Brazilian Decimetric (1.4, 2.8 & 5.6)GHz Array in relation to Space weather

Prof. Hanumant Shankar Sawant
BDA – Co ordinator

SCIENTIFIC GOALS

- BDA will produce **high spatial and time resolution images** of radio sources with high dynamic range.
- BDA will provide solar radio **images in the lower corona** where **energy release** to solar flare takes place, their analysis will lead to better understanding of the fundamental problems in solar physics and also will be used, in a spectral tomography technique being developed for **application to space weather forecasting**.
- BDA will be very useful for **galactic and extra-galactic investigations** of the southern sky not accessible to VLA.

GALATICA E EXTRAGALÁTICA

José Wiliams Vilas Boas – (SJC-INPE)

Luis Claudio L. Botti (SP-INPE)

Carlos Alexandre Wuensch(SJC-INPE)

Thyrso Vilela Neto (SJC-INPE)

Reinaldo Ramos de Carvalho (SJC-INPE)

Camilo Tello (UC- Berkley & SJC-INPE)

Zulema Abraham (USP)

FÍSICA SOLAR

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Reinaldo Roberto Rosa (SJC-INPE)

Adriana Válio Silva (MAC-SP)

Francisco C.R. Fernandes (UNIVAP)

Brazilian Scientists visited India for the BDA project

1.Dr. Angelo Neri (2)

2. Prof.Saito

3. Dr. Claudio Faria

4. Dr. Felipe Madsen - One Ph.D (2)

5. Dr. J.R Cecatto

6. Ms. Andrade Maria Con (2)

7. Prof.Jacquim E.r.Costa

8. Prof. Ferandes Cr. Fernandes

9. Dr. Claudemir JDS Silva

Indian scientists participating in BDA

1.Prof.Govind Swarup
2.Prof.Anantha Krishnan
3.Prof.A.Pramesh rao
4 Prof.Jayram Chengalur
5.Prof.P.K.Manoharan
6.Eng.Shankararaman
7.Dr.Sandeep
8.Prof. Siraj .Hasan
9.Prof. K.R.Subramanian (4)
10.Prof.Vinod Krishan

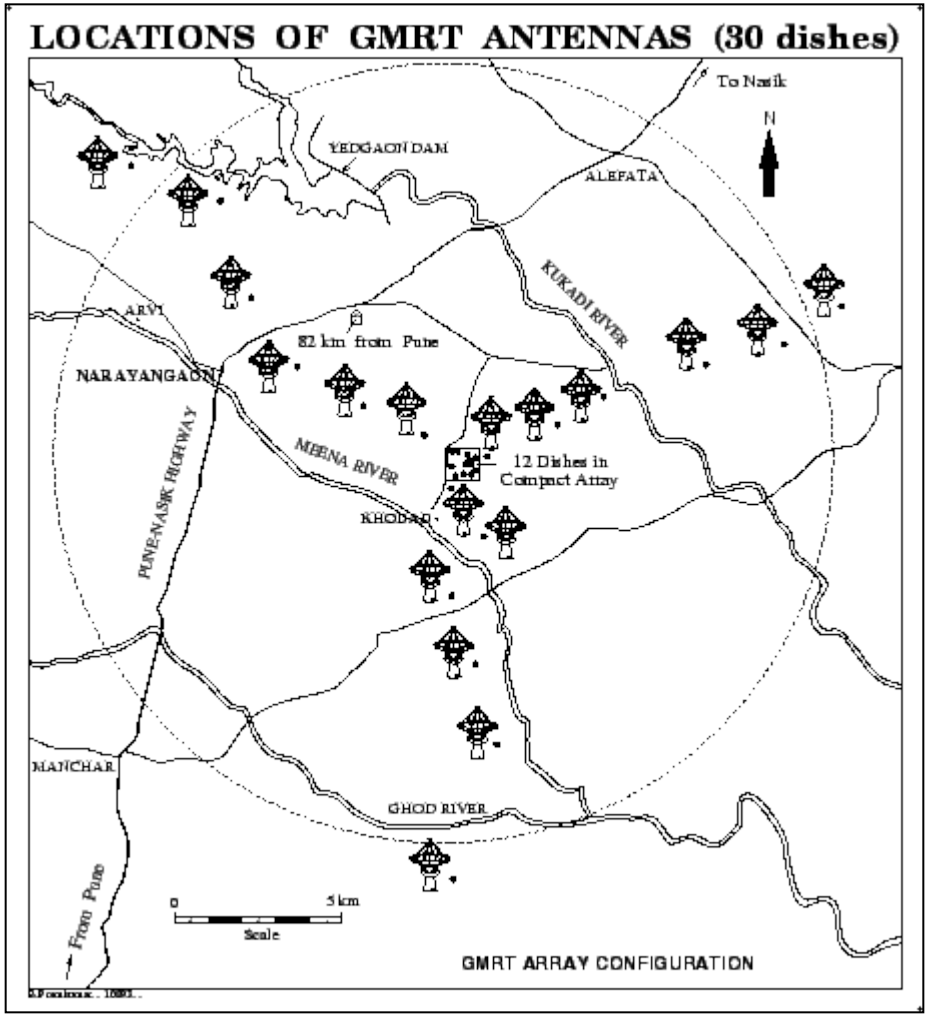
11.Eng.M.S.Sundararajan
12.Prof.R.Ramesh
13.Dr.Ebenezer
14.Prof.Som Krishan IISC.,
15.Prof.Hari om Vats PRL
16.Prof.Janardhan
17.Dr.Umesh Joshi
18.Dr.Nanditha Srivatsav
19.Eng.Abhay Joshi (4)
21.Eng.Shrijkanth Bhanu

