Square Kilometre Array

• an extremely powerful survey telescope at metres>λ>cm with the capability to follow up individual objects with high angular and time resolution

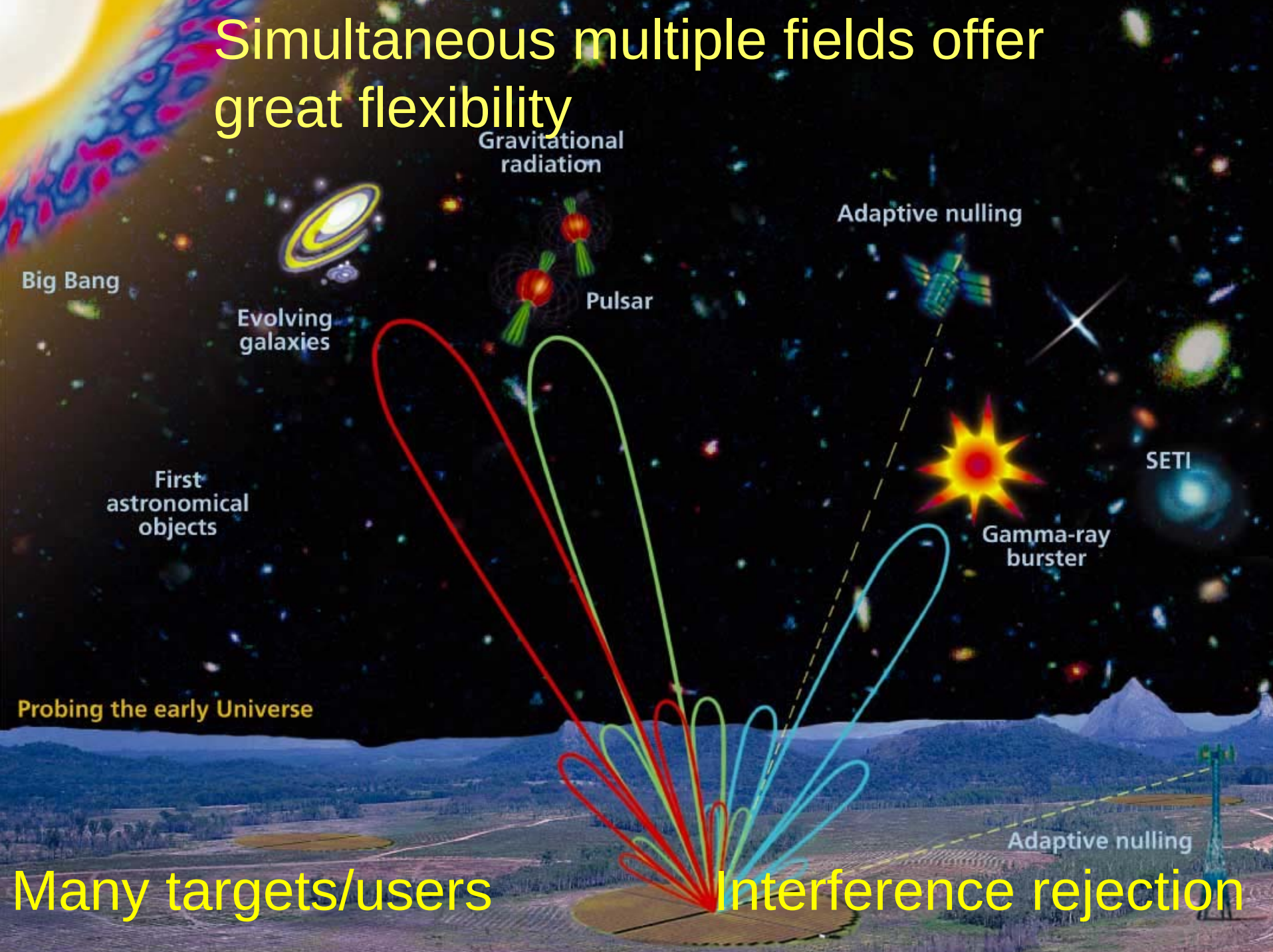
• ~ 1 km^2 collecting area; sensitivity ~50 x EVLA

• frequency range 0.1 – 25 GHz (goal)

• field of view at least 1 sq deg at 1.4 GHz
goal: many tens of sq. deg.

