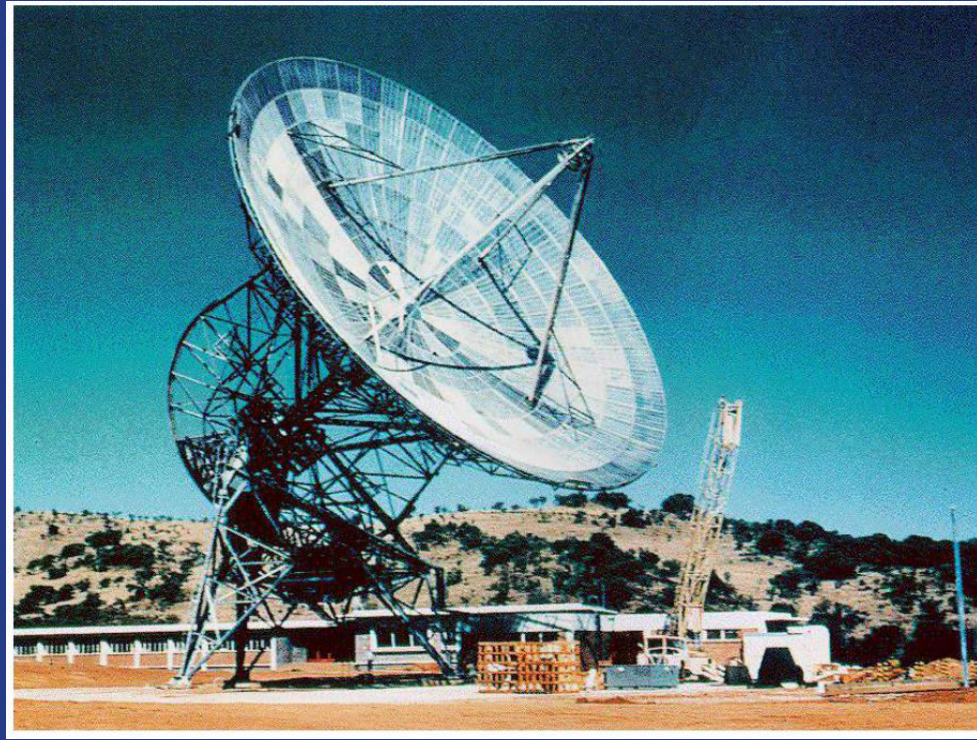


INVESTMENT IN SPACECAN DEVELOPING COUNTRIES BENEFIT?

Pontsho Maruping, Chairperson – South African Council for
Space Affairs

Topics

- Where did it all begin?
- The Sumbandila experience
- What can we learn from the SKA SA approach?
- Final word

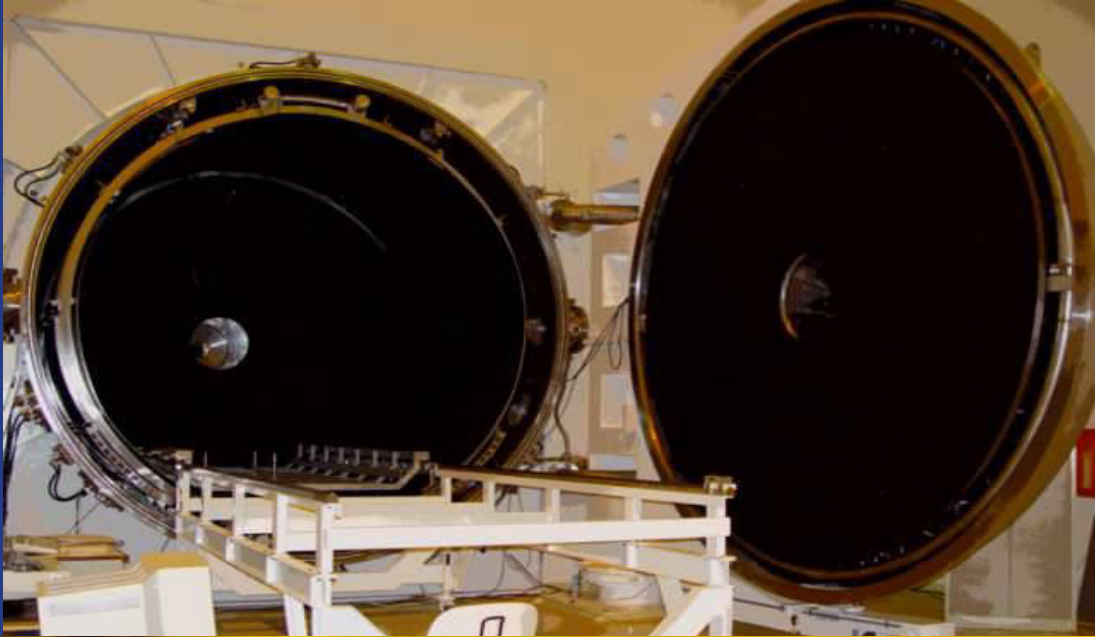


WHERE IT BEGUN

Cape of Good Hope....circa 1820

Then...