Valley in Chchoeira Paulista selecting "T"array site, Prof. G. Swarup, Director GMRT – India Dr. H.S. Sawant - INPE and Dr. Hari Om Vats – PRL - India discussing with civil engineer on **13th September 1997.**

Panoramic view of GMRT dishes

Location and Configuration of GMRT

- Longitude: 74 deg E
- Latitude: 19 deg N
- About 70 km N of Pune
- 30 dishes 45 m diameter
- 12 dishes in central array
- 18 dishes in 3 arms Y shaped
- Resolution of a ~ 25 km dish



BDA
BRAZILIAN DECIMETRIC ARRAY

DISTRIBUTION OF RADIOHELIOGRAPHS IN THE WORLD.

Location: INPE's campus at Cachoeira Paulista
(Longitude 45º 0' 20'' W Latitude 22º 41' 19'' S).

Configuration, with the longest baseline of about of 2.3 km (East-West) and : "T" shaped array consisting of 38 parabolic antennas of 4 m diameter in a compact "T", with base lines up to 252 m (E-W) and 162 m (S). 1.2 km (South). The central portion have 26 antennas distributed

Spatial and time resolutions: < 10 sec of arc at 5.6 GHz and 100 ms.

Frequency: 1.2 - 1.7, 2.8 and 5.6 GHz.

Sensitivity: 3 mJy at 21 cm for a system temperature of 50 K, using low–noise amplifiers.

PARTICIPATING INSTITUTIONS

National Institute for Space Research – INPE:

1. Astrophysics Division (DAS)
2. Laboratory of Applied Computation (LAC)
3. Center of Radio Astronomy – Mackenzie (CRAAM) – INPE
4. **Tata Institute of Fundamental Research (TIFR) – GMRT – NCRA – India.**
5. **Indian Institute of Astrophysics (IIA) – Bangalore, India.**
6. **Physical Research Laboratory, Ahemedabad, India**
7. **University of California - Berkeley (UCB), Dept. of Radioastrophysics, USA.**
8. **NASA – GFSC – Maryland, USA.**
9. **New Jersey Institute of Technology (NJIT), USA.**
10. **Siberian Solar Radio Telescope (SSRT), Russia.**