• goal of multi-beam instrument at lower frequencies
  – re-use area up to 4 times
    • operational and science advantage

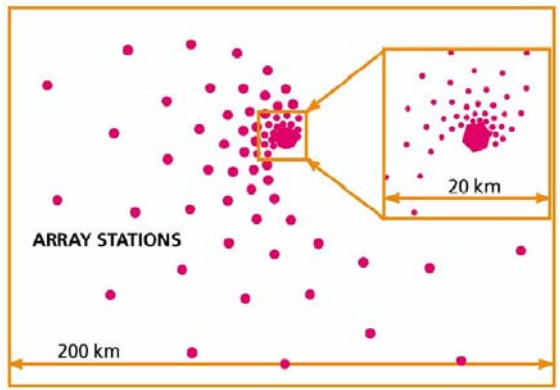
Simultaneous multiple fields offer great flexibility



Many targets/users

Interference rejection

SKA (2)

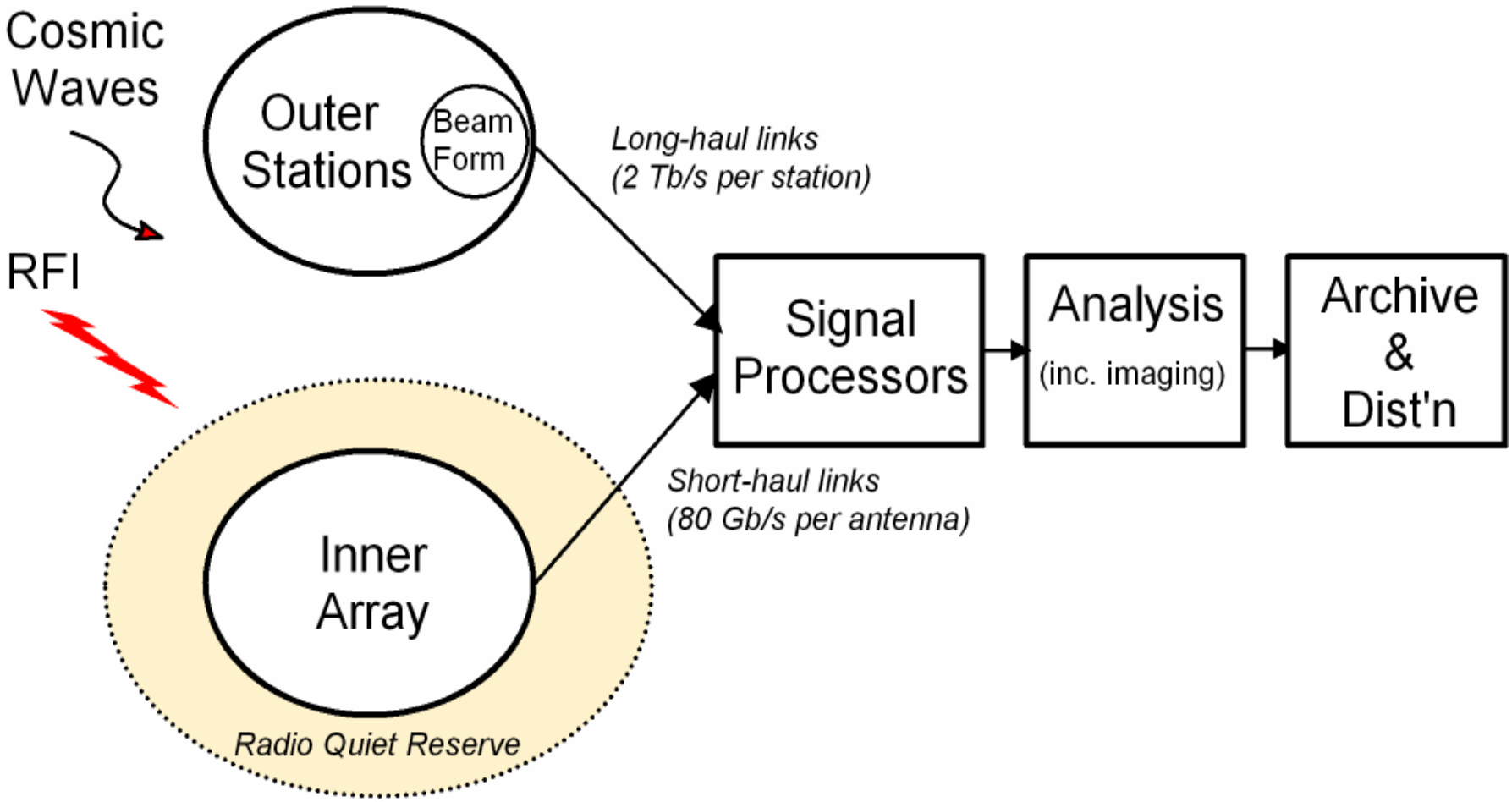


- configuration

20% of total collecting area within 1 km diameter,
50% of total collecting area within 5 km diameter,
75% of total collecting area within 150 km diameter,
maximum baselines at least 3000 km from array core

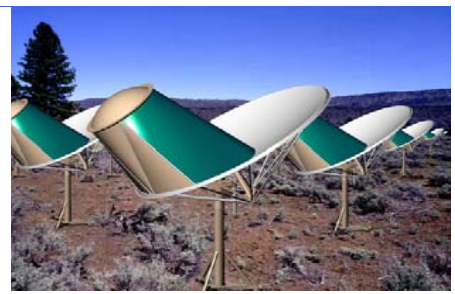
- 15-country international collaboration
