



UNAM  
UNIVERSITY OF NAMIBIA

# Status of Astronomy in Namibia

Dr Michael Backes

UNAM – Department of Physics  
Head of Namibian H.E.S.S. group

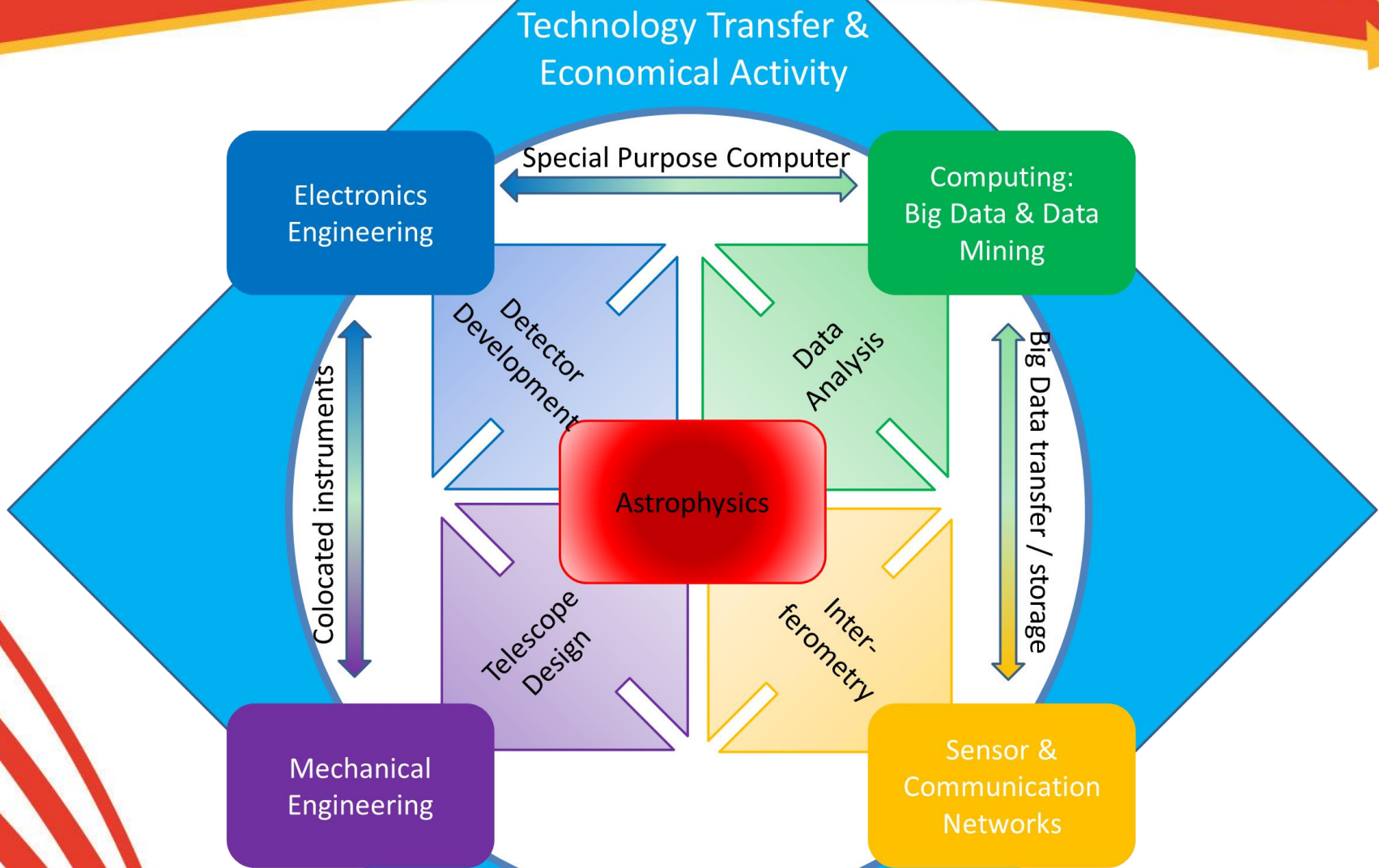
28<sup>th</sup> June 2018

# UNAM: Department of Physics

## Astrophysics & Space Science Research Group

1. **R Steenkamp**, PhD  
(HoD; Space Physics)
  2. **M Backes**, PhD FRAS  
(PG Training; Gamma-ray Astronomy)
  3. **R Evans**, PhD  
(Optical, IR & mm-wave Astronomy)
  4. **E Kasai**, PhD  
(Optical Spectroscopy)
  5. **ID Davids**, MSc  
(PhD stud: Gamma-rays – NWU)
  6. **H Ndiyavala**, MSc  
(PhD stud: Gamma-rays – NWU)
  7. **KP Shiningayamwe**, MSc  
(PhD stud: Gamma-ray instrumentation;  
collab: UOxford)
- MSc Students**
- a. **MS Nekwaya**, BSc (Hons)  
(MSc stud: Gamma-ray instrumentation;  
collab: UOxford)
  - b. **TT Nanghonga**, BSc (Hons)  
(MSc stud: Gamma-rays)
  - c. **VM Mantedo**, BSc (Hons)  
(MSc stud: Optical Astro)
  - d. **JNS Shapopi**  
(MSc stud: Gamma-rays; collab: MPI-K,  
Wits)

# Why Astronomy?



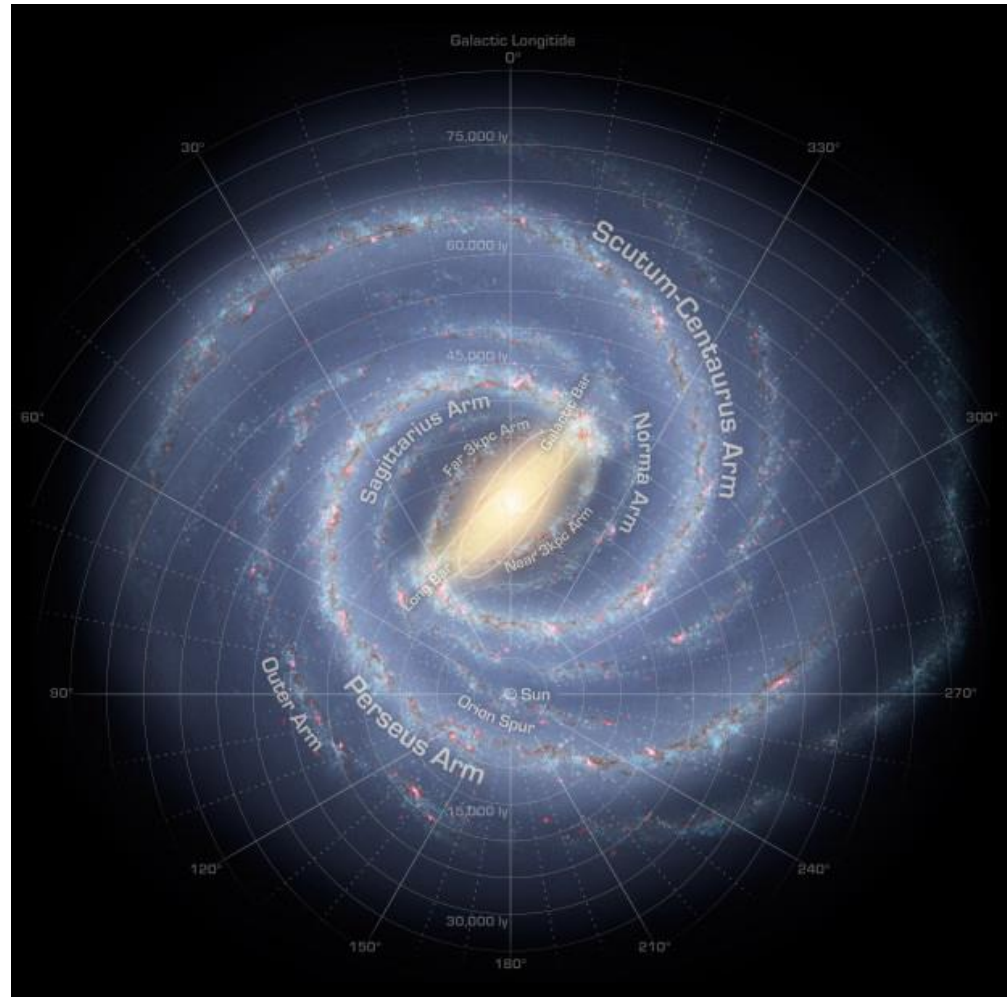
# Why Astronomy in Namibia?

