



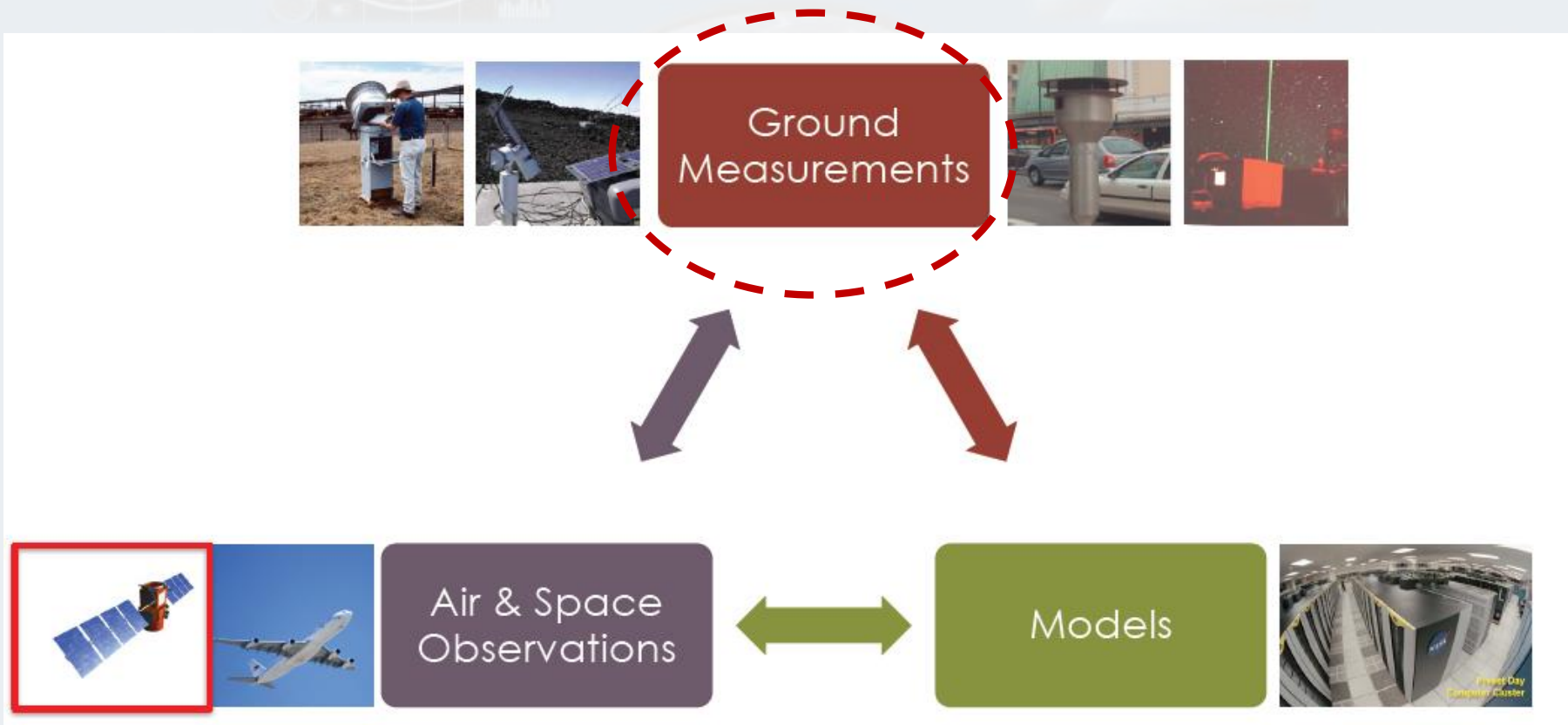
Environment Monitoring Aided By NavIC

Dr. Abha Chhabra & Nishkam Jain

**Space Applications Centre, Ahmedabad
Indian Space Research Organization (ISRO)**

**09 December, 2019
ICG-14, Bengaluru**

Deteriorating '**Air Quality**' has become a *serious concern* due to *adverse impacts on Human health*, Climate, Hydrological cycle, Earth's Radiation budget etc.

