

# **Opportunities for Atmospheric Studies through Sounding Rockets**

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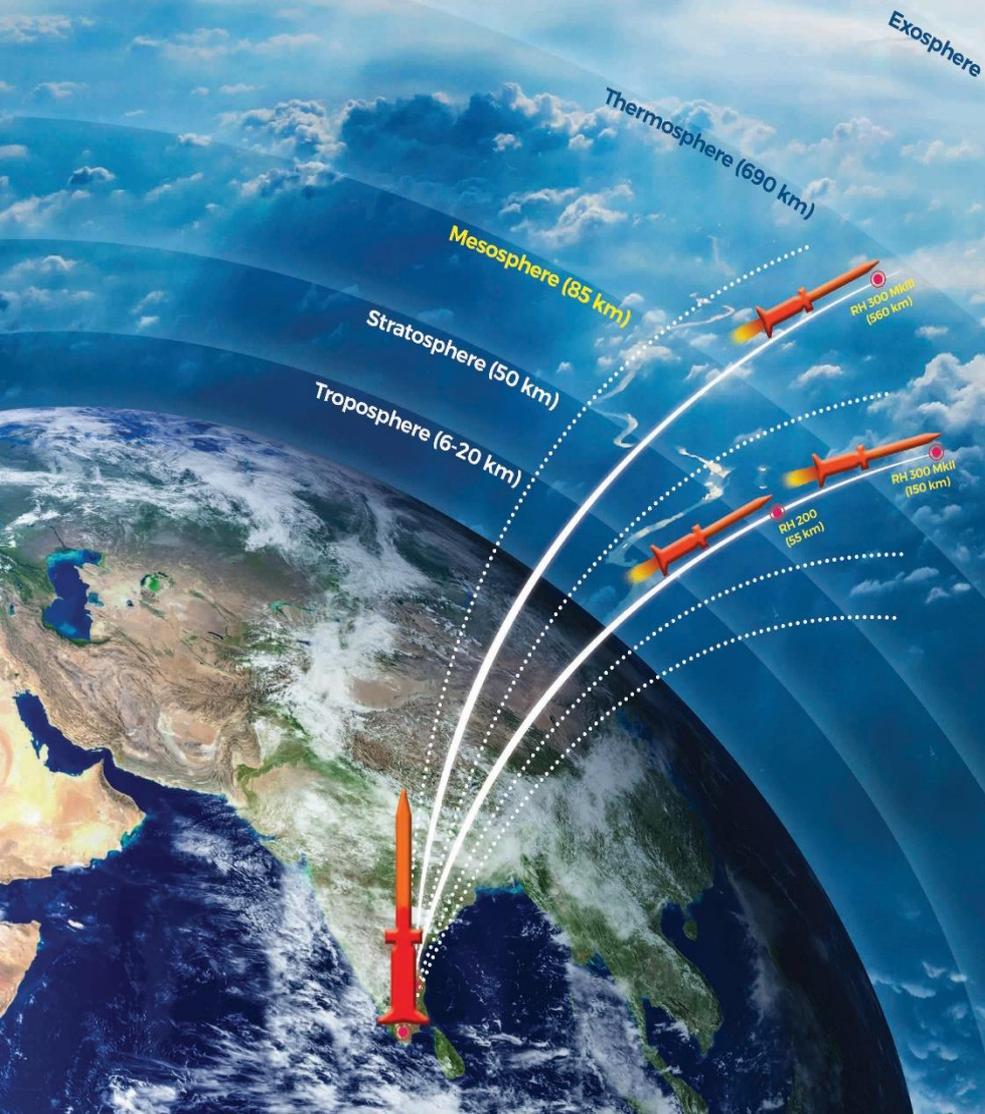
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# SOUNDING ROCKETS

A PLATFORM FOR YOUR EXPERIMENTS



RH 200

RH 300 MKII

RH 560 MKIII

ATV-EX



PAYLOAD CAPABILITY (KG)

14

60

100

400

ALTITUDE (KM)