*“Astronomy is one such disciplines where Africa enjoys a considerable comparative advantage, due to the excellent conditions for observation on our continent. (...) We must exploit this geographic advantage for the maximum benefit of our people.”*

**Hon. Naledi Pandor**  
Minister of Science and Technology (RSA)  
Windhoek, 12 August 2014

# Why Astronomy in Namibia?

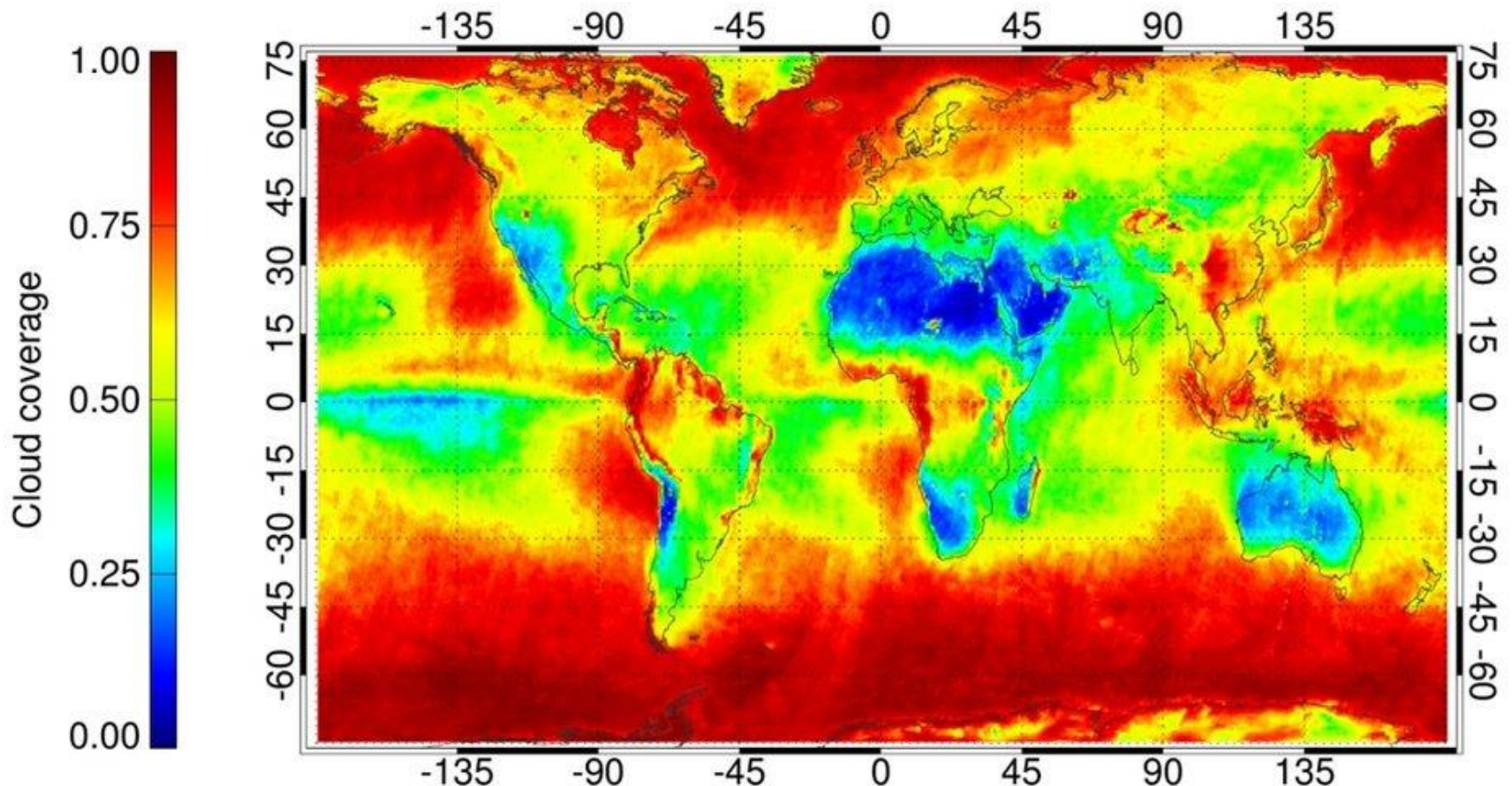
- Best view towards centre of the Milky Way:
- at  $-29^\circ$  latitude:
- visible in winter
- exactly overhead



<https://andrewrhodesphoto.wordpress.com/tag/guide-to-the-milky-way/>

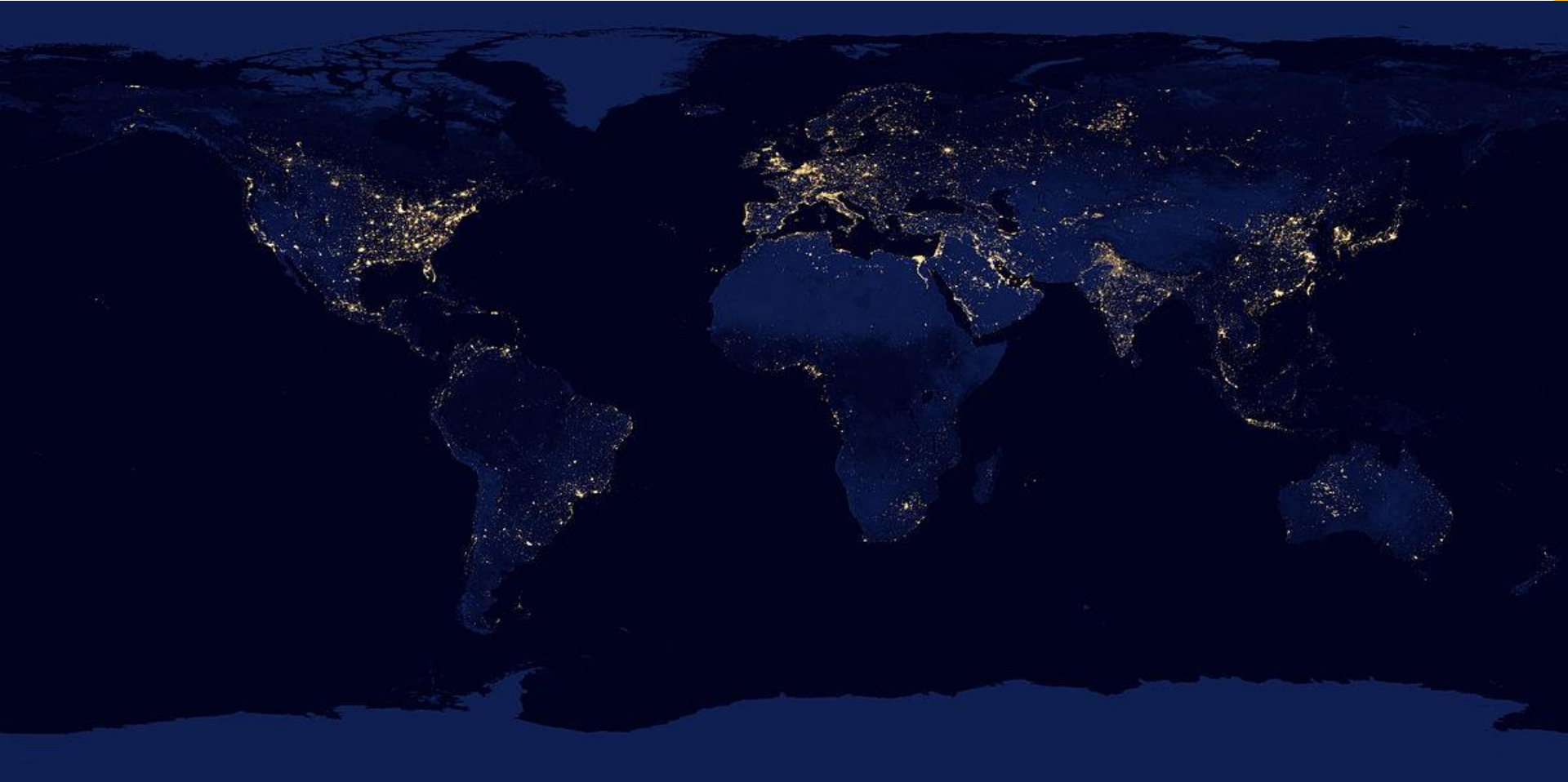
# Why Astronomy in Namibia?