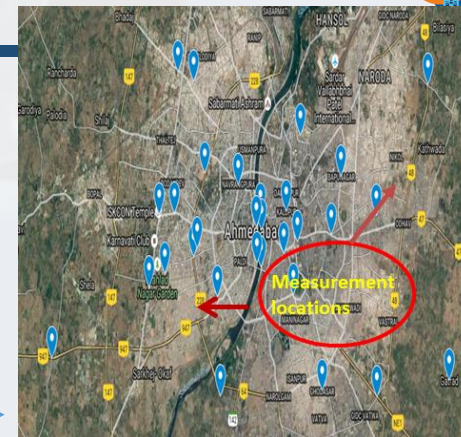


Remote sensing measurements together with **Ground-based Monitoring** and transport models form an *Integrated system*, to better understand the '**Air quality**'.



Example: Study site
Ahmedabad and adjoining
areas of Gandhinagar

Stratified sampling of measurement
locations representing different
micro-environments of the city



Field set-up of
instruments for
Particulate Matter,
Black Carbon and
trace gases air
pollutants data
collection

DC Battery and Inverter
cum UPS for field operation
of Aethalometer, AE-33



CO₂ gas
monitor



NH₃, NO₂
NO gas
monitor



MICROTOS
Sunphotometer



Mini Laser Aerosol Spectrometer



DC Battery for power supply
in field operations

