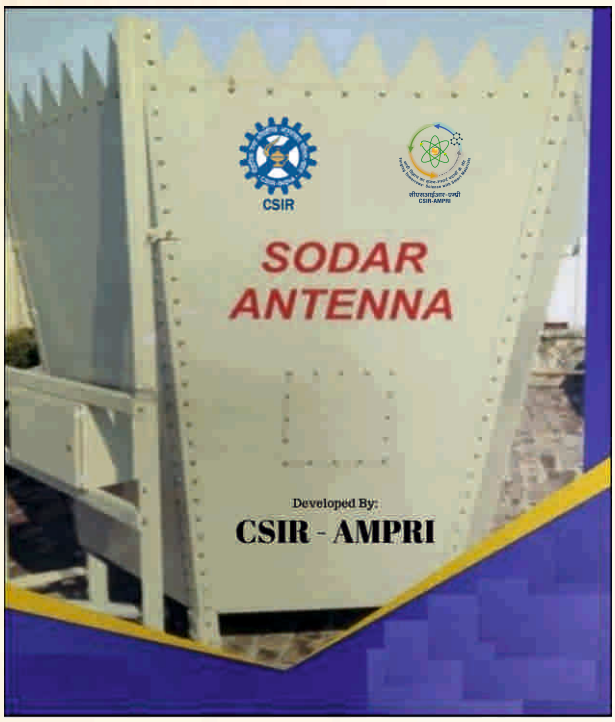
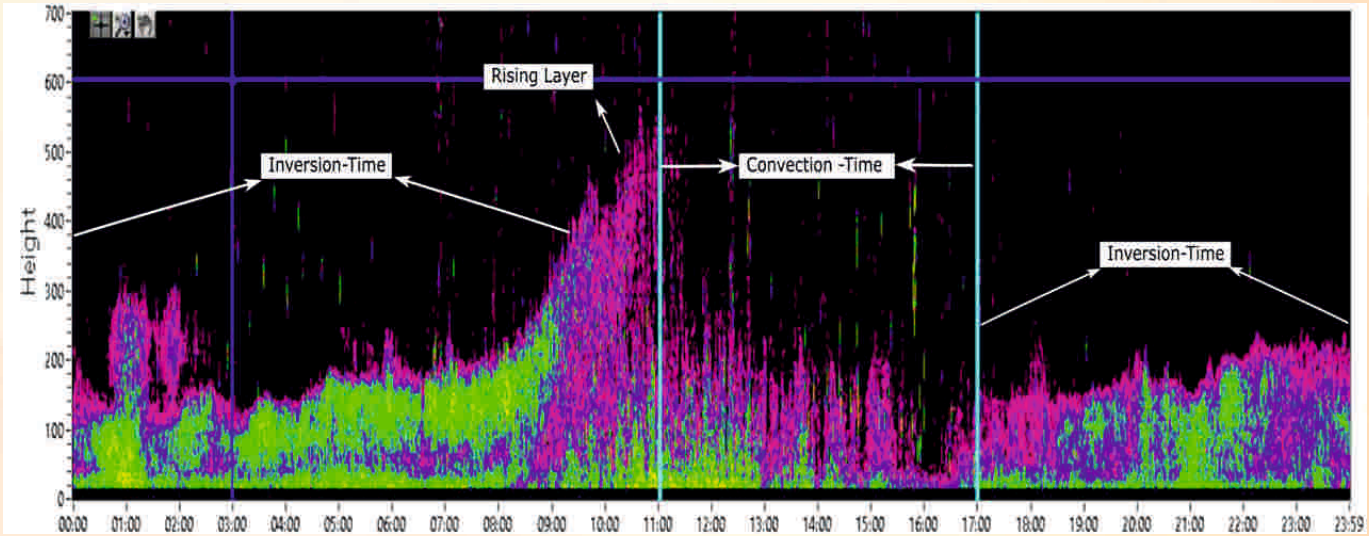
Indigenous SODAR (Sound Detection and Ranging) System



Importance of SODAR:

- SODAR is one of the best remote sensing techniques which is internationally recognized and proven cost effective to provide continuous real-time data of air pollution meteorological parameters.
- It is recommended by Environmental Protection Agency (EPA) for air quality dispersion modelling in Environmental Impact Assessment (EIA).
- It is designed at the request of the Central Pollution Control Board (CPCB), Delhi.