- international funding
  - cost goal ~ €/$ 1 billion
  (~ €/$ 1000 per sq. m)
- site selection in 2006; technology selection in 2008; initial operations 2015; full operations 2020

SKA Concept

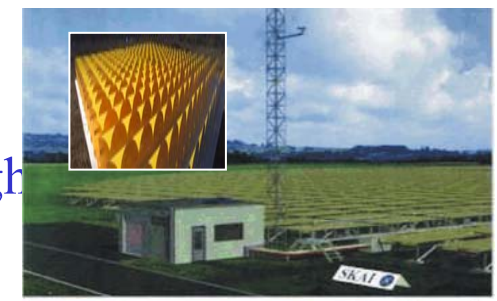

Cosmic Waves
RFI
Outer Stations
Beam Form
Long-haul links
(2 Tb/s per station)
Signal Processors
Analysis
(inc. imaging)
Archive & Dist'n
Short-haul links
(80 Gb/s per antenna)
Inner Array
Radio Quiet Reserve

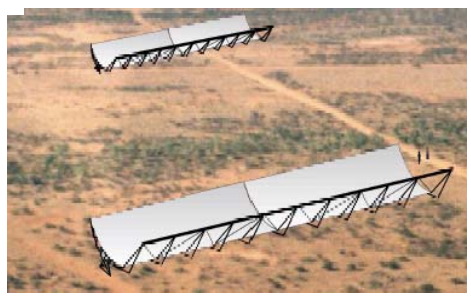
Antennas

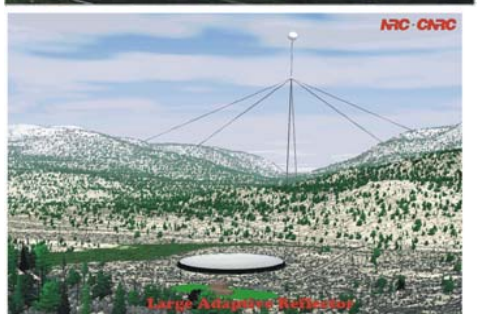
- range of possible solutions
  - flux concentrators
  - aperture phased arrays

