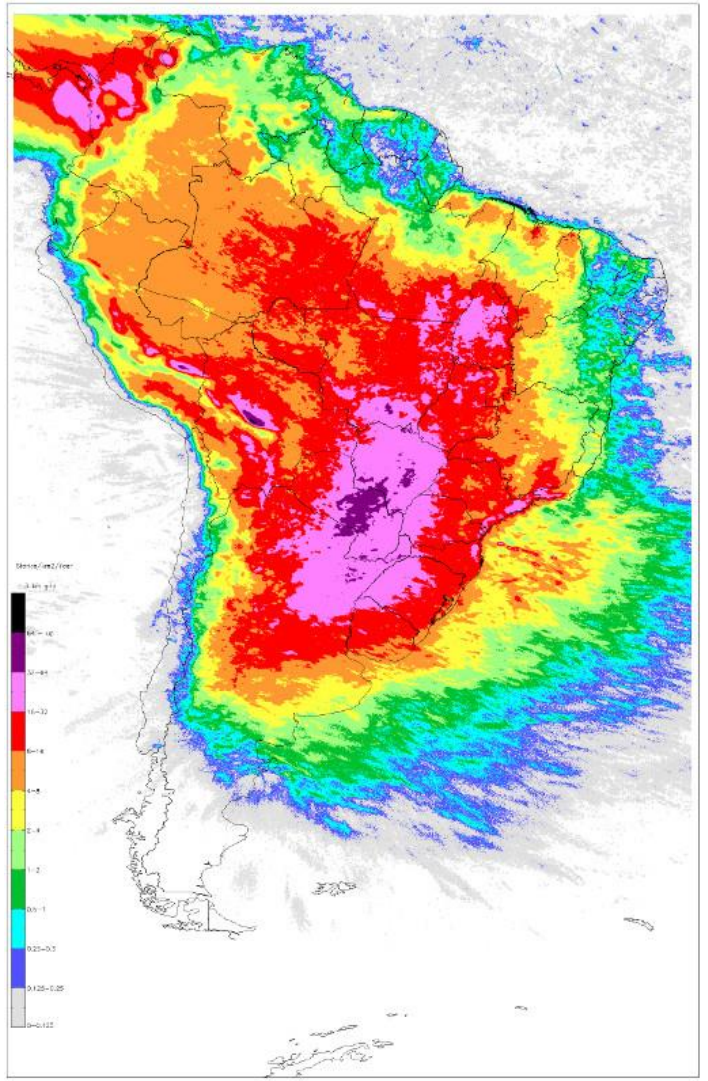
- Studies & Applications on Weather & Climate
- Interaction Atmosphere-Biosphere-Ocean
- Micrometeorology
- Atmospheric Polution
- Physics of Atmospheric Research and applications in Meteorology



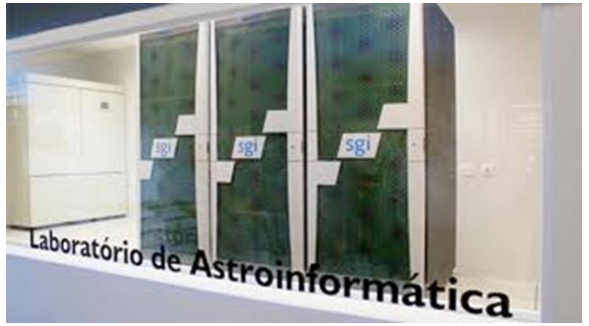
Future of students in Meteorology

Where to work:

- Academic Instituitions
- Centers of Weather Forecast
- Energy companies
- Eolic & Solar energy generation companies
- Environmental bodies
- Analysis of environmental impact companies - RIMAS