55

150

560

260

LAUNCH SITE

Thiruvananthapuram, Kerala & Sriharikota, Andhra Pradesh

Sriharikota, Andhra Pradesh

*Give wings  
to your experiments*

- » **Microgravity experiments** upto 6 minutes
- » Launch near Earth's Magnetic equator
- » **Upper Atmospheric Studies**
- » **Flight testing** of new avionics

# Origin Of Space Research Activities In India

- In 1963, Thumba Equatorial Rocket Launching Station (TERLS) was established
- Thumba at  $8^{\circ} 31' 49''$  N and  $76^{\circ} 52' 11''$  E is near the Geomagnetic Equator.
- Ideal launch site for meteorological and upper atmospheric research
- The first sounding rocket launched from TERLS on November 21, 1963 was Nike Apache
- Dedicated to the UN in 1968

3507 launches  
so far..

- Vehicle: RH200: 1445, RH300: 47, RH560: 52
- Indian: 2127,
- Other Nations: 1380
- Regular RH-200 fortnightly launches from TERLS

# Major Sounding Rocket Campaigns

Year	Name	Payloads	Vehicles
1998	Dynamics Of Indian Equatorial Ionosphere over SHAR (DEOS)	Resonance Cone , Impedance Probe Payload, Precision Magnetometer and RABER payload	RH560MkII
1999	Leonid Meteor Shower (LMS)	Langmuir Probe, Electric Field sensor and Radio Frequency Mass Spectrometer (RFMS)	RH300MkII
2000	Equatorial Wave Studies (EWS)	Chaff experiments	RH200
2002-2007	Middle Atmosphere Dynamics (MIDAS)	Chaff experiments	RH200
2004	Mesospheric Turbulence Studies (MTS)	Langmuir Probe (LP) Spherical Probe (SP)	RH300MkII RH200
2008	Airglow Emission Studies (ABHA)	Multi wavelength photometer, Langmuir Probe	RH300MkII
2010	SOORYAGRAHAN (Solar Eclipse campaign)	EACE, ENWi, Langmuir Probe, Electric Field and Tri Methyl Aluminium	RH300MkII RH560MkII RH200

# Sounding rockets offered for experiments

**ATV EX**

Payload: 300 kg  
Altitude: 260 km  
Appln: Microgravity

**RH560MkIII**

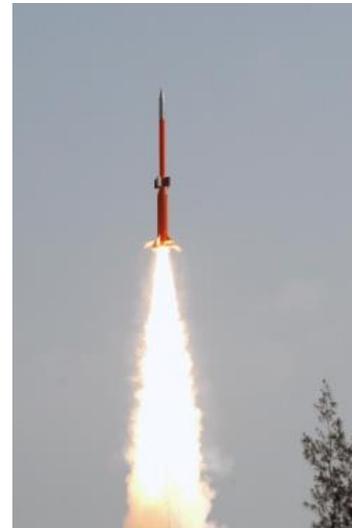
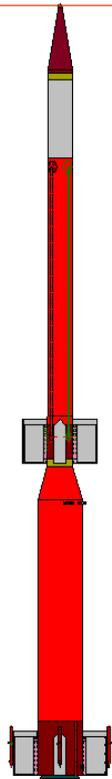
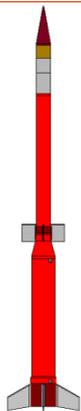
Payload: 120 kg  
Altitude: 510 km  
Appln: E & F region