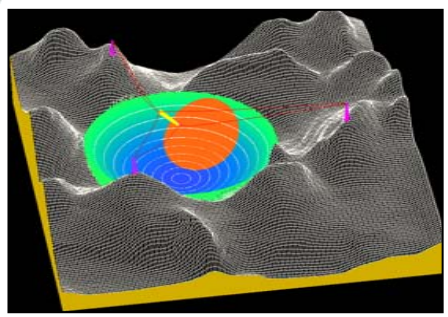


- SKA will likely use at least two antenna types
  - cost effective high frequency solutions don't provide enough area at low frequencies
  - want good efficiency at high frequency AND multi-fielding (or at least wide field of view) at low frequency



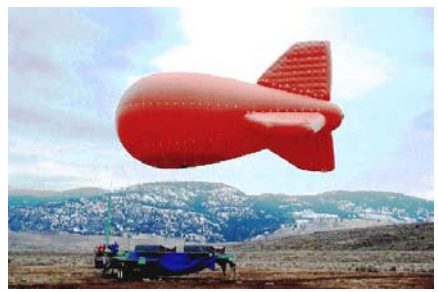






Antenna Innovations

- cheap, accurate 12m dishes using hydroforming or preloading
- active surfaces for large reflectors
- suspended or airborne inertial feed platforms
- broadband feeds
- low-cost dense arrays for aperture and focal planes