## Average annual cloud cover



[[http://www.esa.int/spaceinimages/Images/2013/09/Cloud\\_cover](http://www.esa.int/spaceinimages/Images/2013/09/Cloud_cover)]

# Why Astronomy in Namibia?



# Why Astronomy in Namibia?

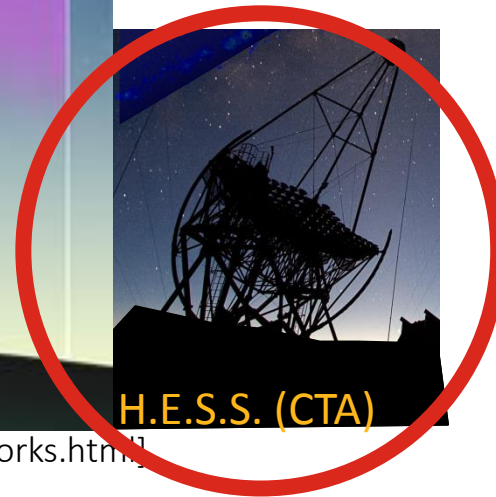
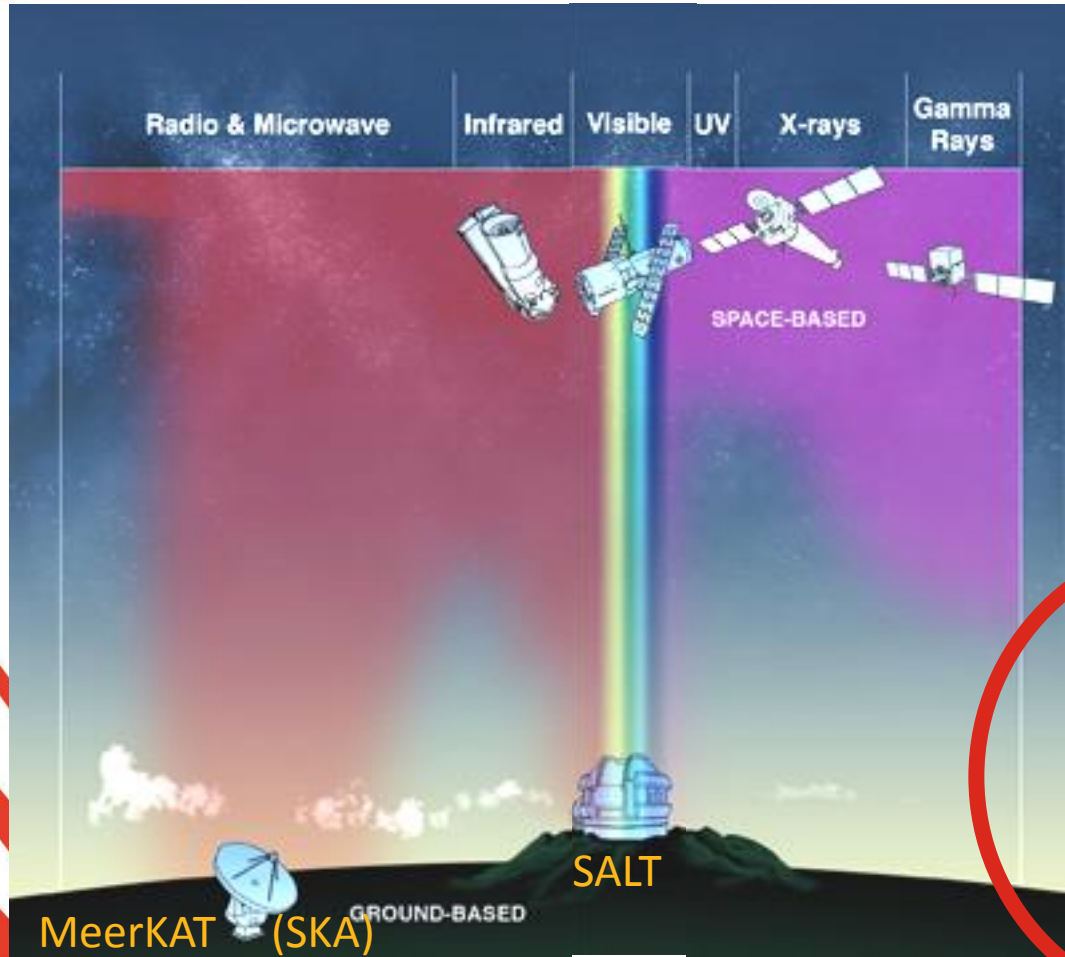


FloriansPhotographs.blogspot.com

[<https://apod.nasa.gov/apod/ap160515.html>]



# Ground-based Astronomy



[<http://www.astro.ucla.edu/~stacee/staceehowitworks.html>]

# H.E.S.S.: Phase I (2002-2012)

High Energy Stereoscopic System



4 Gamma-ray telescopes

12m diameter, separated 120m apart

# H.E.S.S.: Phase I (2002-2012)

107m<sup>2</sup> mirror  
380 facets  
12m diameter  
15m focal  
length



# H.E.S.S.: Phase I (2002-2012)



12

960 pixels  
5° field of view  
16ns integration time  
200-300 images/s  
1000 hours / year