**RH300MkII**

Payload: 80 kg  
Altitude: 110 km  
Appln: D & E region

**RH200**

Payload: 14 kg  
Altitude: 60 km  
Appln: Meteorological



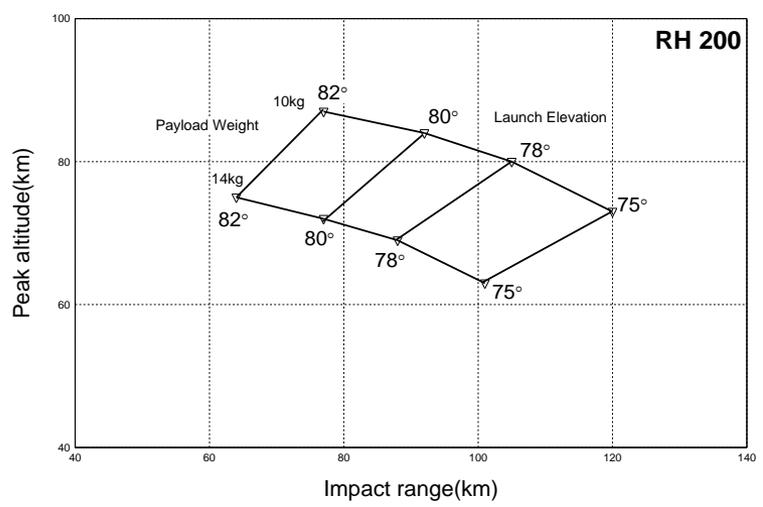
# Sounding Rocket Launch Stations

	TERLS / VSSC Trivandrum	SDSC SHAR
Latitude	8° 32'N	13° 43' N
Longitude	76° 52'E	80° 13' E
Launchers	RH 200 & RH 300 MKII	RH 200, RH 300 MKII, & RH 560 MKIII
Telemetry Stations	S-Band Telemetry Station	Two S-Band Telemetry Stations
Tracking Stations	C-Band & S-Band Radars	PCMC Radars, C-Band & S-Band Radars
Telecommand Station	-	Tele-command (S-band)
Real Time Systems	Real Time Data Processing Real Time Display	Real Time Data Processing Real Time Display Real Time Tracking Aids
Meteorology	Met Observatory Met Towers Balloon Launch Facility Data Bank	Met Observatory Met Towers Balloon Launch Facility Data Bank
Others	Iono Sonde Radio Sonde Range Timing Count Down Range Timing UT CC TV System	Iono Sonde Radio Sonde Range Timing Count Down Range Timing UT CC TV System



# RH 200

- Two stage vehicle
- Capable of lifting 14 kg payload (scientific payload 5 kg) to 60 km altitude
- Payload volume F115 x 100 mm
- Capable to reach very high acceleration ~45 g
- Technology demonstrator for flight qualifying space vehicle avionics
- Mainly used for meteorological studies