BDA
BRAZILIAN DECIMETRIC ARRAY

BDA PROTOTYPE OF 5 ELEMENTS AT INPE-SJC. CAMPUS

BDA
BRAZILIAN DECIMETRIC ARRAY

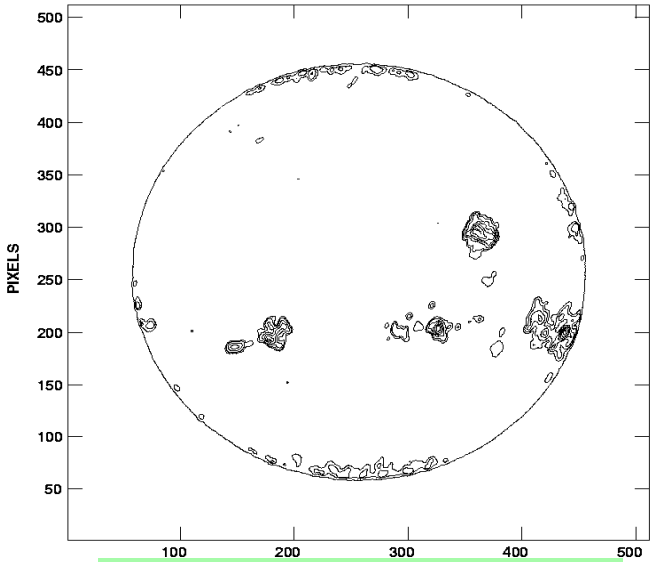
BDA 5 ELEMENTS SHIFTED TO FINAL SITE OF BDA AT CACHOEIRA PAULISTA

Present status of BDA

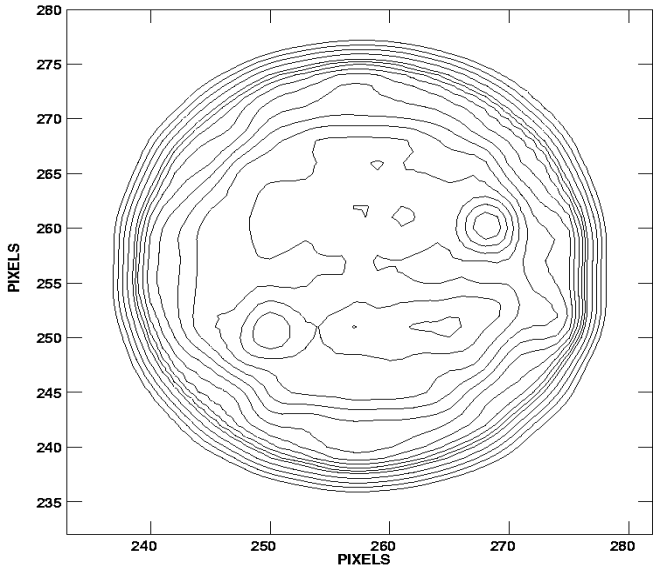
Present status of BDA

BDA
BRAZILIAN DECIMETRIC ARRAY

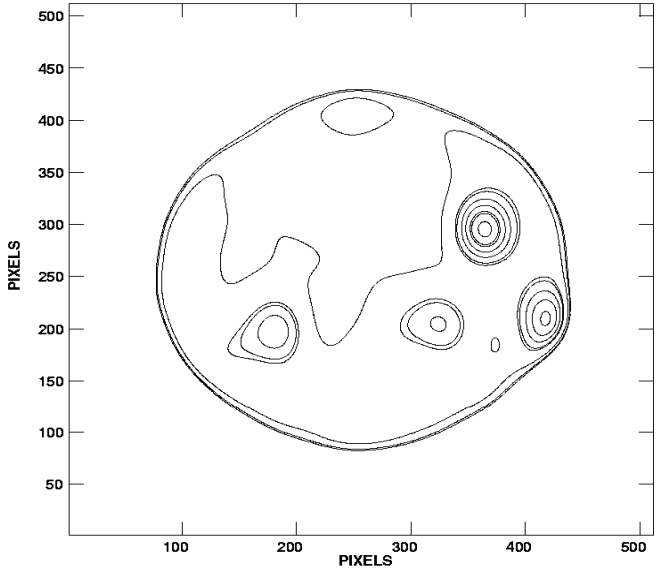
SOLAR IMAGE CAPABILITY



Nobeyama 17 GHz



BDA “Dirty” Image



BDA “Clean” Image

Space Weather

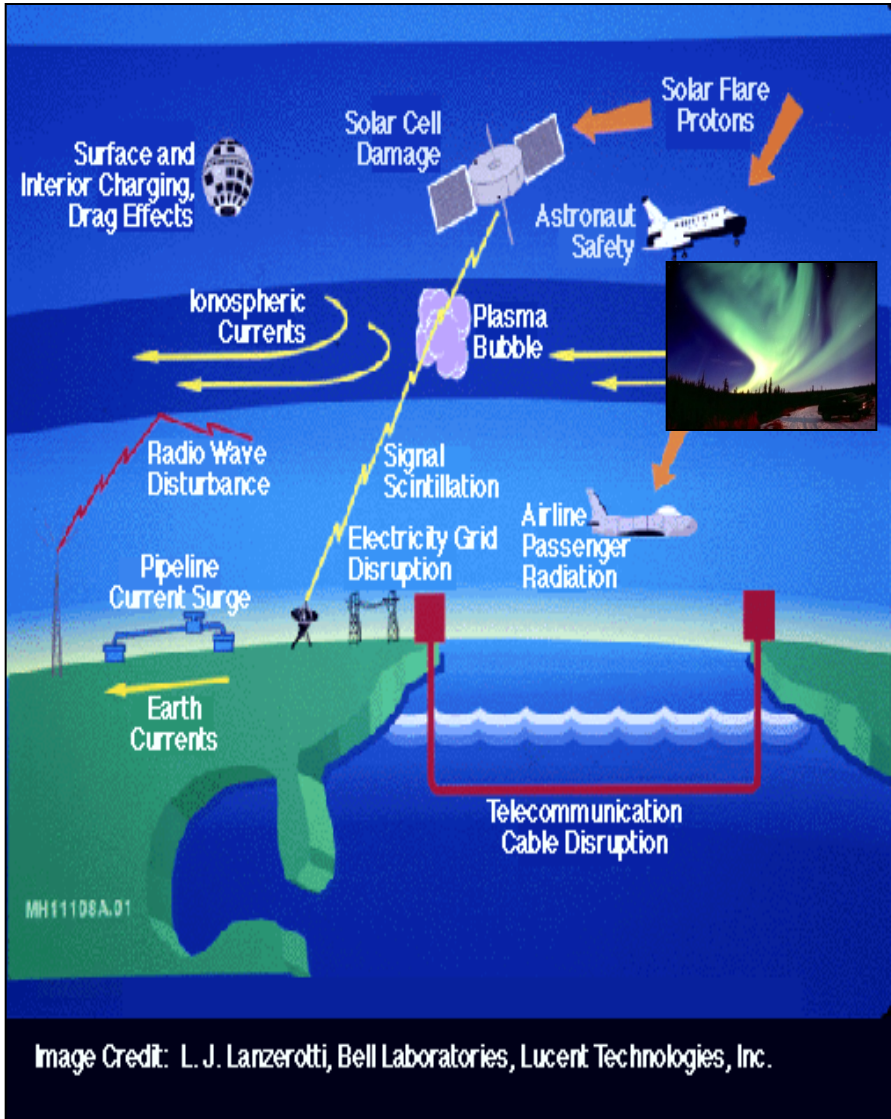
Space weather happens with a solar storm from the Sun travels through space and impacts the Earth's