Site

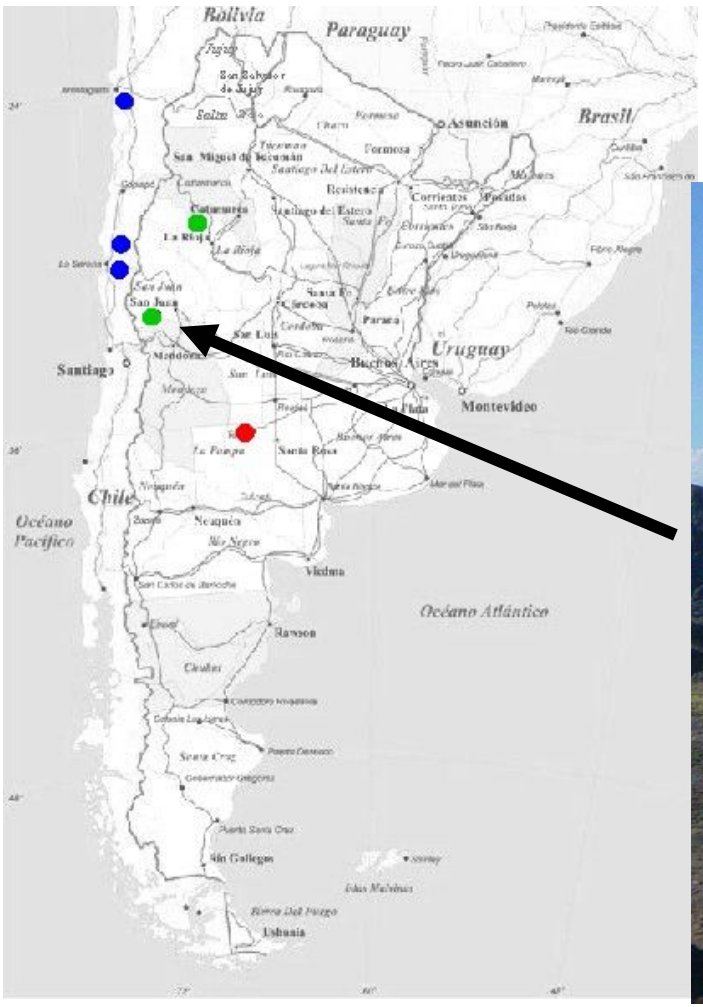
- Initial site analyses submitted by

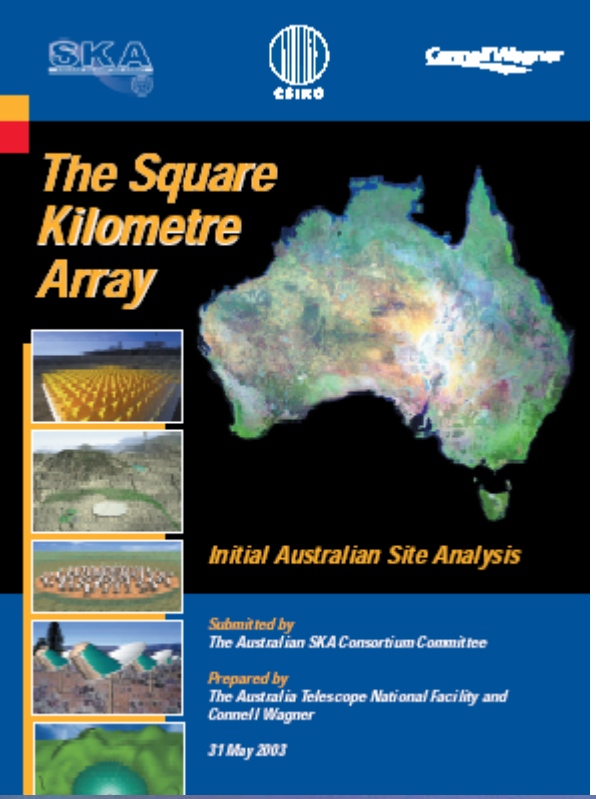
Argentina, Australia, Brazil, China, South Africa, and USA