Date	Events
1820	Royal observatory opened
1961	Deep Space Station 51 built in Hartebeeshoek by NASA to track deep space probes
1950s -1970s	Satellites tracked by scientists upper atmospheric effects on orbits
1965	First images of Mars received at Hartebeeshoek
1968-1981	South Africa ratifies space treaty and signs conventions
1975	Deep Space Station converted to Hartebeeshoek radio astronomy observatory
1980s - 1994	Program to build and launch reconnaissance satellites is implemented
1993-94	Space Affairs Act passed and amended
1999	Sunsat satellite launched
2008	SANSA Act passed
2009	Sumbandila launched

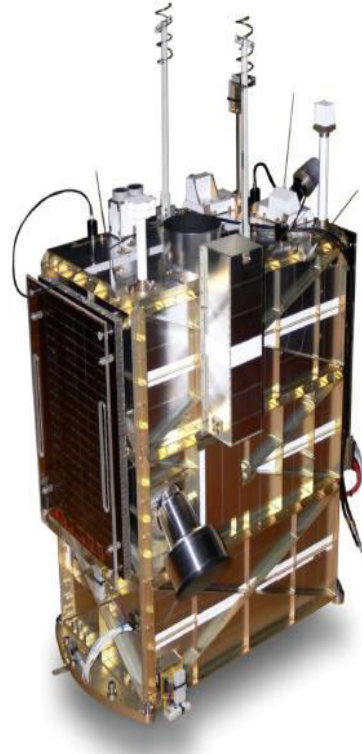


SUMBANDILA EXPERIENCE

Small satellite with a big mission

What we paid for

- Development of an 80 kg satellite
- Training of 9 interns
- Launch of a satellite

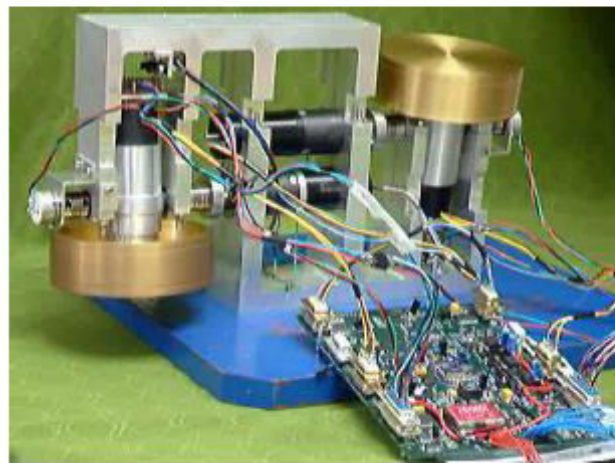
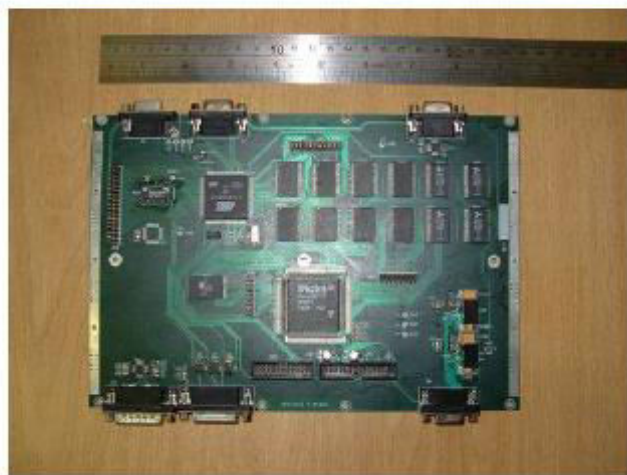


What was delivered?