Extra filter tape
for Aethalometer



GRIMM Spectrometer



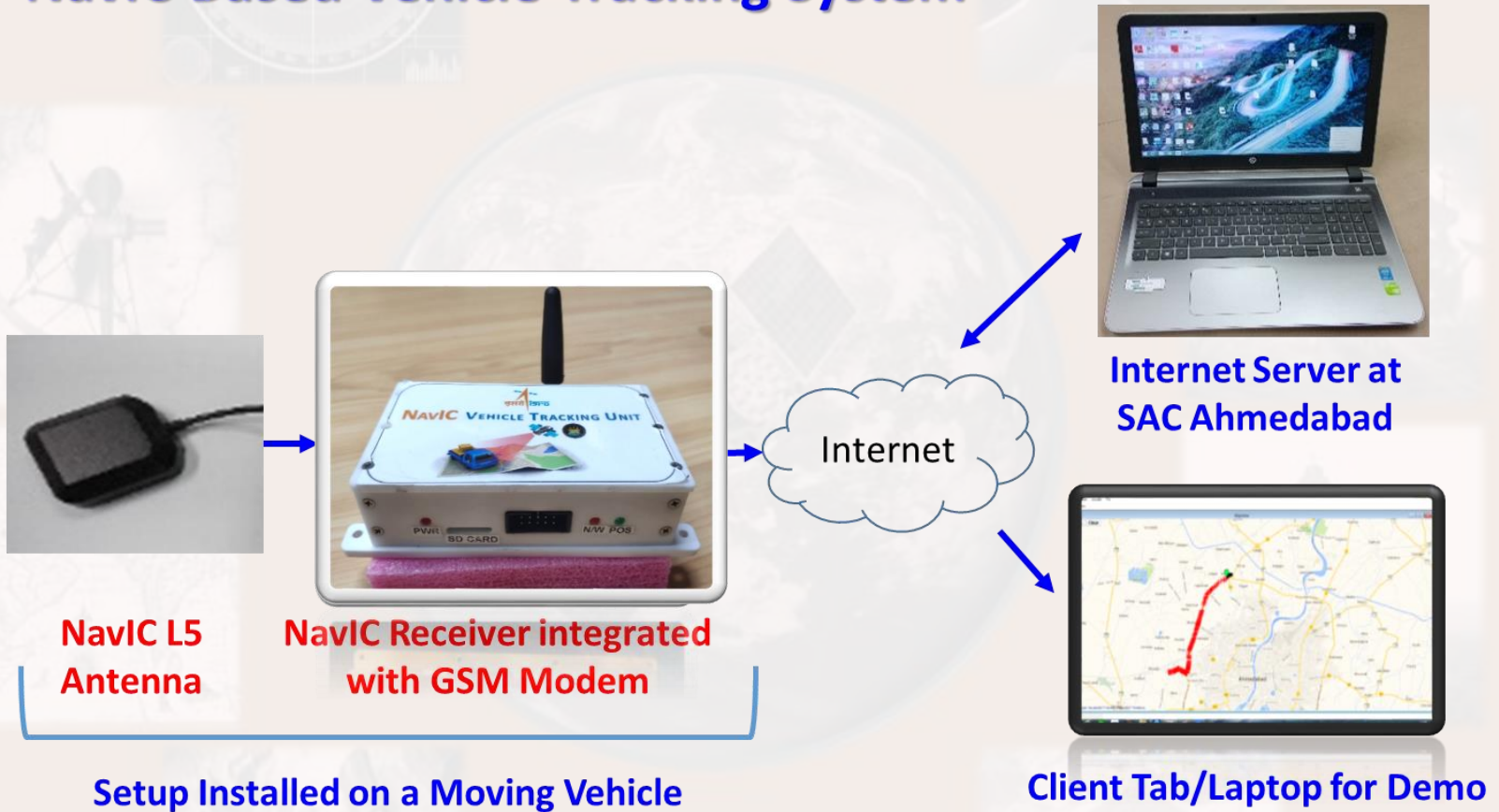
Aethalometer, AE-42

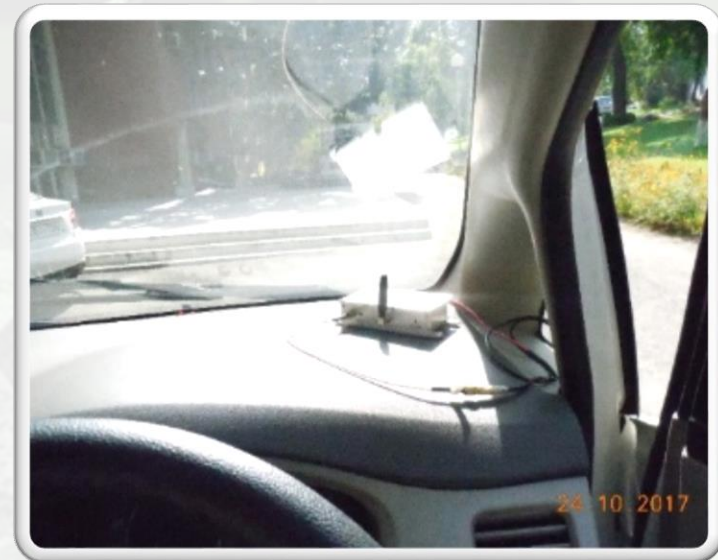


Aethalometer, AE-33

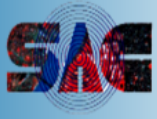
NavIC based Vehicle Tracking system (VTS)

NavIC Based Vehicle Tracking System





- ❖ NavIC and NavIC + GPS based **positioning**
- ❖ Integrated Sim900 GPRS module to **transmit position via Internet**
- ❖ Control Server to visualize **live tracking on GIS maps**
- ❖ Client application to **remotely visualize** live tracking on GIS maps
- ❖ **ISRO's Bhuvan and Google GIS maps supported.**
- ❖ Used for Payload tracking from SAC to ISITE Bangalore
- ❖ Field trials by VSSC, MOBIS (Hyundai) for fleet tracking