- Formal Request for Proposals to be issued in July 2004, due 31 May 2005

- RFI testing at candidate sites in 2004-5

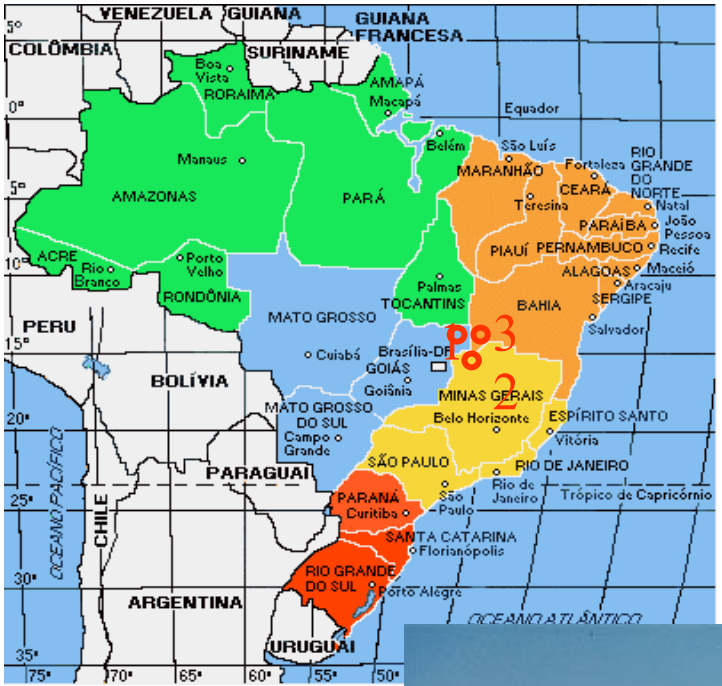
SKA in Argentina





SKA in Australia

Brazil


VENEZUELA
GUIANA
GUIANA FRANCESA
COLÔMBIA
SURINAME
Boa Vista
RORAIMA
AMAPÁ
Macapá
Equador
Manaus
AMAZONAS
PARÁ
Belém
São Luís
MARANHÃO
Fortaleza
RIO GRANDE DO NORTE
CEARÁ
Teresina
Natal
PARAÍBA
João Pessoa
PIAUÍ
PERNAMBUCO
Recife
ALAGOAS
Maceió
ACRE
Rio Branco
Porto Velho
RONDÔNIA
Palmas
TOCANTINS
Aracaju
SERGIPE
BAHIA
Salvador