Cape Town, 20/2/2010, Sumbandilasat, False colour RGB, Roll angle = 19°





Industrial participation

Name of Company	Number of Employees
British American Tobacco	70
Calculus Products	35
Clip-Lok Sim-Pak SA	12
Comar International	23
Daliff Engineering	45
Denel Optronincs	
Dowd Engravers	20
Flexi-Gear & Engineering	13
GCC U/S	12
ITM U/S	30
Sagex	400
SED U/S	4
SMD U/S	6
Tellumat	100
West Eng Supply Co	13

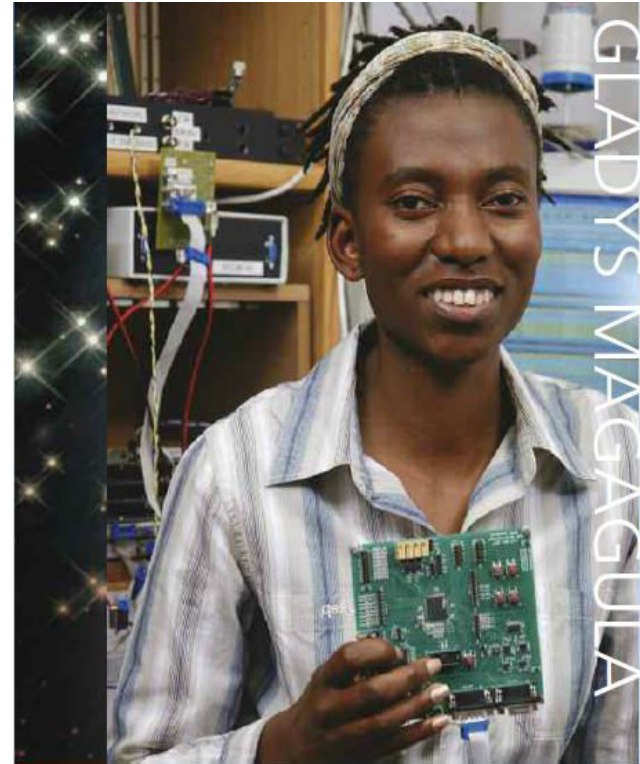
Name of Company	Number of Employees
Aeromec Engineering	40
Barry Stott Cases	3
C&C Tooling	3
CHg Engineering	7
Chromar	1
Elite Engineering	4
Fabrinox	50
GRP Tubing	11
Loci Laser Cut & Manufacturing	12
Proto Engineering	20
Stopak	200

Name of Company	Number of Employees
BJR	10
Clive Wire Cutting	3
Eikestad Bolt & Nut	3
ISSA	20
M&H Engineering	2
Metal Grapho	200
Multicam RSA	7
Pro-Bolt	3
Schuurmans	60
Somchem	
Strand Anodizing	2
Techni-Rig & Freight	10
Theo Marnewick Engineering	3
Topfast	8
West Beach Instrumentation	5



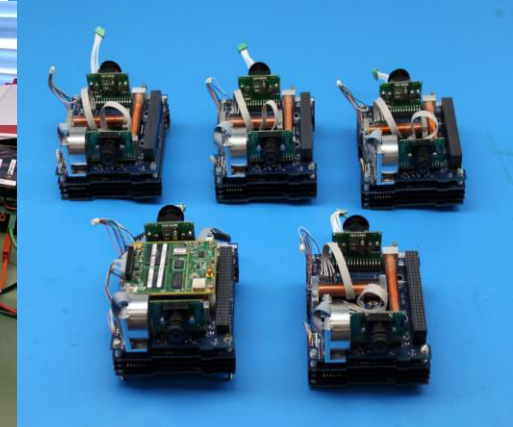
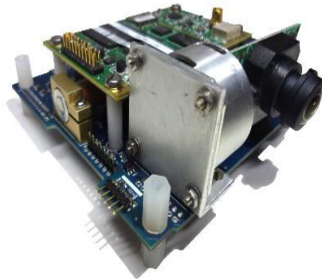
What was delivered?