magnetosphere. Studying space weather is important to our national economy because solar storms can affect the advanced technology we have become so dependent upon in our everyday lives. Energy and radiation from solar flares and coronal mass ejections can

- Harm astronauts in space
- Damage sensitive electronics on orbiting spacecraft
- Cause colorful auroras, often seen in the higher latitudes
- Create blackouts on Earth when they cause surges in power grids.

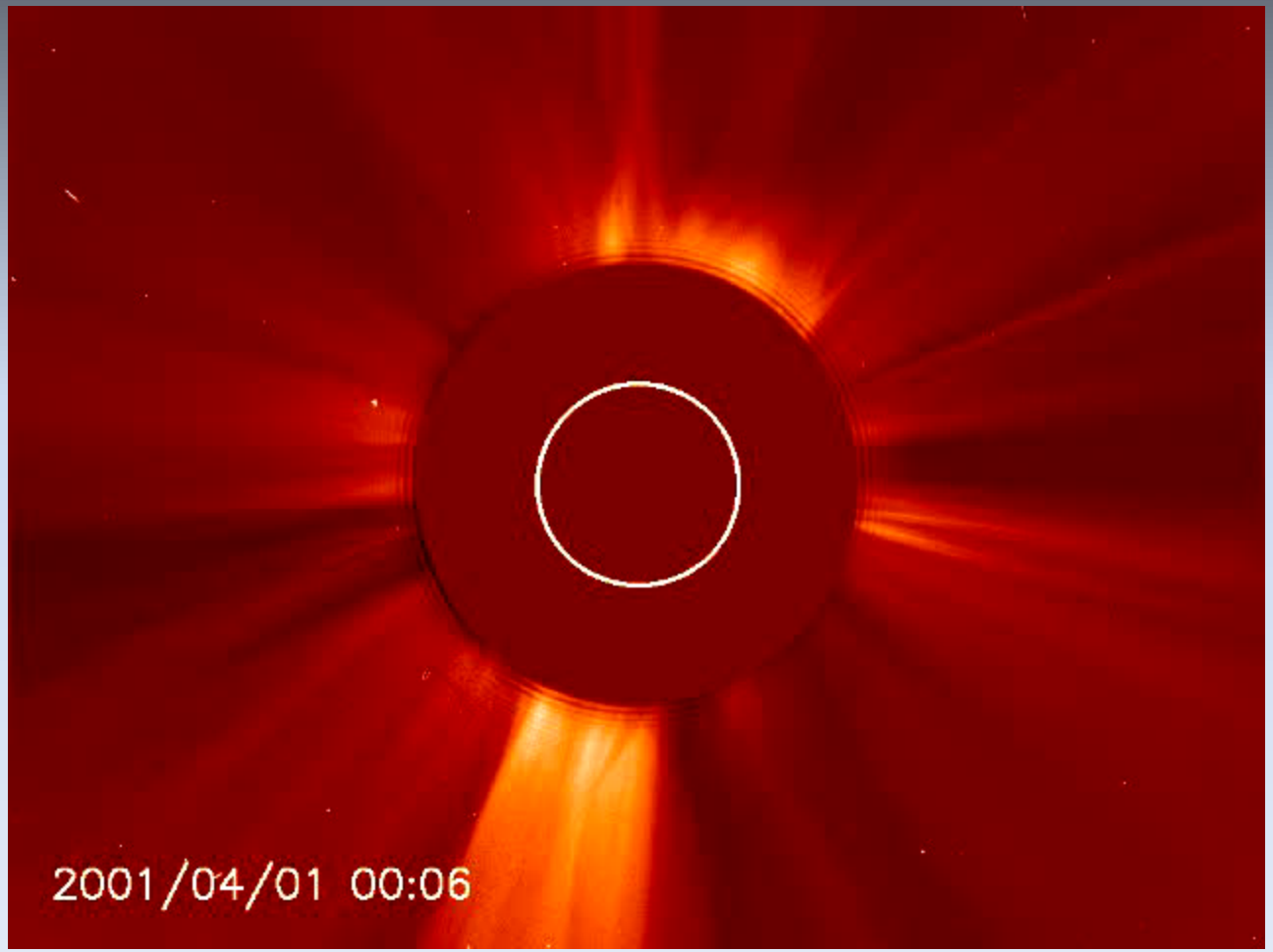
Understanding the changing Sun and its effects on the solar system, life, and society is the main goal of -Earth Connection theme