# H.E.S.S.: Camera Upgrade



# H.E.S.S.: Camera Upgrade

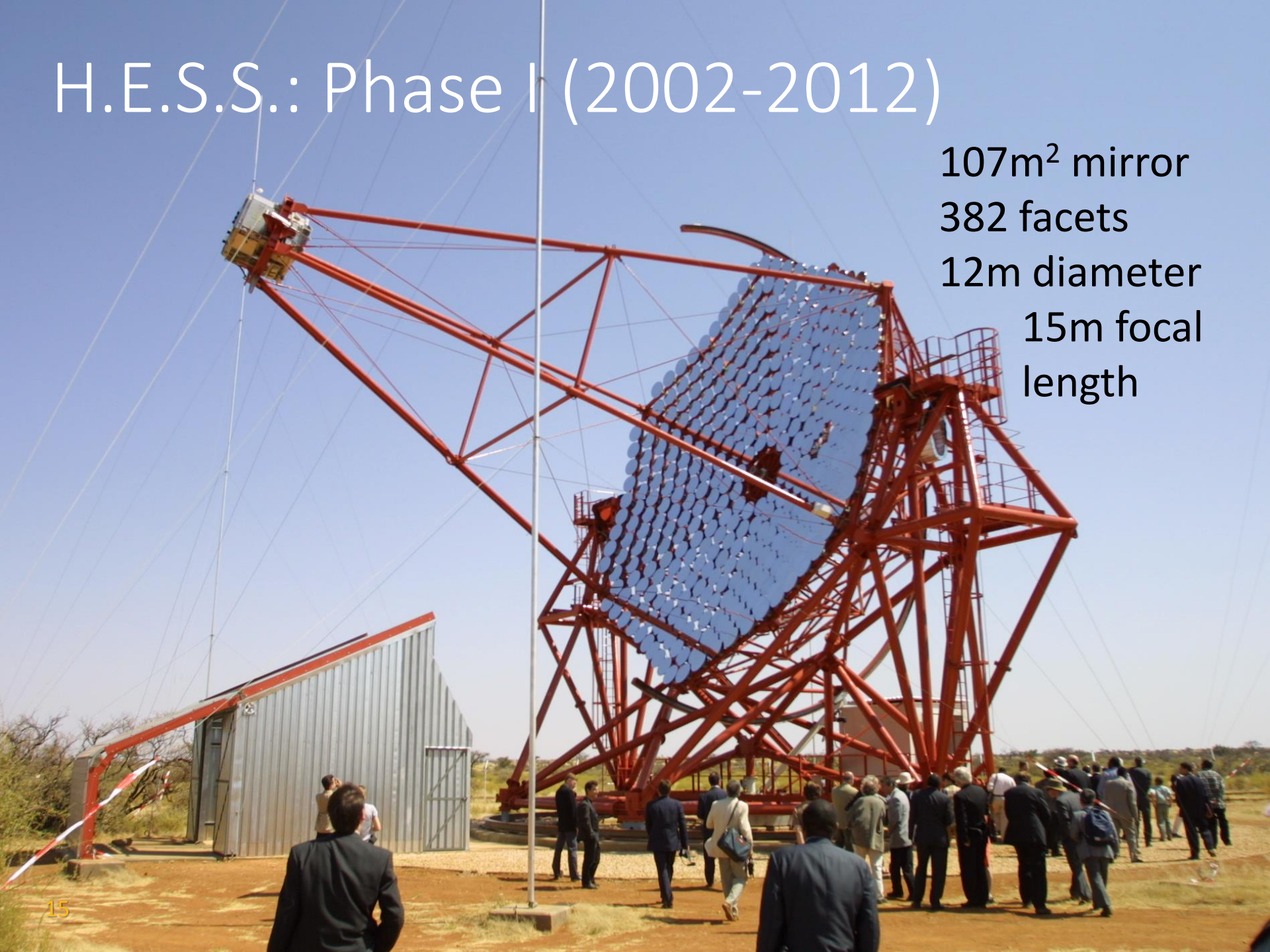


Electronic pedestal investigation  
of front-end electronics



# H.E.S.S.: Phase I (2002-2012)

107m<sup>2</sup> mirror  
382 facets  
12m diameter  
15m focal  
length



# H.E.S.S.: Phase II (since 2012)

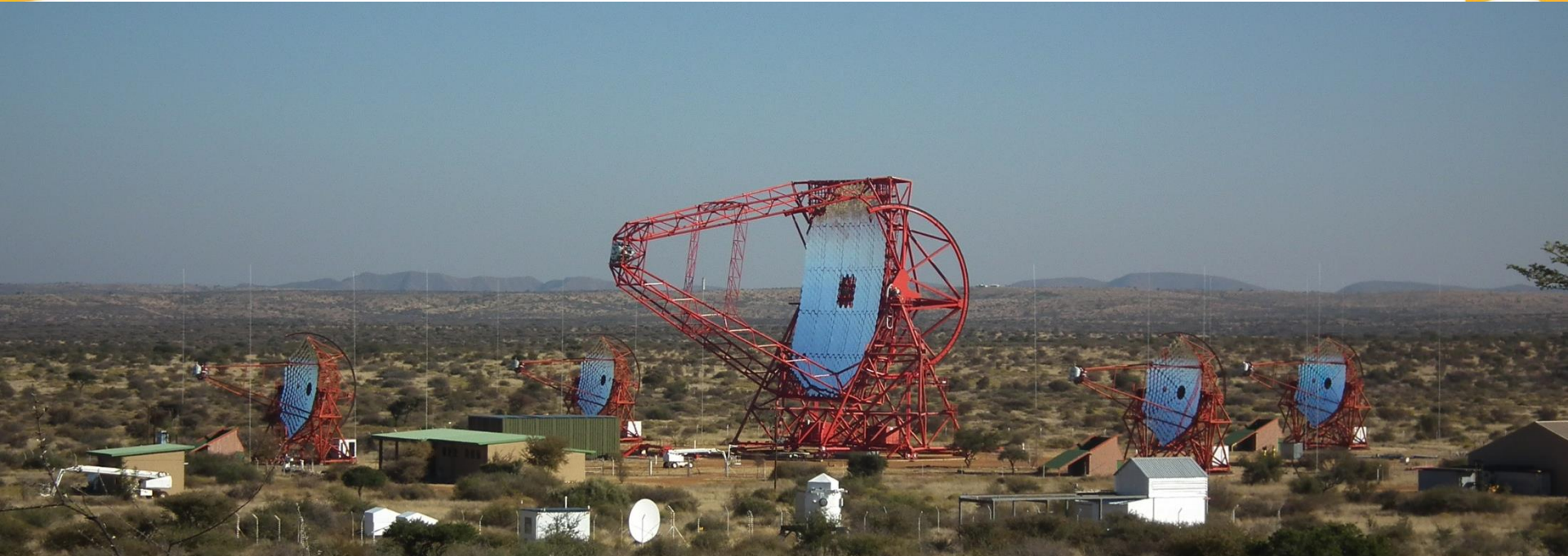
614m<sup>2</sup> mirror  
875 facets  
28m diameter  
36m focal length





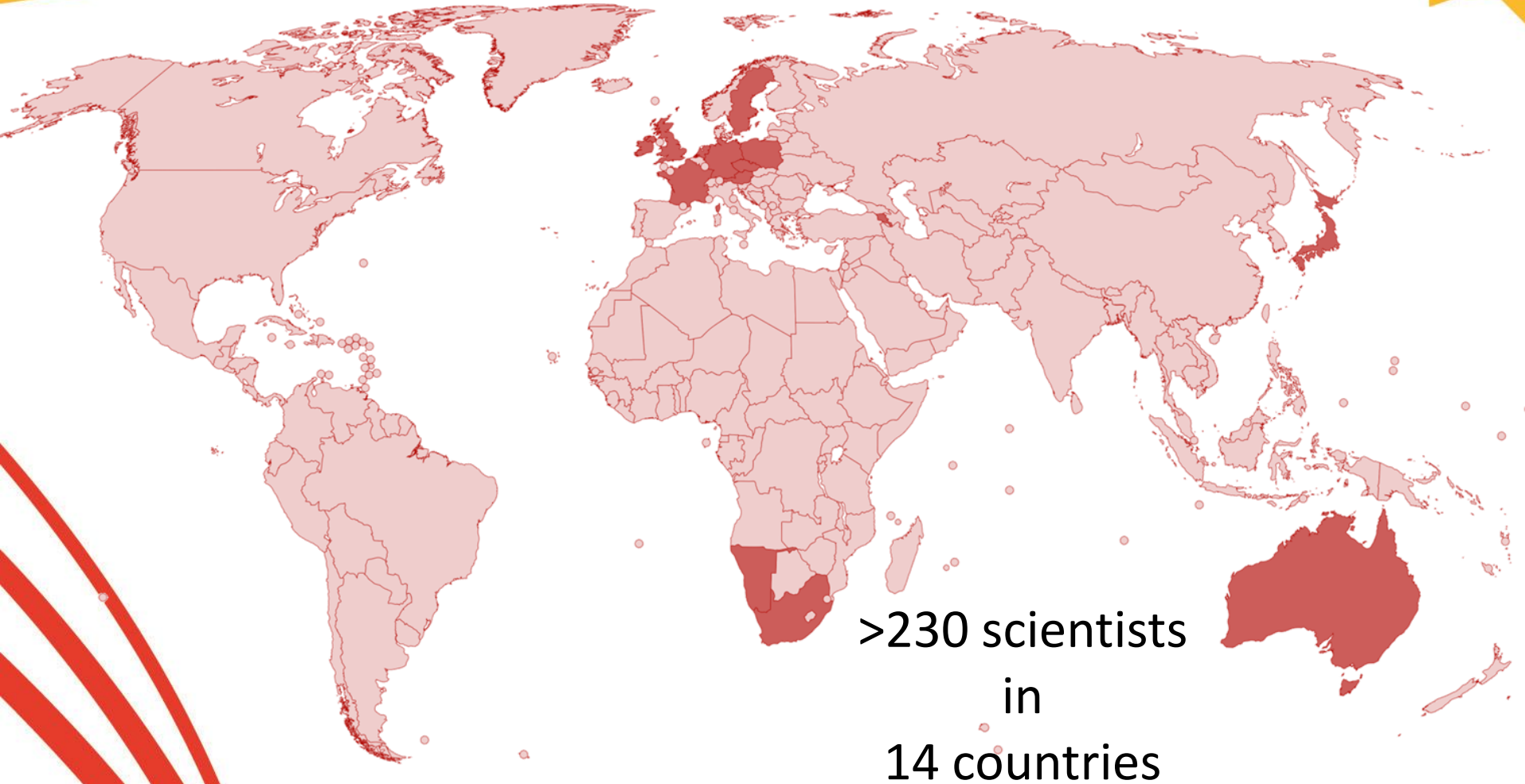
# H.E.S.S.: Telescopes

High Energy Stereoscopic System



since 2002: 4x 12m telescopes  
since 2012: central 28m telescope,  
i.e.  $614\text{m}^2 = 2$  tennis courts of mirrors