- 9 trainee engineers
- 19 Masters
- 3 PhDs
- Experience for 78 engineers

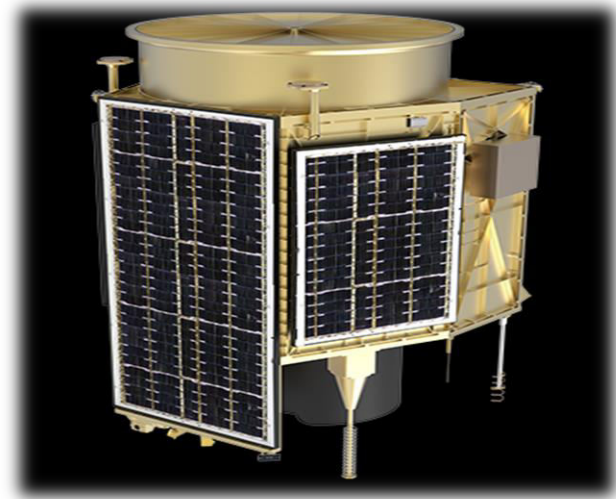
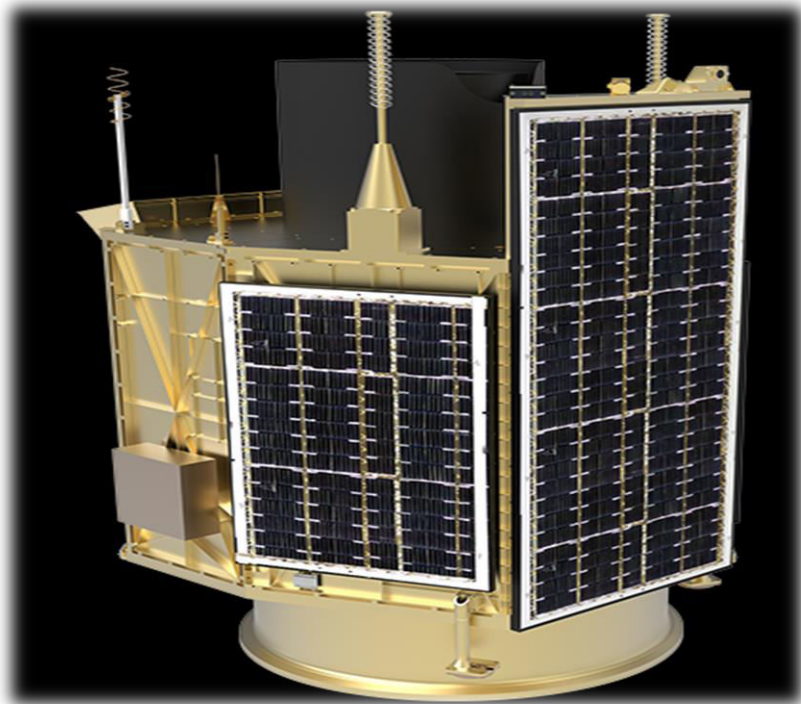


Collaboration...leading to CubeSats

- ❑ TshepisoSat launched in 2013
- ❑ 2 CubeSats as part of QB50 mission in 2017
- ❑ Supplied 15 ADCS units supplied to other teams in the mission
- ❑ 97 satellite engineering post-grads
- ❑ Potential spin-offs