Effects of Space weather

- Currents induced in power grids
- Spacecraft detector upsets
- Hazards to humans in space
- Ozone depletion in major events
- Speculated climate impacts
- Aurora
- Spacecraft drag, collisions, loss
- Communications & navigation

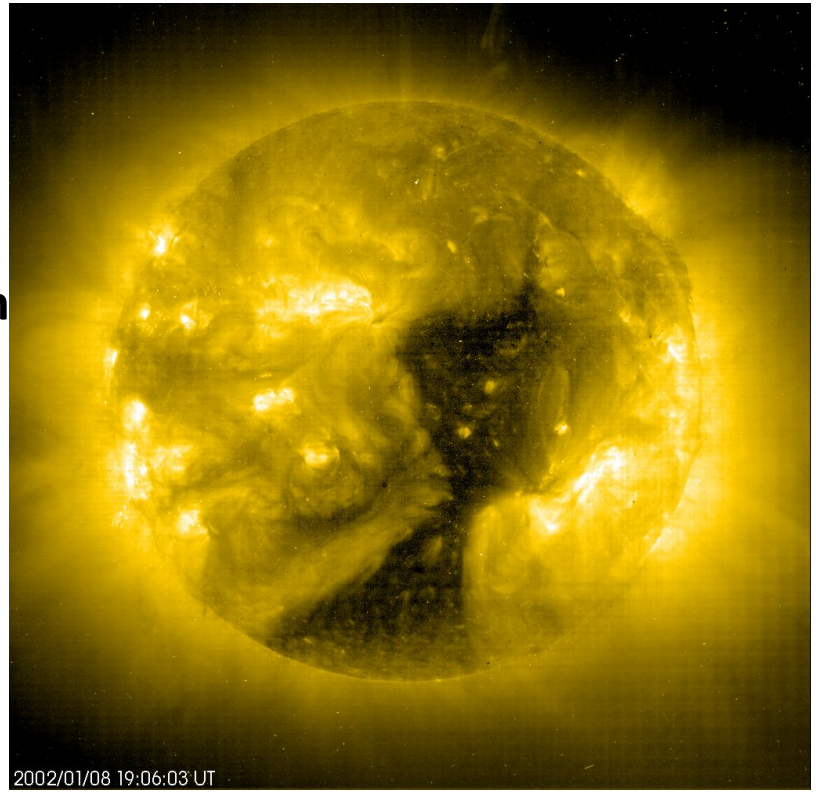


CME events of April 2001



CORONAL HOLES

Coronal holes are important large-scale structures on the Sun, which produce high-speed solar wind streams (HSS). Interaction of Solar Wind with magnetosphere produces **Geomagnetic storms that are known for producing MeV electrons in Earth's magnetosphere.** These electrons can be hazardous to satellites and astronauts in the space, and hence important for space weather prediction.



BDA can observe the coronal holes at multi frequenies.

Acknowledgements


Thank you!