nishkam jain



Group Operator

- Home
- User
- Channel
- Terminal
- Tracking
 - Asset
 - Historical
- Log

Historical Tracking

Home > Tracking > Historical Tracking

* Indicates Mandatory

Group: *

sac

Channel: *

2

Terminal: *

1102

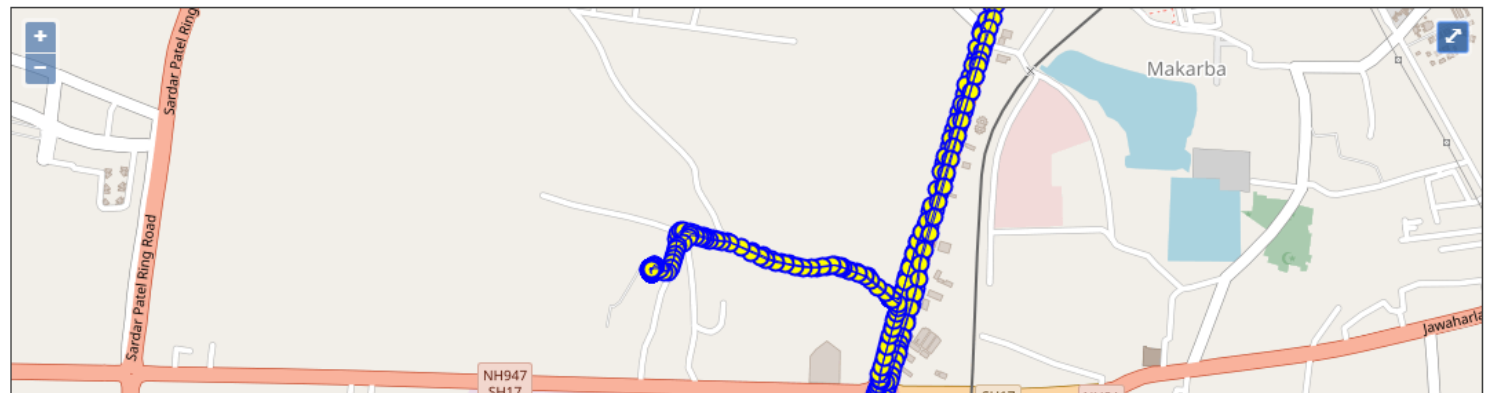
From Date: *

2019-10-04 09:00:30

To Date: *

2019-10-04 13:00:30

Trace



Air Quality Field campaign using SAC NavIC Receiver and Vehicle Tracking Unit (VTU)



इसरो ISRO





AQ measurements at Muncial Solid waste disposal and burning site, Pirana, Ahmedabad

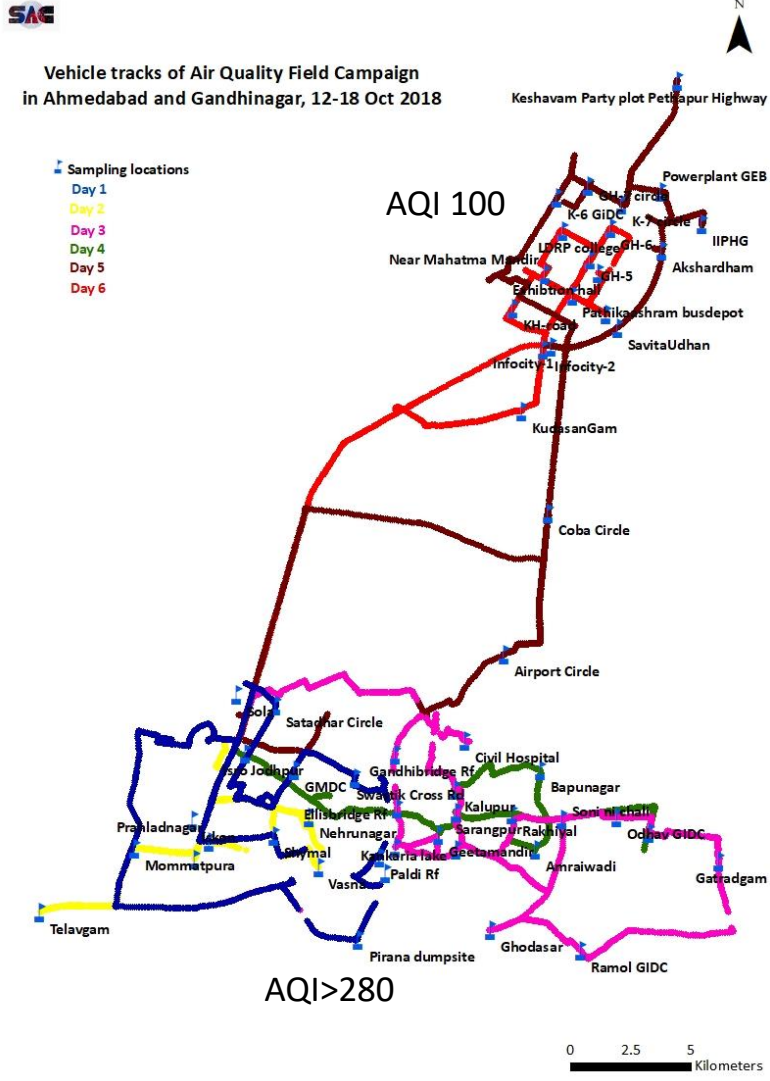


collected *in-situ* data of various particulate and gaseous air pollutants at 33 and 21 sampling sites in Ahmedabad and Gandhinagar representing different micro environments.