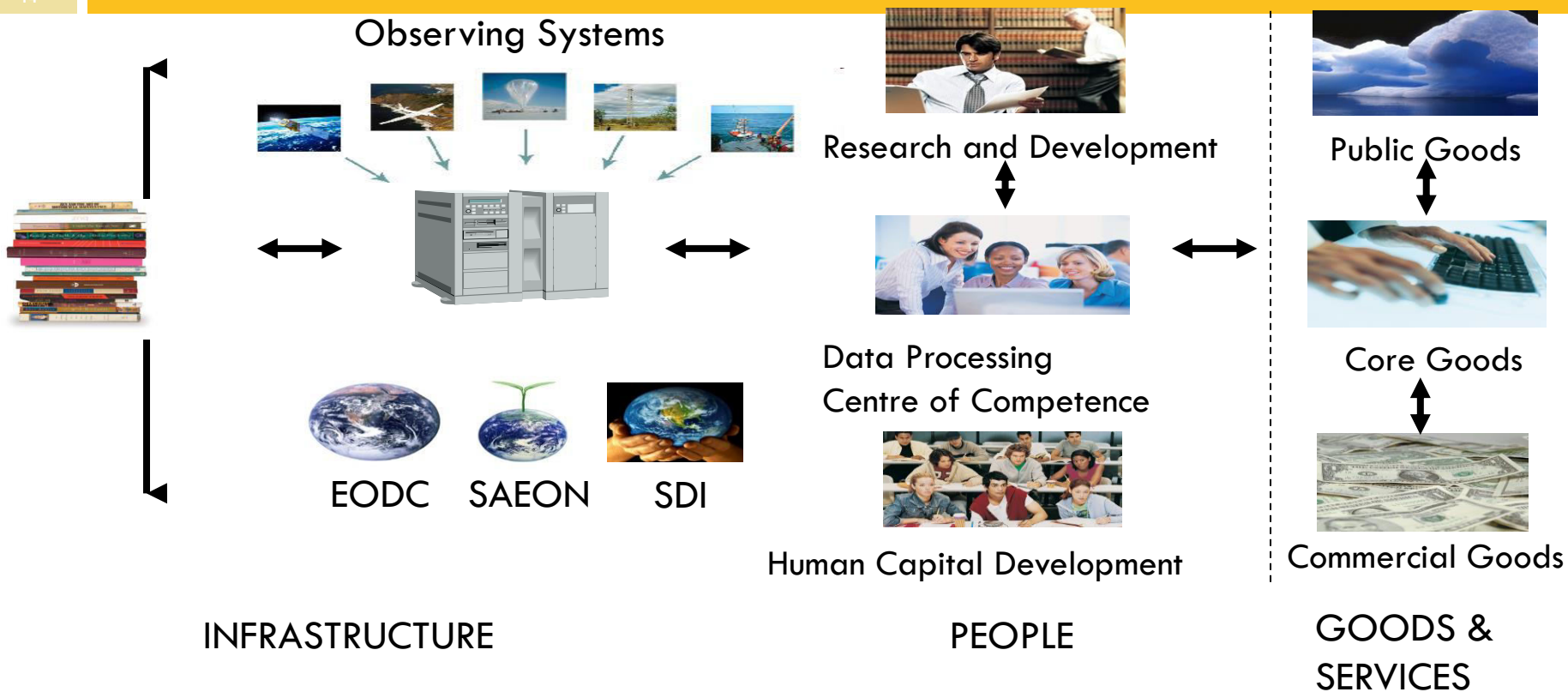


ZA-ARMC1 - Satellite under development



More Skills in Space Application Value Chain

14



WHAT CAN WE LEARN FROM SKA SA?