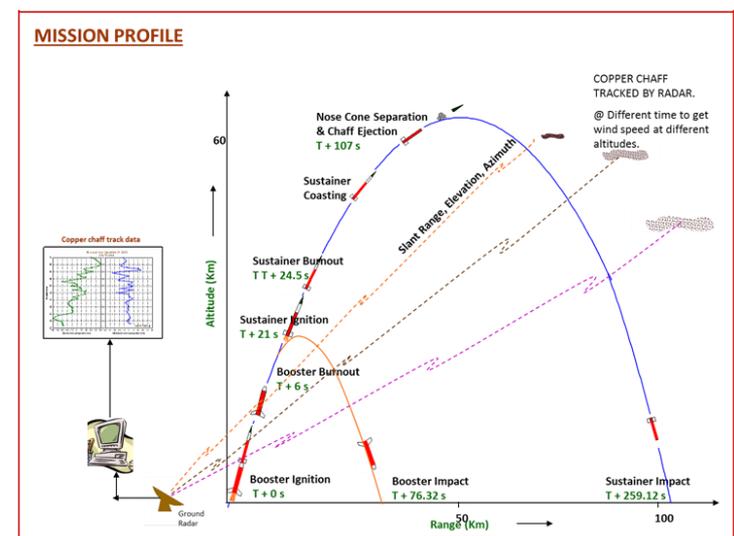


**First launch: 1971**

**159 successively successful launches**

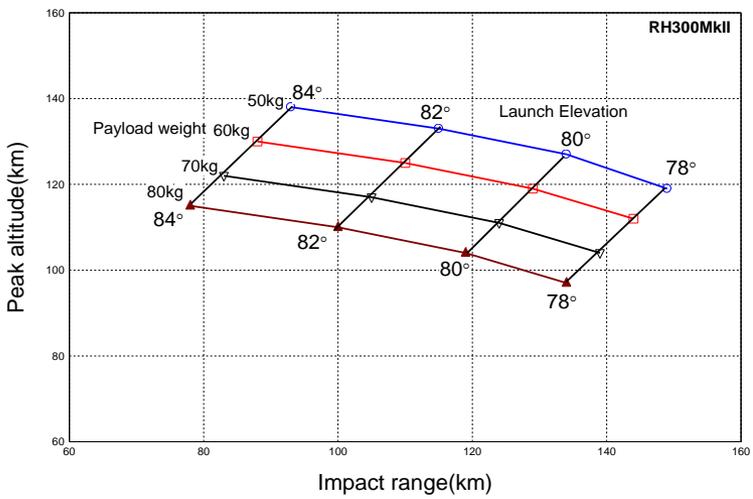


Typical Payload Assembly



# RH 300 MkII

- Single stage vehicle
- Capable of lifting 80 kg payload (scientific payload 20 kg) to 110 km altitude
- Payload volume F280 x 500 mm
- Mainly used for experiments in D & E regions of atmosphere
- Capable to experiment multiple payloads in single flight



**First launch: 1983**

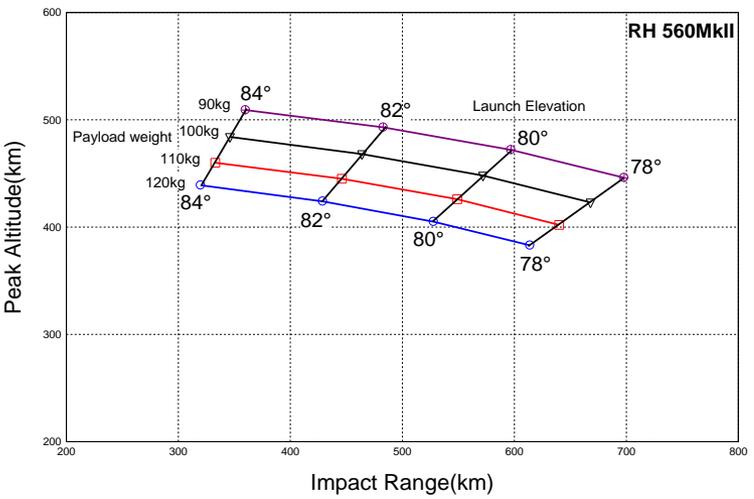


Typical Payload Assembly

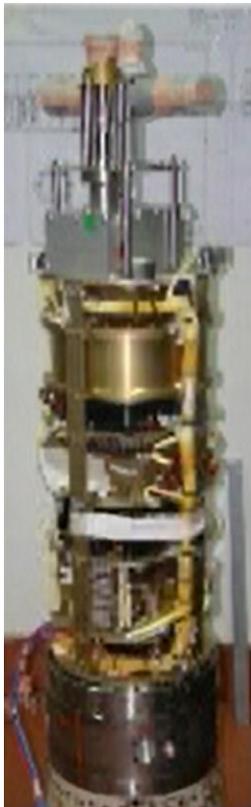


# RH 560 MkIII

- Two stage vehicle
- Capable of lifting 120 kg (scientific payload 40 kg) to 510 km altitude
- Payload volume F280 x 900 mm
- Mainly used for experiments in E & F regions of atmosphere
- A work horse vehicle to qualify various launch vehicle systems



**First launch: 1973**



Typical Payload Assembly



# Sounding Rockets: The Ideal Platform for Space Science Experiments



Probe high altitude regions inaccessible by balloons and satellites



Test bed for technologies for space systems



Low cost tool for scientific experiments



Payload capability up to 300 kg



Less turn around time



Simple and versatile

# Features available

**Suitable for experiments D, E and F region of the Atmosphere**

**Qualified and reliable telemetry and tracking system**

**Payload deployment mechanisms - nosecone ejection, boom deployment, door ejection, chemical release**

**Real time data processing and data uplink**

**Vehicle attitude measurements**

**Near simultaneous launching from TERLS & SHAR**

**Multiple scientific experiments in a single flight**



# Research avenues..



# Thank You

**For any additional information/query contact us : [isroic@isro.gov.in](mailto:isroic@isro.gov.in)**