# H.E.S.S.: The Collaboration



# H.E.S.S.: A 10 year success II

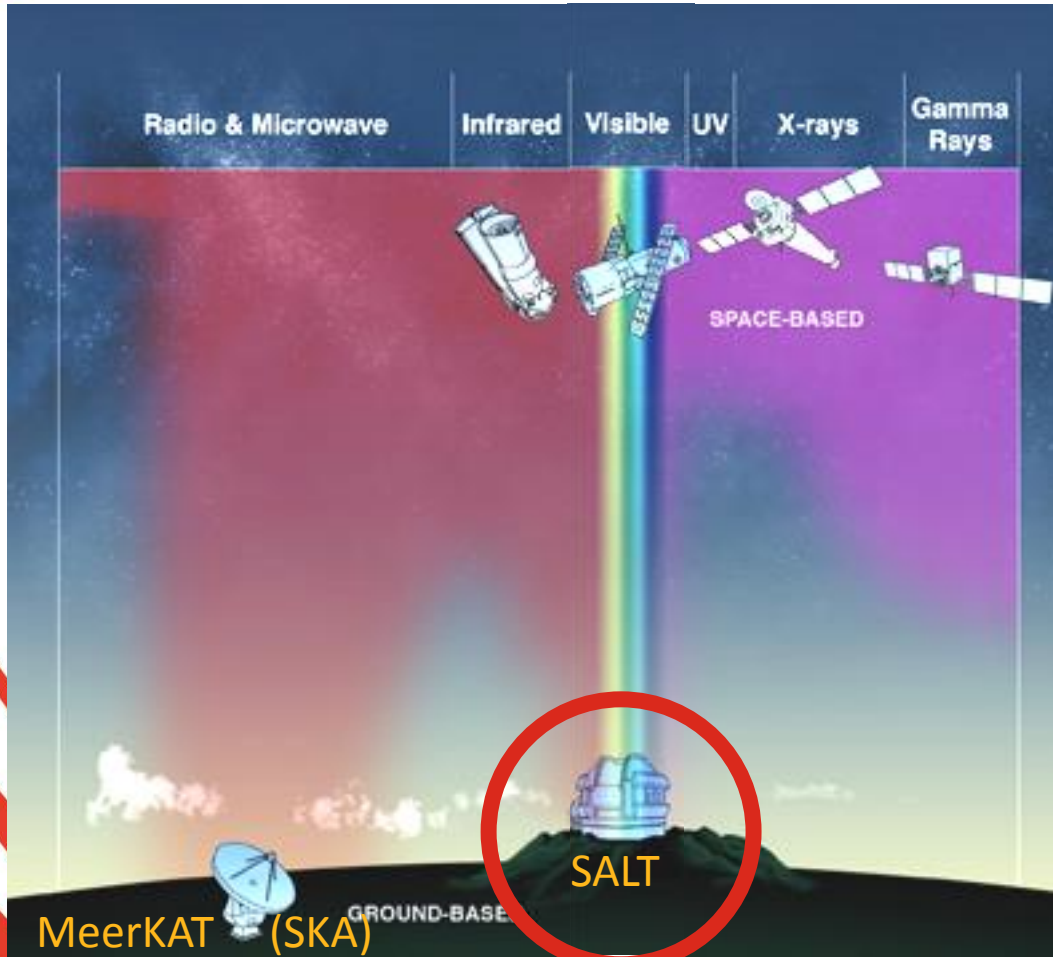
Rank				
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Key	<p><b>Descartes research prize 2006</b></p> <p>Excellence in scientific collaborative research</p> <p><b>Laureate</b></p> <p><i>We, the 2006 Descartes Prize Grand Jury, hereby certify that the research project entitled</i></p> <p><b>H.E.S.S.</b></p> <p>The High Energy Stereoscopy System</p> <p>by</p> <p><b>Prof. Werner HOFMANN</b></p> <p>Max Planck Institute for Nuclear Physics, GERMANY</p> <p><i>in collaboration with</i></p> <p><small>Dr. Michael Panth, Institut National de Physique Nucléaire et de Physique des Particules, France • Dr. Paula Chadwick, University of Durham, United Kingdom • Prof. Thomas Lohse, Humboldt-Universität zu Berlin, Germany • Dr. Philippe Goret, Commissariat à l'Énergie Atomique, Centre de Saclay, France • Prof. Goetz Heinzelmann, University of Hamburg, Germany • Prof. Stefan Wagner, Universität Heidelberg, Germany • Dr. Helene Sol, Institut National des Sciences de l'Univers, France • Prof. Reinhard Schlickeiser, Ruhr-Universität Bochum, Germany • Prof. Luke O'Connor Drury, Dublin Institute for Advanced Studies, Ireland • Prof. Ladislav Rob, Charles University, Czech Republic • Prof. Orker Comelis de Jager, North-West University, South Africa • Prof. Christian Stegmann, Friedrich-Alexander Universität Erlangen-Nürnberg, Germany • Prof. Andrea Santangelo, Eberhard Universität Tübingen, Germany • Prof. Michal Ostrowski, Jagiellonian University, Poland • Dr. Rüdik Bronislaw, Nicolaus Copernicus Astronomical Center, Poland • Dr. Ashot Akhperjanian, Yerevan Physics Institute, Armenia</small></p> <p><i>Has been selected as a laureate of the European Union Descartes Research Prize 2006</i></p>			
[Natur		<p><b>Janez Potočnik</b> Commissioner for Science and Research</p>	<p><b>Claudie Haigneré</b> President of the Grand Jury 2006</p>	<p><b>CAPACITIES</b></p>

telescope

# H.E.S.S.: Namibian Participation

- **Regular contacts with international experts**
- **Since 2013:**
  - 1 Ph.D. at NWU (back at UNAM since 2016) on AGN
- **Since 2014:**
  - 5 B.Sc.(hons) students have done 1 month observation shifts
  - 3 B.Sc.(hons) student data analysis (thesis)
- **Since 2015:**
  - 1 M.Sc. student involved in technical upgrade of the cameras
- **Since 2016:**
  - NCRST support
  - 2 MSc students have served as observation shift leaders
- **Since 2017:**
  - 1 Ph.D. student on astrophysical observations (Globular Clusters)
- **Since 2018:**
  - 1 Ph.D. student on technical topic (calibration, timing)
  - 1 M.Sc. student on technical, 1 on astrophysical topic (AGN)
  - ...

# Ground-based Astronomy



[<http://www.astro.ucla.edu/~stacee/staceehowitworks.html>]