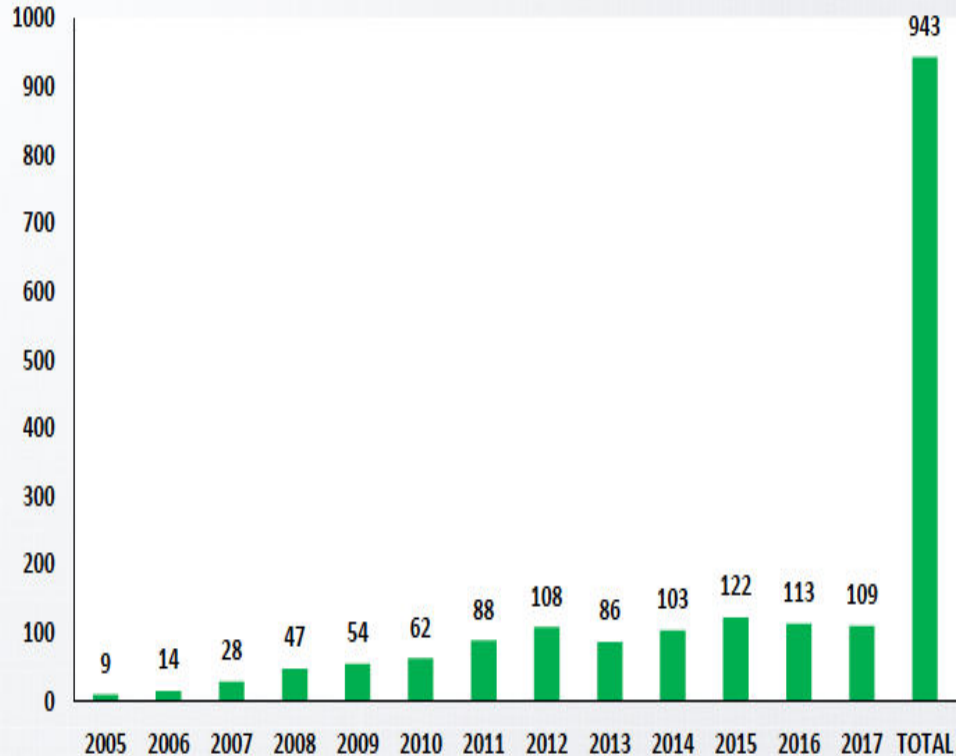
Big science

Secure political buy in

- Astronomy
Geographic
Advantage Act
- Bid process

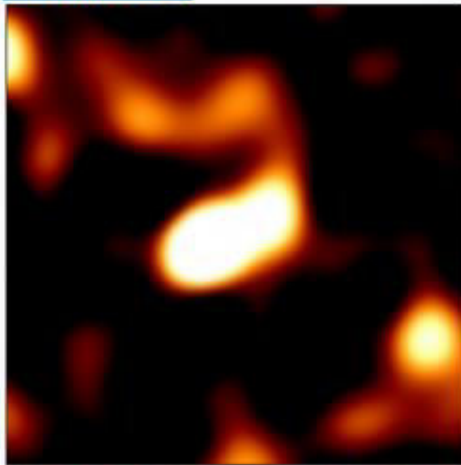


Start HCD early

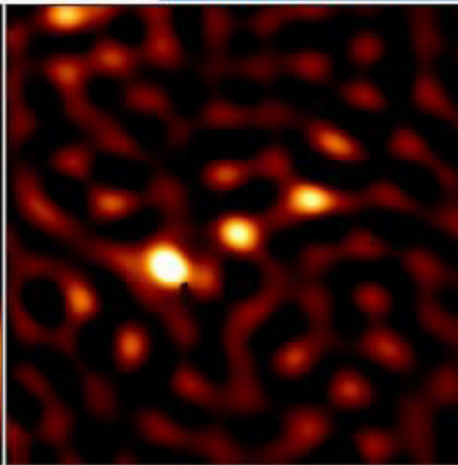


- And take care of the full value chain
 - ▣ Youth development
 - ▣ Young professionals
 - ▣ Research chairs
 - ▣ Trade skills

KAT-7 in 2012



MeerKAT-4 in 2016

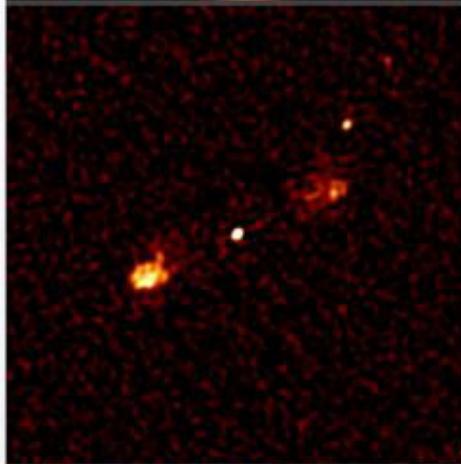


Increased observation power of MeerKAT

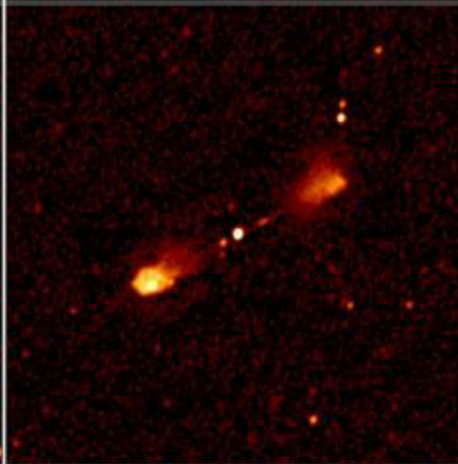
A galaxy in the distant universe imaged with ever better South African radio telescopes

Same black hole observed with increasingly improved arrays of antennas.

Jets of particles accelerated by the black hole at the centre to near the speed of light emit radio waves.



MeerKAT-16 in 2016



MeerKAT-16 in 2017



Credit: SKA South Africa.