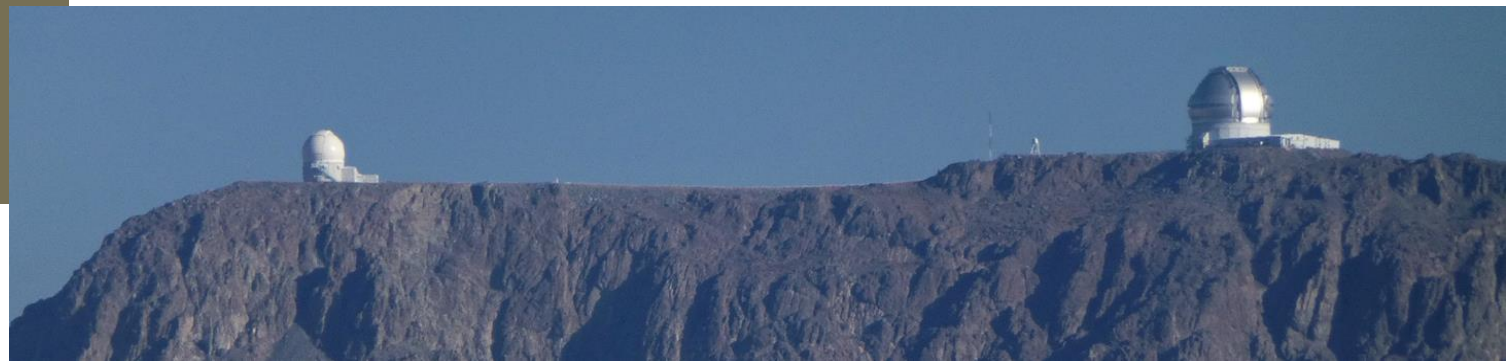
IAG-Infraestructure



- Library, acess online.
- Informatics:
  - All students have na office and a computer
  - Acess to several clusters
  - Data center (FAPESP multiusuário)
- Laboratories (mechanics, optics, eletronics)
- In Astronomy:
- Observatory of the Campus (imager and spectrograph with didactics aims)
- Observatory Abrahão de Morais – Valinhos (Meridian circle, robotic telescope)

Infrastructure

- Acess to telescopes by the brazilian community
  - 4m SOAR (Chile; 33%)
  - 2 8m Gemini (Havaí + Chile; 6.5%) + (Subaru, Keck)
  - 1.6m & 0.6m of LNA/MCTI, M.G.
  - 13.7m radiotelescope of Itapetinga.
  - Acess to data (***and observing time***) at ESO, Keck, other, and space (HST, XMM-Newton, Chandra, Spitzer, Fermi, Planck, CoRoT, JWST, Gaia)



FELLOWSHIPS

- Essentially all students have a fellowship and an office with a computer.
  - CAPES/PROEX
  - CNPq
  - FAPESP (10% mestrado e 30% doutorado)

- Acess to infrastructure of USP:

  Restaurant

  Hospital Universitário

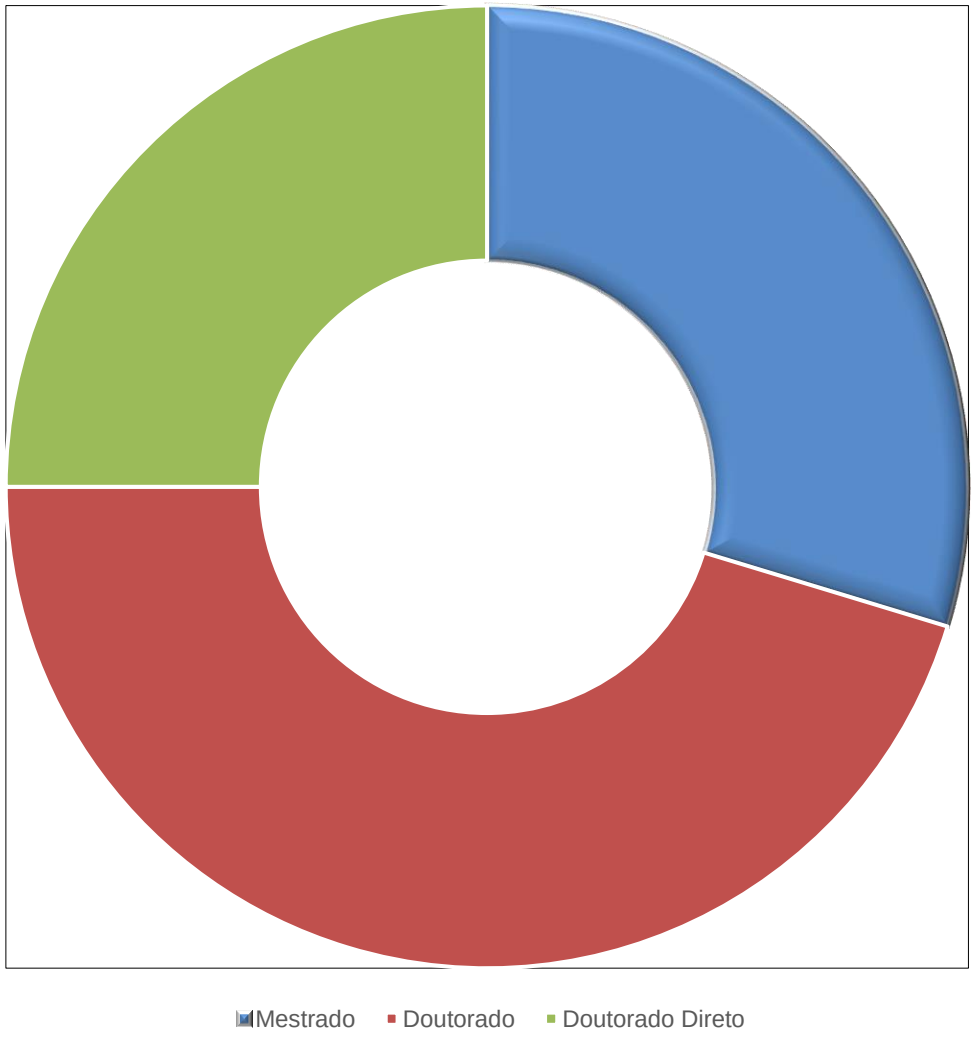
  CEPEUSP

  CRUSP

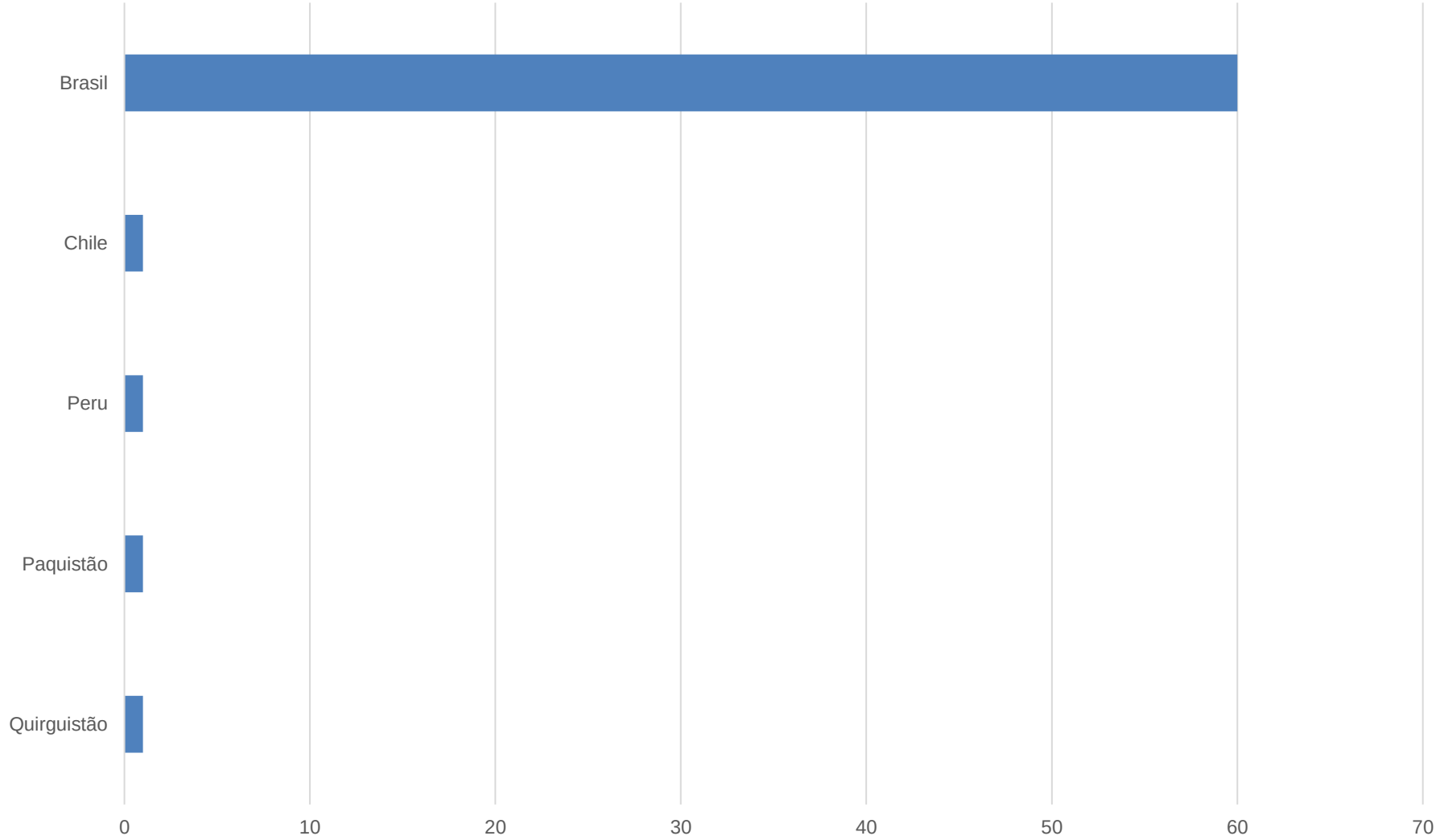
Number of graduate students

- Astronomia: 64 graduate students / 34 staff
  - 26 staff with credentials
- Geofísica: 48 graduate students / 19 staff
- Meteorologia: 79 graduate students / 23 staff
- MPEA: 20 master students / 21 staff

Students in astronomy: M, D, DD



Grad students in astronomy per country



Astronomers in Brazil (Round numbers)

Staff: 350

Post-doctoral fellows: 60

Graduate students: 300

Total: 710, members SAB: 800

No. Institutions: > 60

Abroad: > 50

FIM

FIM