# Opt. Astronomy: Observatories



# Opt. Astronomy: CHMO

## Cuno Hoffmeister Memorial Observatory (CHMO)

- 14" telescope
- Professional camera & filters for astronomical observations

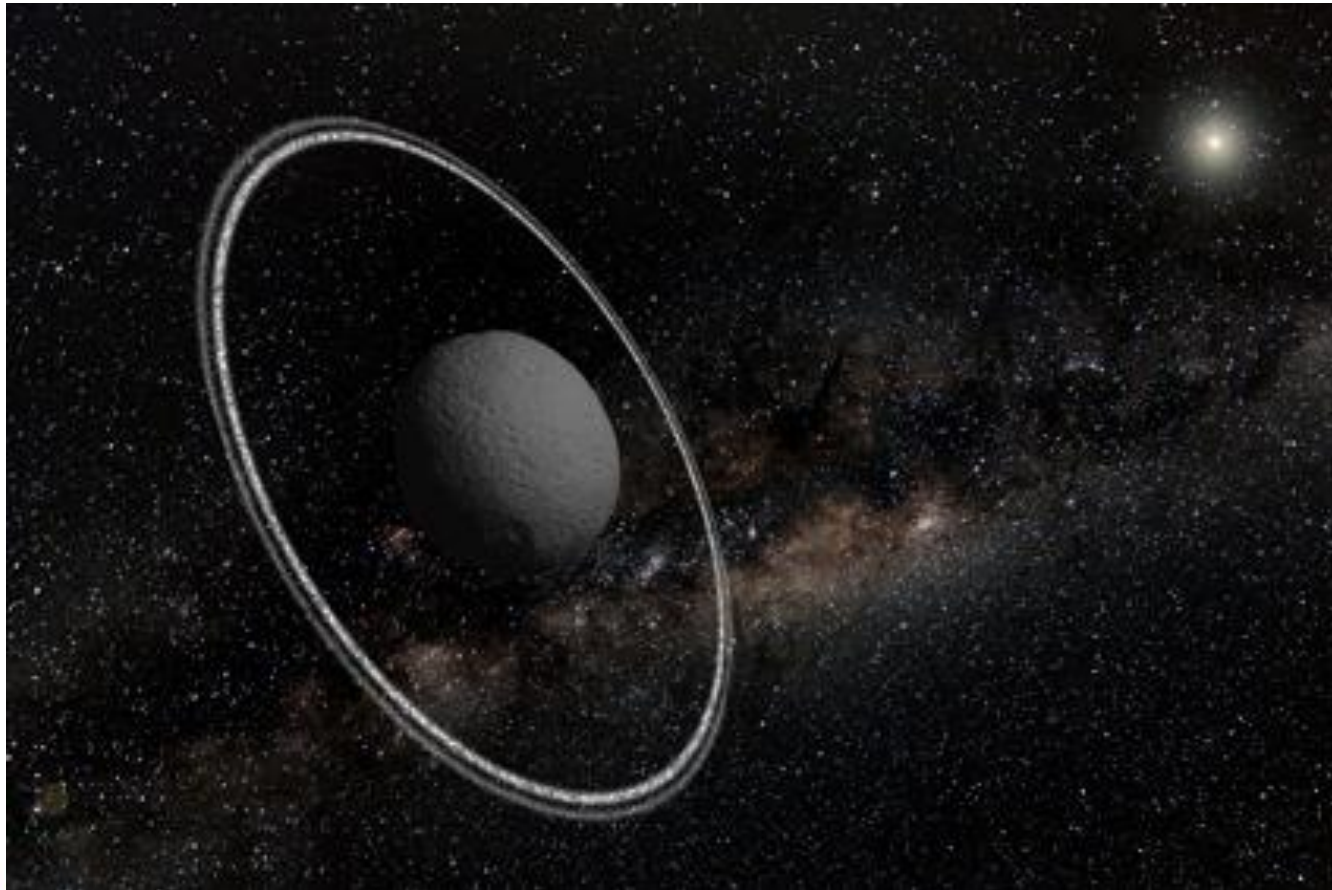
Collaborators:  
Université & Observatoire Paris