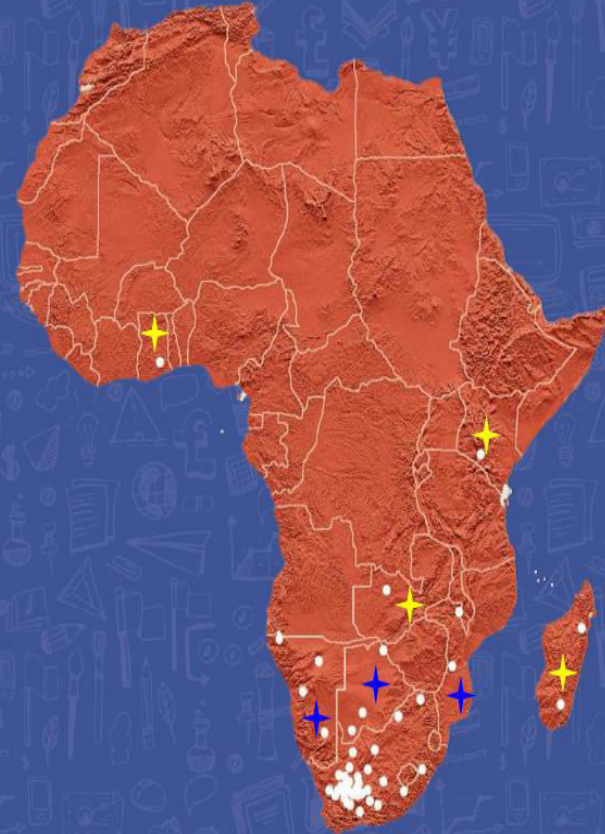
Meaningful partnerships



African VLBI Network (AVN)

- ★ Conversions
- ★ New-builds

- South Africa,
- Botswana,
- Ghana,
- Kenya,
- Madagascar,
- Mauritius,
- Mozambique,
- Namibia, and
- Zambia



Then this happens

- Scientific outputs/impact have grown from below average to twice above the global average – global ranking in astronomy increased from 33 to 21
- Tripled number of astronomers from 60 to about 200 and growing
- Big Data initiatives
- Involvement of industry through commercial spin-offs, localisation and innovations (e.g. ROACH board) – more than 75% local content
- New innovations – low cost storage

LEGEND



Chemistry



Earth & environmental



Life sciences



Physical sciences

Index metrics

Contribution to 68 journals included in the index is known as weighted fractional count (WFC). Read more on S80.



Chile

The clear skies of the Atacama Desert are the perfect location for some of the world's biggest telescopes. This edge in astronomy helped boost the country's contribution to physical sciences to a WFC of 68.05 in 2015 (S60).



South Africa

The country's overall output in the index grew by more than 40% in four years, driven by a significant rise in its physical sciences WFC, which jumped from 23.70 in 2012 to 39.31 in 2015. This result reflects South Africa's strength in astronomy (S59).



Saudi Arabia

The Middle Eastern kingdom wants to reduce its reliance on oil by boosting science. Its chemistry WFC almost tripled to 66.66 from 2012 to 2015, and its contribution to Earth and environment research climbed from 2.77 to 7.02 (S58).



India

The contribution of Indian researchers to chemistry publications grew from a WFC of 350.39 to 472.48 in four years. The subject made up more than half the country's output in the index in 2015 (S59).



Thailand

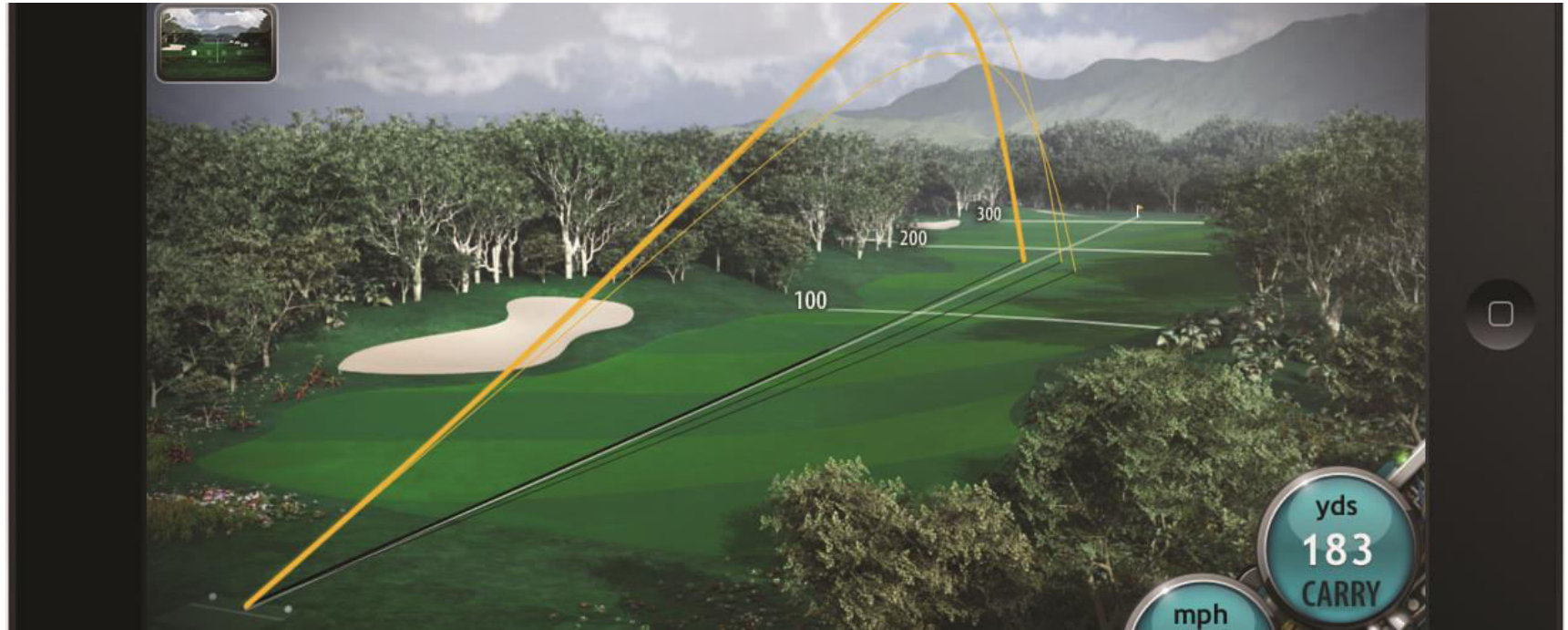
Starting from a small base, Thai researchers almost doubled their output in physical sciences in four years, resulting in a WFC of 17.06 in 2015. The country is trying to boost the number of researchers and industry funding for science (S61).