MATO GROSSO
PERU
Cuiabá
Brasília-DF
GOIÁS
Goiânia
BOLÍVIA
MINAS GERAIS
Belo Horizonte
ESPÍRITO SANTO
Vitória
MATO GROSSO DO SUL
Campo Grande
PARAGUAI
SÃO PAULO
RIO DE JANEIRO
Rio de Janeiro
São Paulo
Trópico de Capricórnio
PARANÁ
Curitiba
CHILE
SANTA CATARINA
Florianópolis
RIO GRANDE DO SUL
Porto Alegre
ARGENTINA
URUGUAI
OCEANO PACÍFICO
OCEANO ATLÂNTICO
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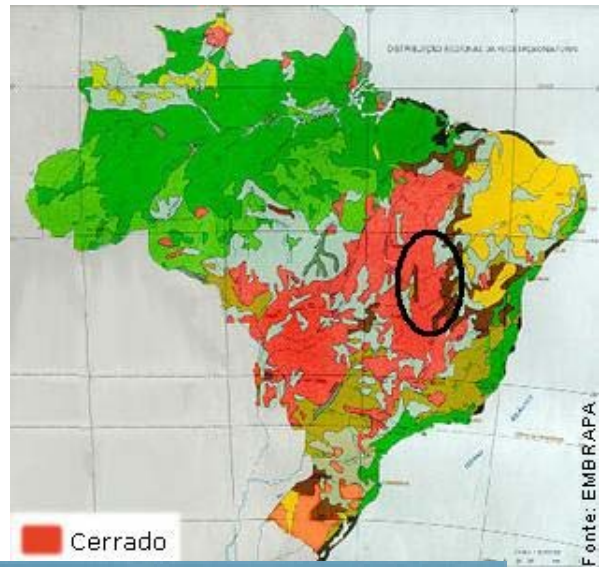
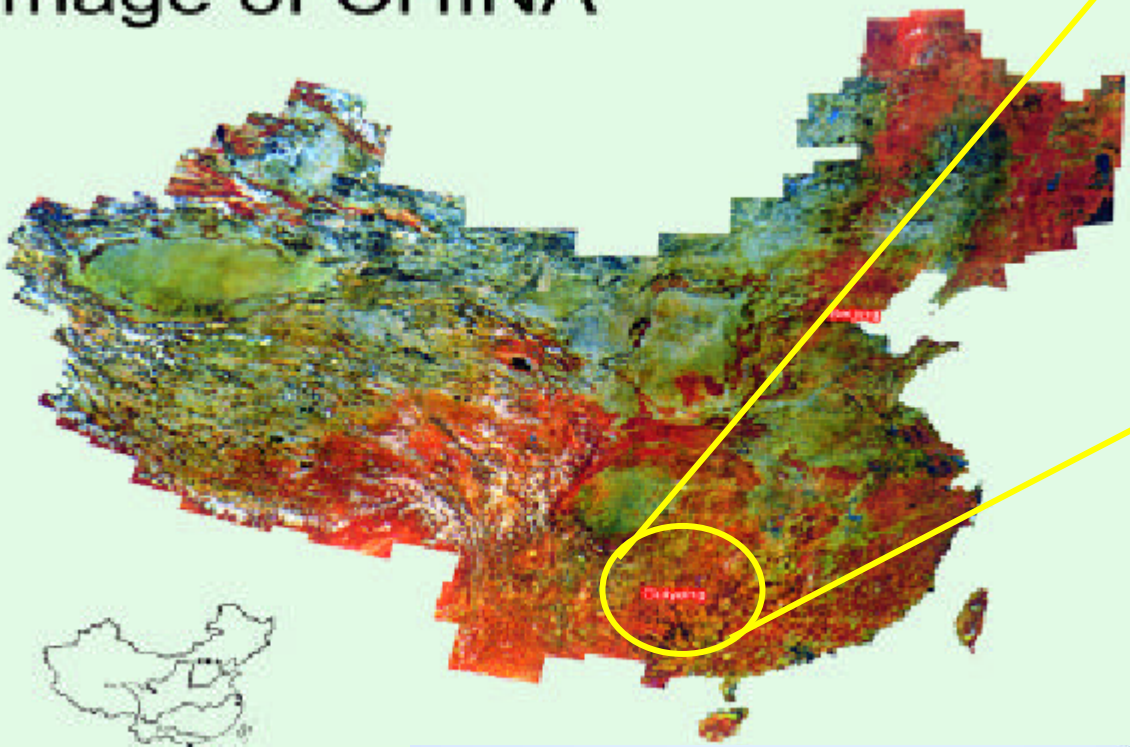
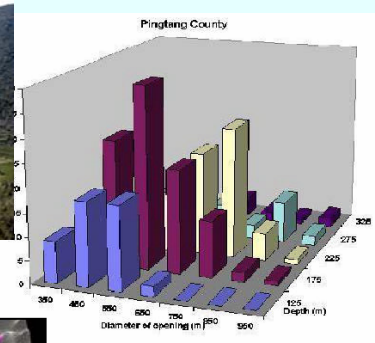