Office of Astronomy for Development

# Opt. Astronomy: Occultations

**Collaborators: Université & Observatoire Paris, IOTA-ES**

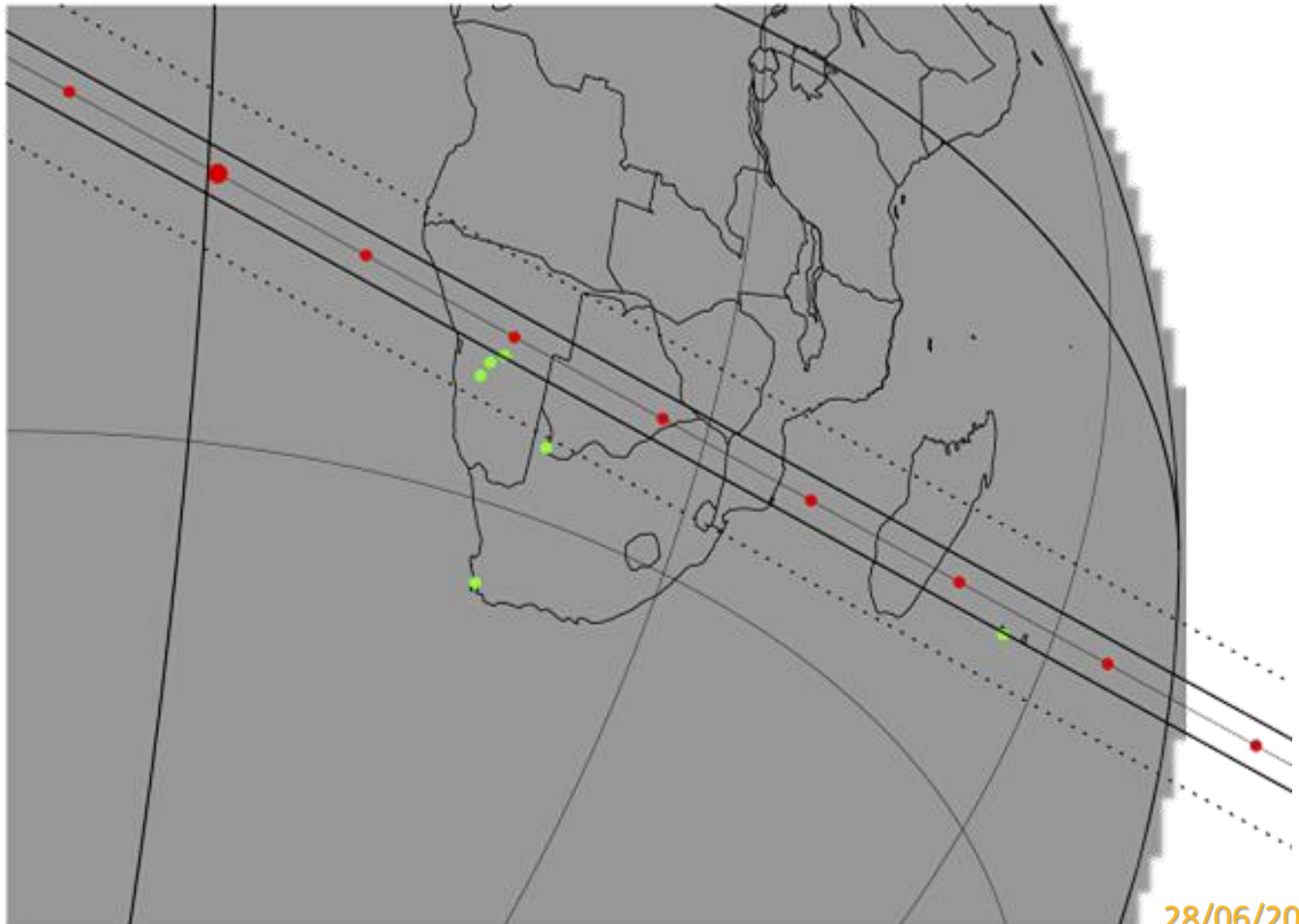


<https://www.obspm.fr/decouverte-inattendue-d.html?lang=en>



# Opt. Astronomy: Occultations

**Collaborators: Université & Observatoire Paris, IOTA-ES**



M. Backes: Status of Astronomy in Namibia

28/06/2018  
ACP2018, Windhoek

# Opt. Astronomy: Occultations

**Collaborators: Université & Observatoire Paris, IOTA-ES**



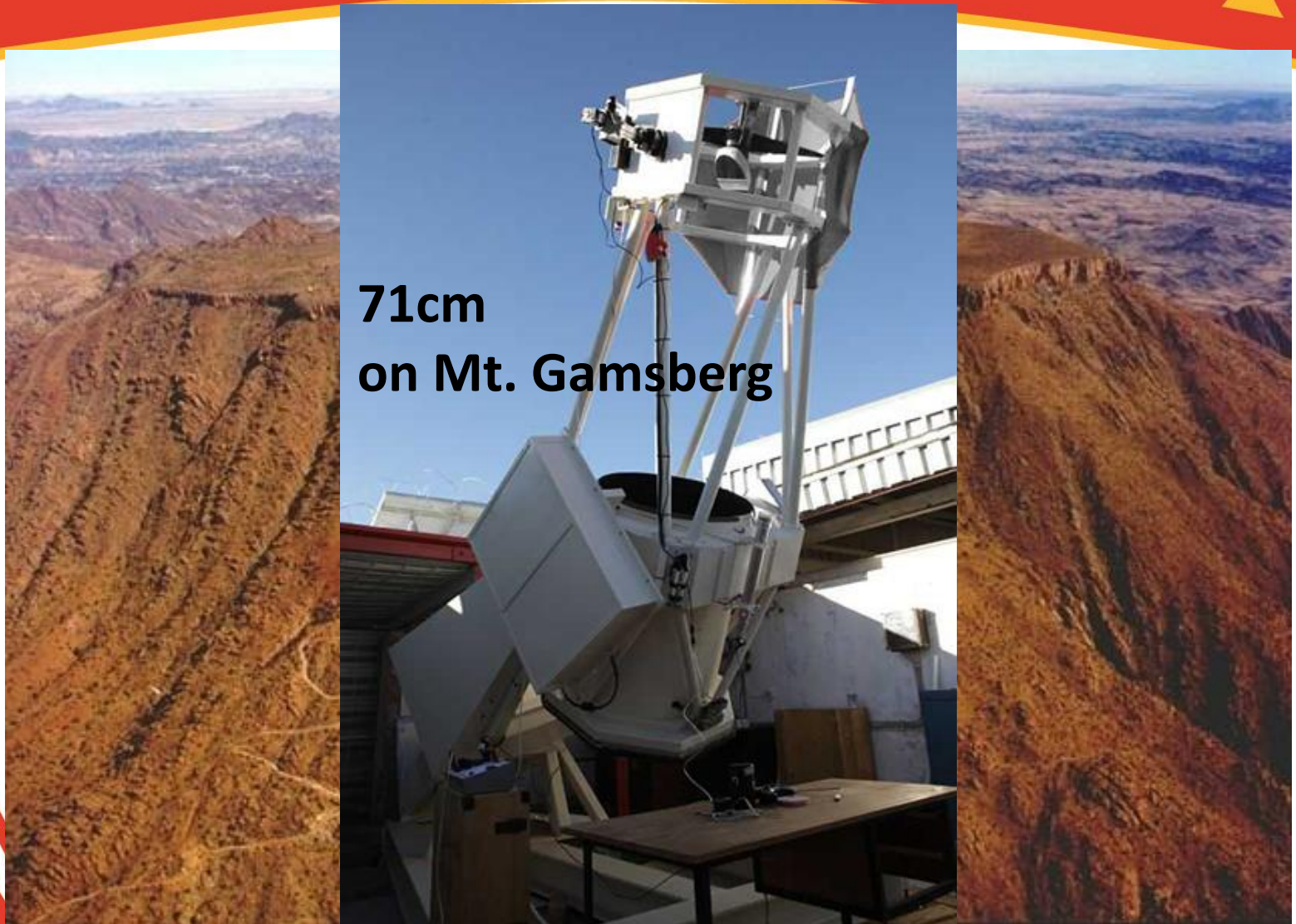
# Opt. Astronomy: IAS

## International Amateur Observatory

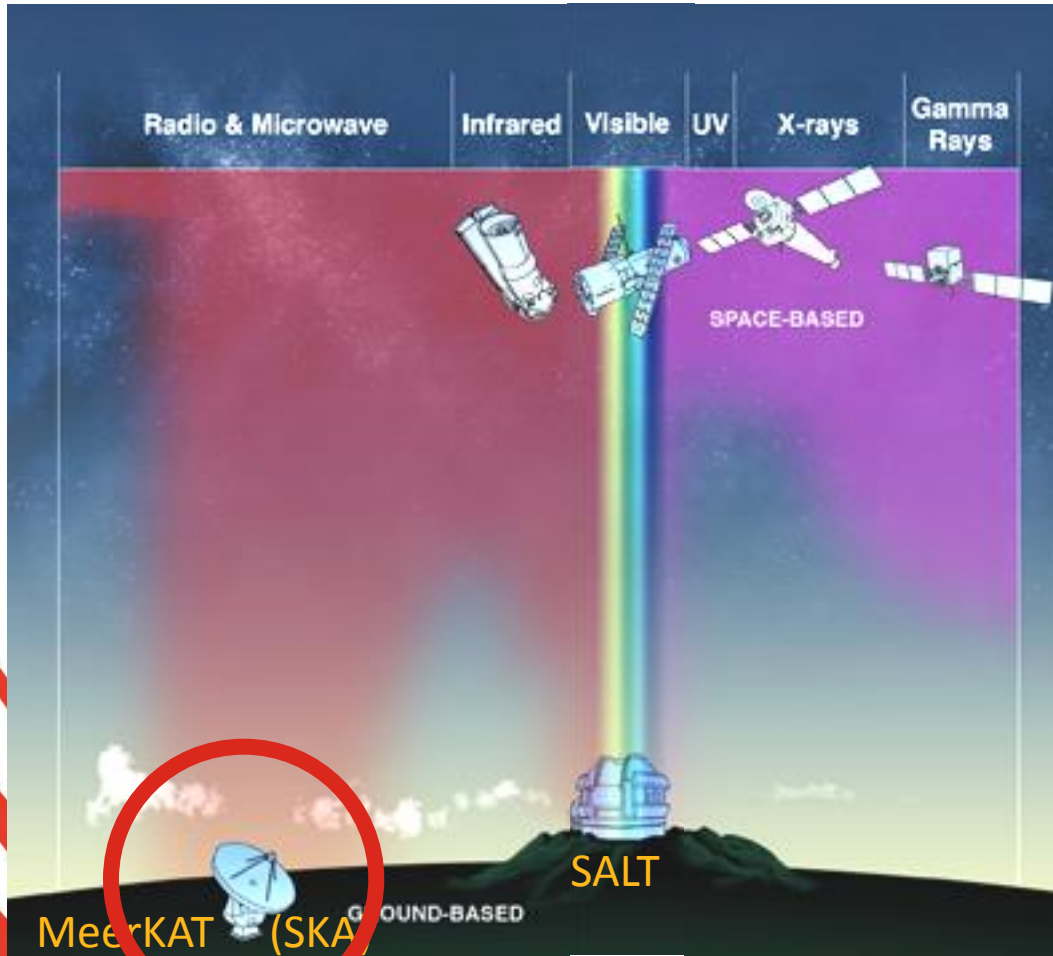
several 50cm  
telescopes



# Opt. Astronomy: IAS



# Ground-based Astronomy

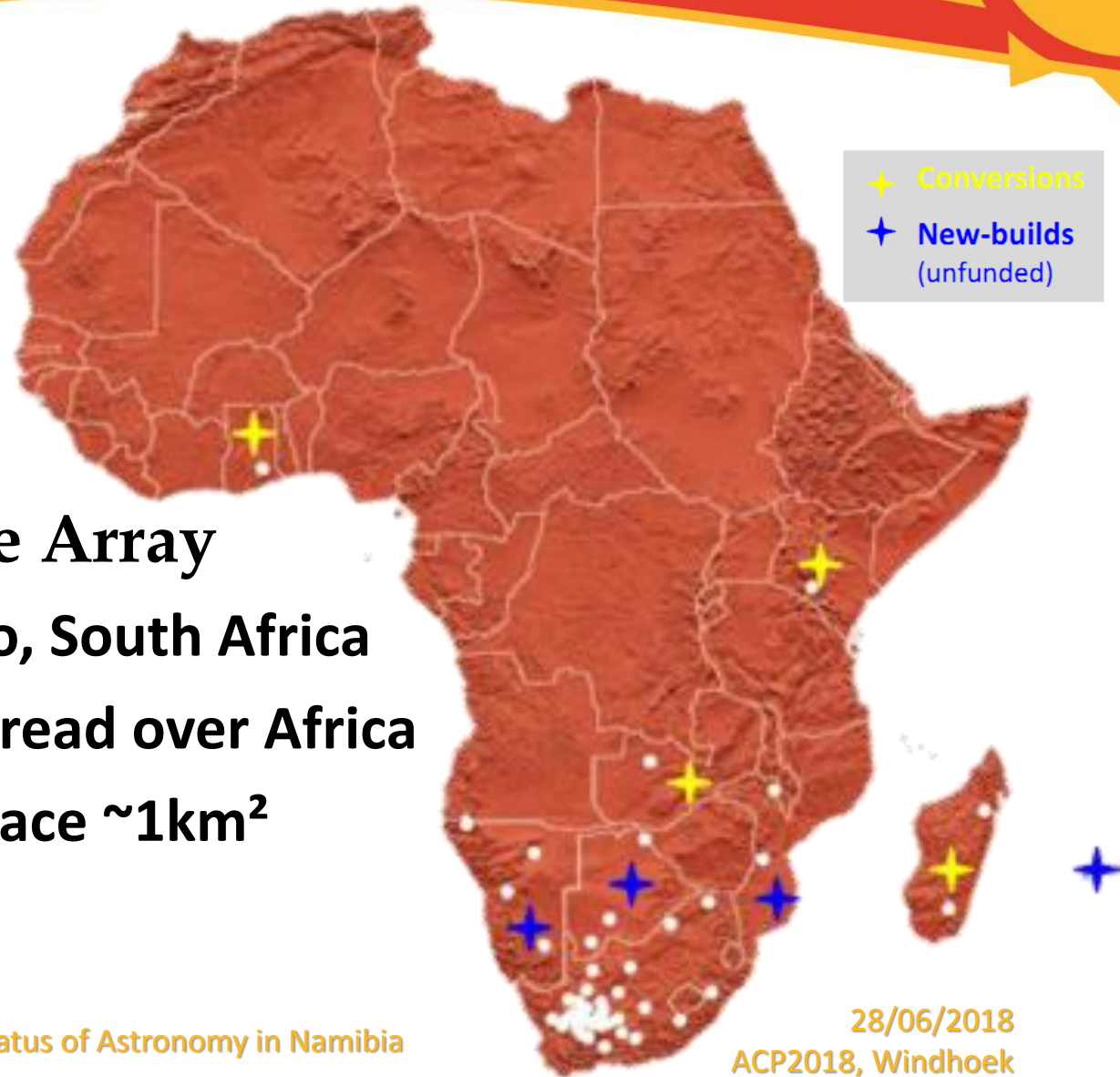


[<http://www.astro.ucla.edu/~stacee/staceehowitworks.html>]

# Radio Astronomy: SKA

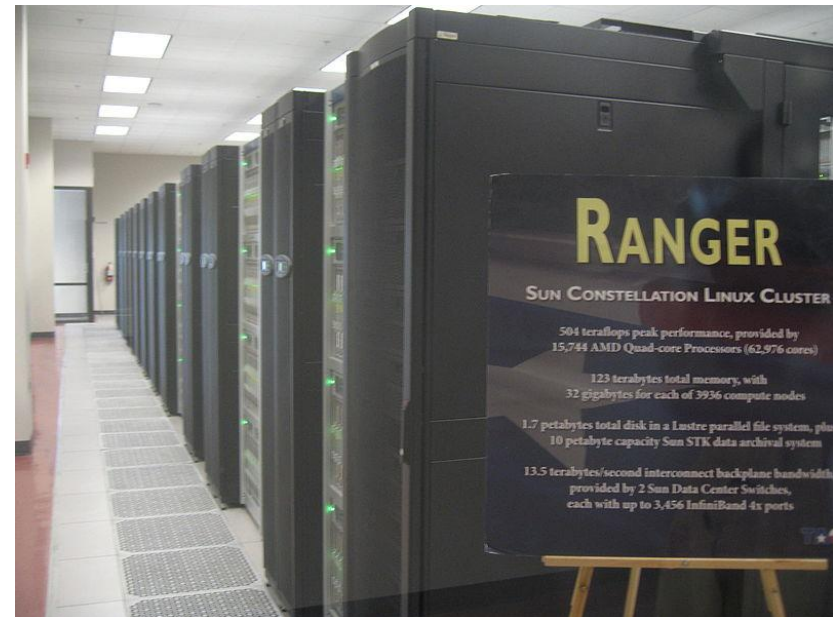
## Square Kilometre Array

- Core array in Karoo, South Africa
- Several outpost spread over Africa
- Total reflector surface  $\sim 1\text{km}^2$



# SKA: Namibian Participation

- Namibia on governmental/agency level involved
- Support for training through UK-SA Newton Fund