Singapore

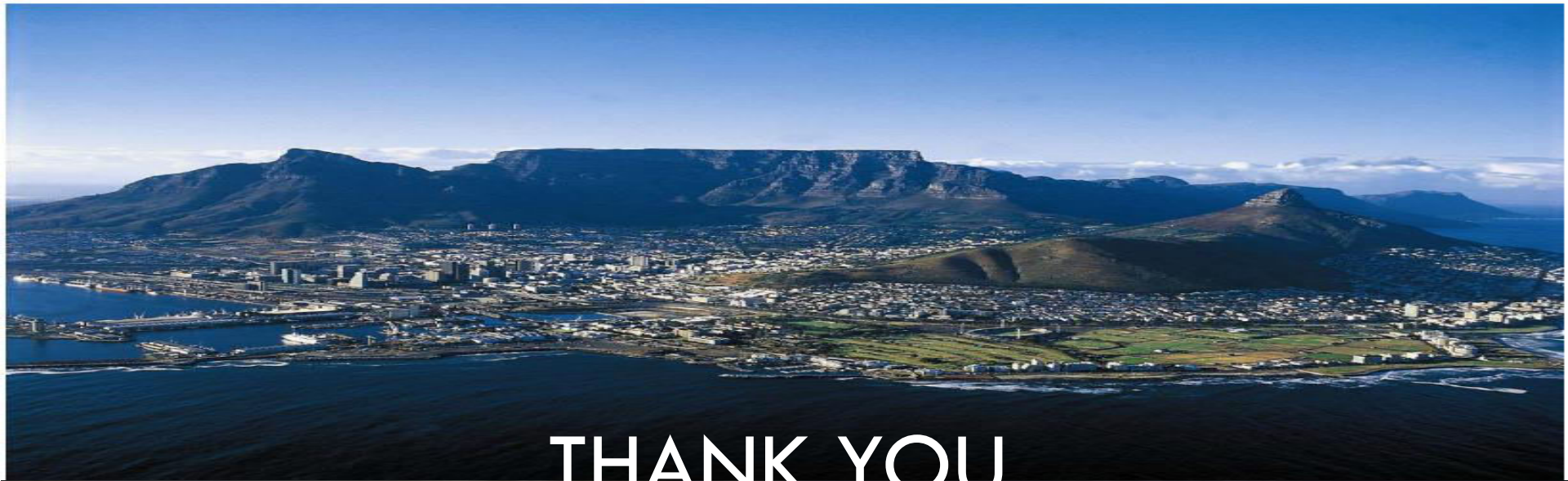
With strong government commitment to science, Singapore experienced a significant rise in chemistry and life science output over four years. Its WFC for Earth and environment research was 7.06 in 2015, a doubling of its 2012 performance (S60).

It takes time



Final word ...SANSA launch





THANK YOU