Cerrado
Fonte: EMBRAPA

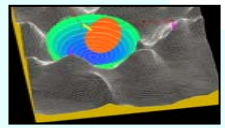

Foto: L.M. Coutinho

Image of CHINA



KARST

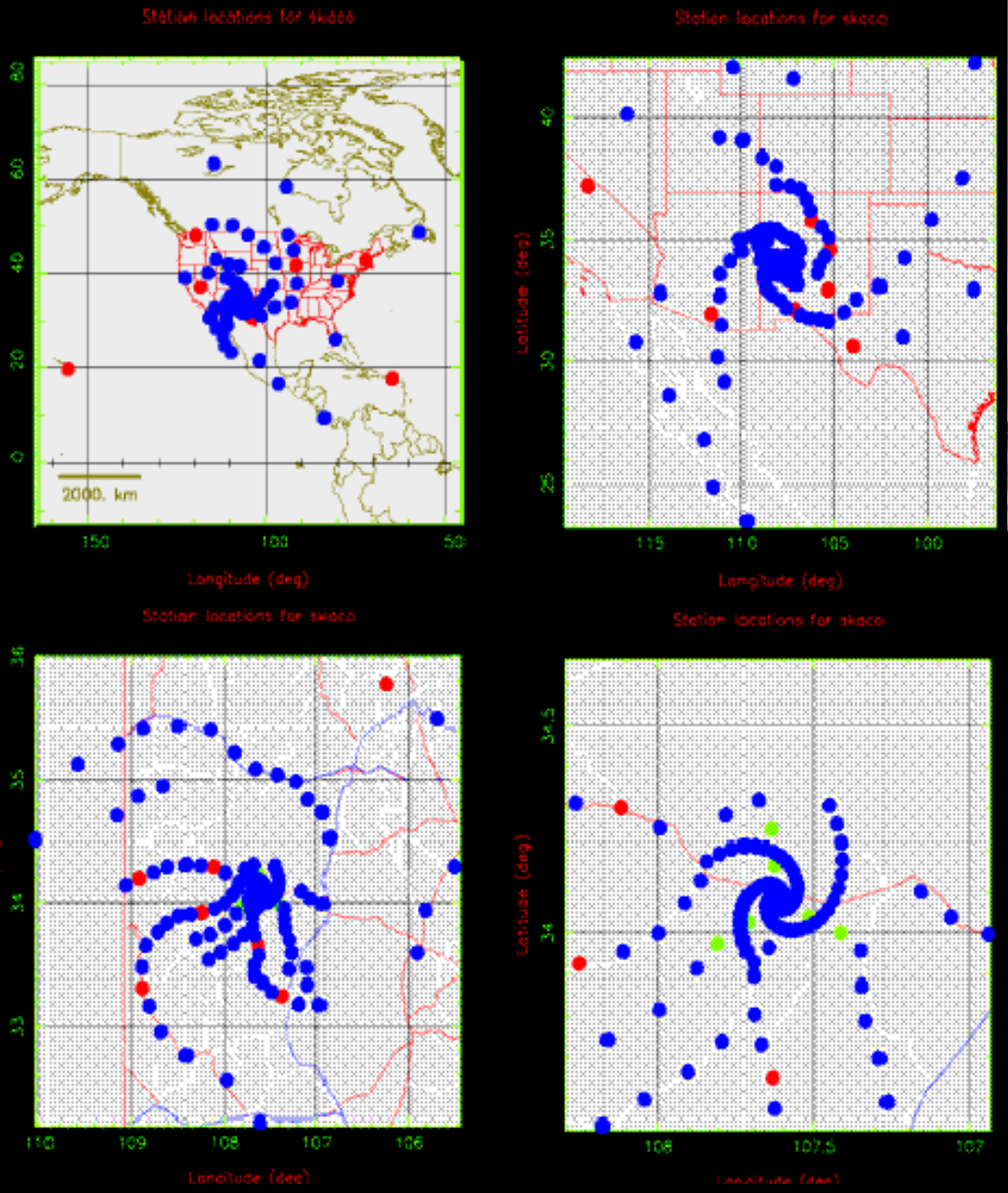


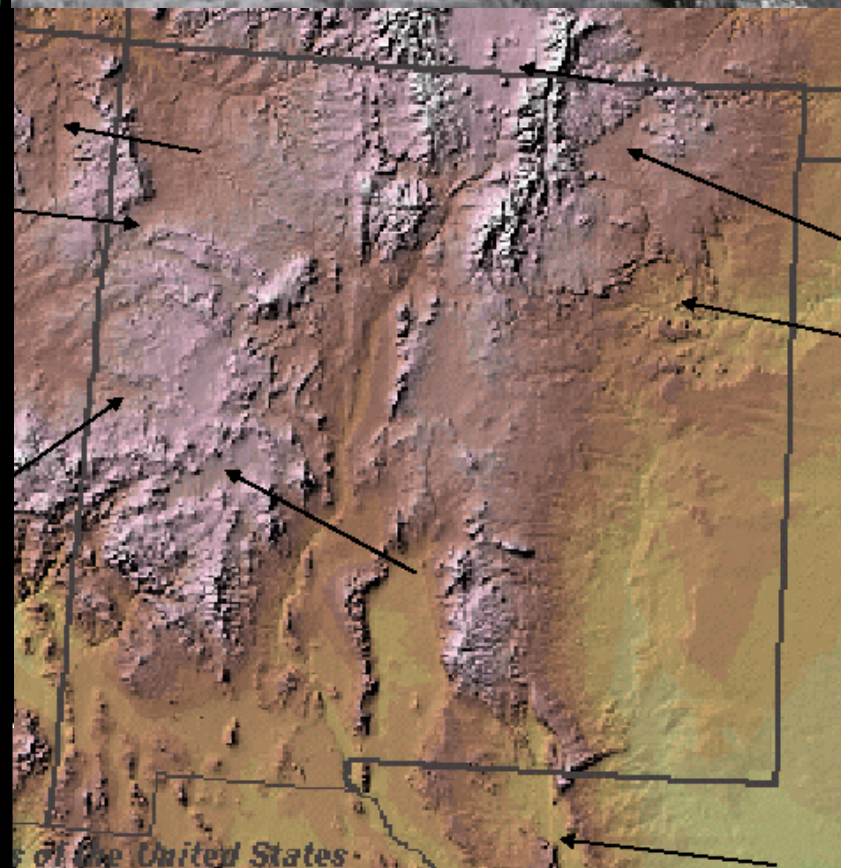


SKA in China

Log spiral array map for the Namaqualand Site

SKA SOUTH AFRICA
SQUARE KILOMETRE ARRAY





SKA in North America

SKA Organisation

SKA Development Plan

- 2000-7 technology prototyping
- 2004-5 site testing
- 2006 selection of site, major external review of design
- 2007 prepare funding proposal for 5% demonstrator
- 2008 selection of technical design (may be a combination)
- 2009 start construction of 5% demonstrator on selected site
- 2010 submit funding proposal for full array
- 2012 start full construction
- 2020 complete construction

www.skatelescope.org