- 2 High Performance Computing clusters being set up:
  - 768 cores, > 1TB RAM, eachcollaboration: CHPC (Cape Town)



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- **MeerKAT single-dish telescope to be build (prob.) 2018 for African VLBI network (AVN) as HCD pathfinder**



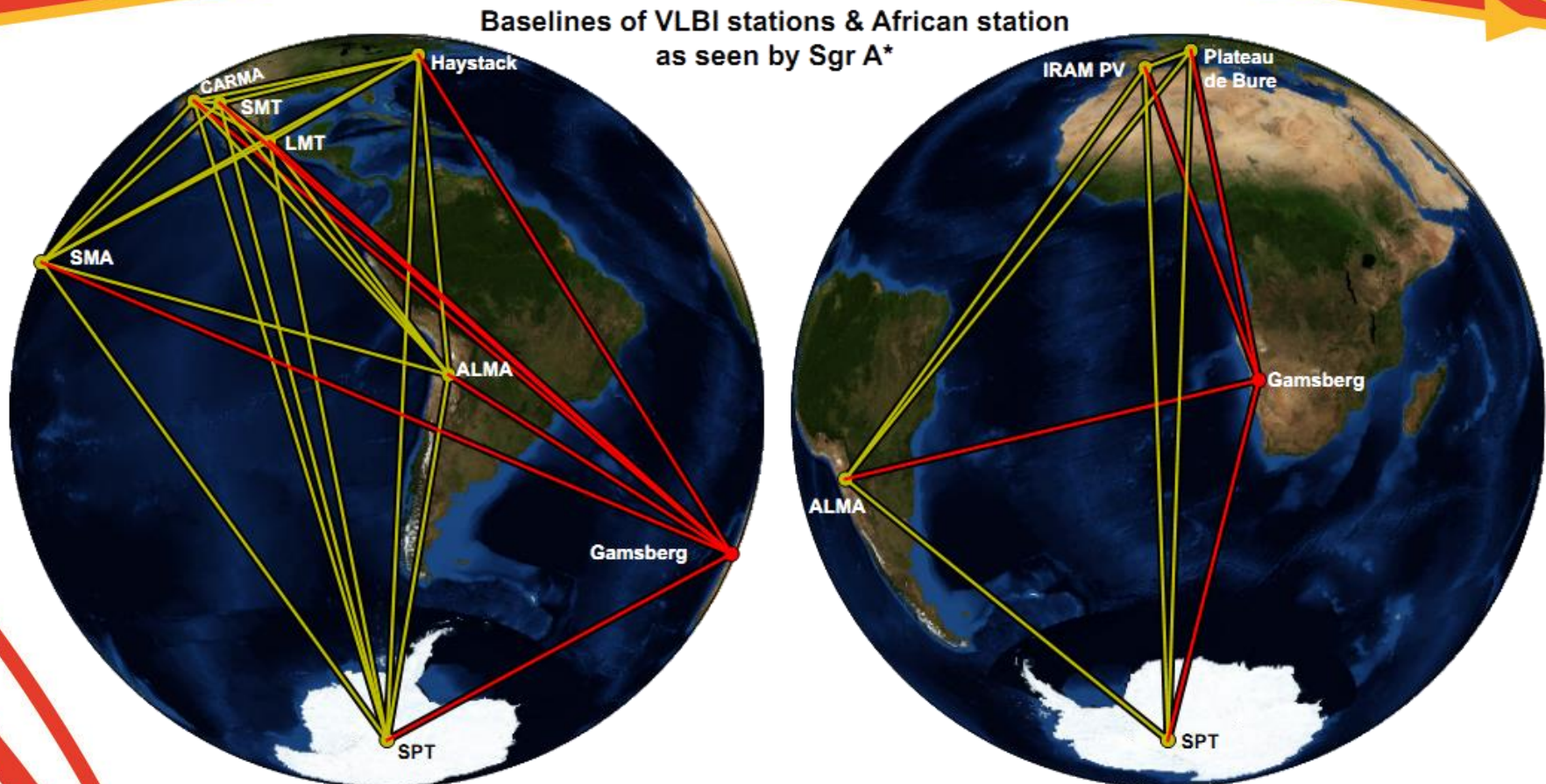


# Africa Millimetre Telescope

RU Nijmegen, MPIfR Bonn, HartRAO, Onsala, UNAM



# Event Horizon Telescope + AMT



Namibia connects to all the high-sensitivity telescopes: IRAM Pico Veleta (PV), NOEMA (Plateau de Burre); ALMA; LMT

# Mt. Gamsberg (2,347 m)



# ***Radboud University branching out to Namibia***

Date of news: 4 October 2016

**The Vice Chancellor of the University of Namibia, Prof. Lazarus Hangula and Prof. Gerard Meijer, president of the executive board of Radboud University, signed a Memorandum of Understanding today. This collaboration is a further step in the internationalisation of the Radboud University and a step in the development of research education in Africa.**



# HCD: DARA training



Posters:

Status of Astronomy in Namibia

The Africa Millimetre Telescope

Thank You