AQ measurements @ GEB, Gandhinagar

Vehicle track of AQ field campaign

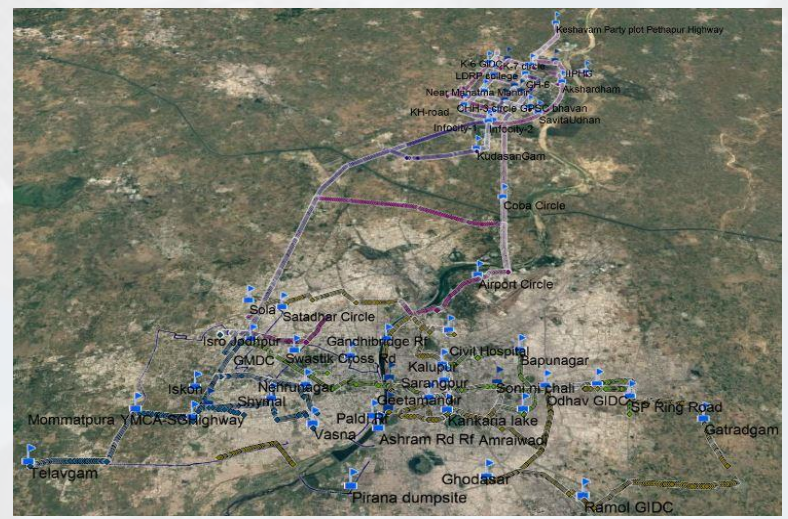


DATA LOG Report

Data Log Create By yagnesh From 2018-10-12 08:00:00 to 2018-10-16 10:10:15

S.No	Time Stamp(DD/MM/YYYY)	Terminal Id	Location	Data	RES	Seq No
1	12/10/2018 08:23:48	1033	72.506111E 23.049156N	GNGGA,025348.000,2302.9494,N,0723 0.3668,E,1.07,1.5,39.3,M,- 55.1,M,0000*52	0	3
2	12/10/2018 08:23:53	1033	72.506119E 23.049158N	GNGGA,025353.000,2302.9495,N,0723 0.3669,E,1.07,1.5,35.6,M,- 55.1,M,0000*51	0	4
3	12/10/2018 08:23:58	1033	72.506119E 23.04916N	GNGGA,025358.000,2302.9496,N,0723 0.3669,E,1.08,1.3,37.7,M,- 55.1,M,0000*53	0	5
4	12/10/2018 08:24:03	1033	72.506119E 23.04916N	GNGGA,025403.000,2302.9496,N,0723 0.3669,E,1.08,1.3,37.7,M,- 55.1,M,0000*5A	0	6
5	12/10/2018 08:24:08	1033	72.506119E 23.04916N	GNGGA,025408.000,2302.9496,N,0723 0.3669,E,1.08,1.3,37.7,M,- 55.1,M,0000*51	0	7
6	12/10/2018 08:24:13	1033	72.506119E 23.04916N	GNGGA,025413.000,2302.9496,N,0723 0.3669,E,2.08,1.3,37.7,M,- 55.1,M,0000*58	0	8
7	12/10/2018 08:24:18	1033	72.506119E 23.04916N	GNGGA,025418.000,2302.9496,N,0723 0.3669,E,2.08,1.3,37.7,M,- 55.1,M,0000*53	0	9
8	12/10/2018 08:24:23	1033	72.506119E 23.04916N	GNGGA,025423.000,2302.9496,N,0723 0.3669,E,1.08,1.3,37.7,M,- 55.1,M,0000*58	0	10
9	12/10/2018 08:24:28	1033	72.506119E 23.04916N	GNGGA,025428.000,2302.9496,N,0723 0.3669,E,2.08,1.3,37.7,M,- 55.1,M,0000*50	0	11

VTU
generated
log report



Snapshot of
Vehicle Track
on Google
Earth image

- ❖ First time use of NavIC as a Societal application towards AQ monitoring demonstrated as a pilot project.
- ❖ NavIC based **Geotagging** of pollution sources and **real time monitoring & reporting** from Ambient Air Quality Monitoring Stations (AQMS) is proposed. NavIC-Rx can be embedded with other environmental sensors hosted at AQMS.
- ❖ NavIC-Rx can also be **integrated with portable hand-held user friendly Indoor and Outdoor Air Quality monitors.**
- ❖ Automated location reporting from Primary and Urban Health Centres for study of air pollutants impacts/identifying 'hotspots'.
- ❖ Wildlife tracking for **Animal behavior studies & Wild life census.**

Future improvement Option for Environment Sensing Applications



((Top View)

35 mm



(Bottom View)

35 mm

35 mm

- Integrated Antenna on PCB
- Low cost, compact design
- Dimension 35 mm X 35mm x 12.3 mm
- Can be integrated with AQI and other environment sensors in a single electronics package
- Sensitivity (GNSS/NavIC)
 - Acquisition : -145/-140 dBm
 - Tracking : -161/-159 dBm
- Power Consumption 277 mW
- 1PPS for Precision Timing