Standard Echogram Structure from SODAR software
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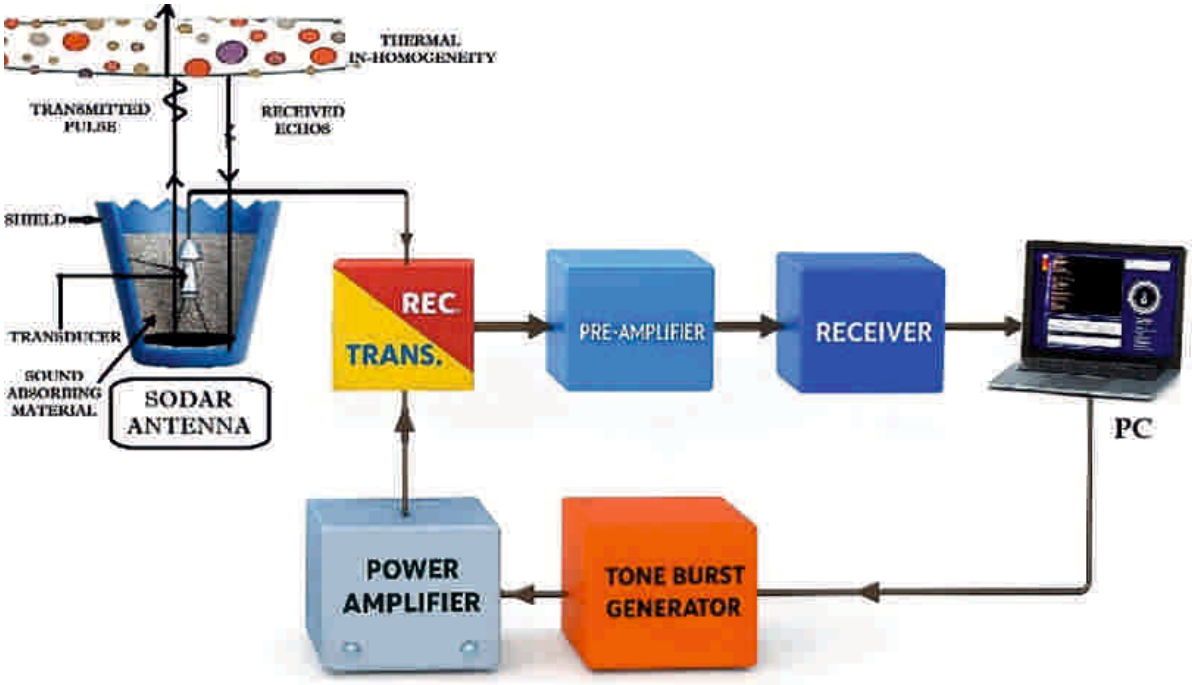
INTRODUCTION:

Sound Detection And Ranging (SODAR) is an acoustic remote sensing technique for real-time monitoring of Atmospheric Boundary Layer (ABL) height and thermal structures of concern in air pollution meteorology. It is internationally recognized and recommended by the Environmental Protection Agency (EPA) for air quality dispersion modeling in Environmental Impact Assessment (EIA). This technique is in use all over the world for various practical and atmospheric research applications. SODAR is an advanced remote sensing system that uses sound waves to probe the atmospheric boundary layer (ABL), providing real-time measurements of thermal structure, turbulence, and mixing heights up to several hundred meters above the surface. These parameters are crucial for weather prediction, air quality assessment, aviation safety, and urban environmental management. .

WORKING PRINCIPLE

SODAR transmits highly directional high-power short bursts of sound energy (10 – 20 Watts) of fixed audio frequency (between 1kHz – 4 kHz) with a duration of about 100 ms, the repetition rate of 6 seconds for 1 km probing range. The back scattered acoustic signals from atmospheric fluctuations, of eddy sizes 0.1 – 1 m within the inertial sub-range of turbulence, are received by the same antenna (mono-static). The signals are processed to produce a pictorial view of the turbulent regions occurring in real space and time above the antenna.



Block diagram representation of SODAR

HARDWARE SPECIFICATIONS

DESIGNING SPECIFICATIONS OF CSIR-AMPRI MONOSTATIC SODAR	
Transmitted power (electrical)	90 Watts
Transmitted power (acoustical)	15 Watts
Pulse width	100 ms
Pulse repetition period	6 sec
Operational range	1000 m
Receiver bandwidth	50 Hz
Frequency of operation	2250 Hz
Acoustic velocity	340 m/s (average)
Receiver Gain	80 dB
Receiver area	2.5 sq. m

APPLICATIONS

- Environmental Impact Assessment studies
- Mixing height studies
- Inversion climatological studies
- Stability class characterization
- Stack plume monitoring
- Thermal structure studies
- Base parameter for forecasting/ prediction model development.

WHO CAN USE SODAR ?

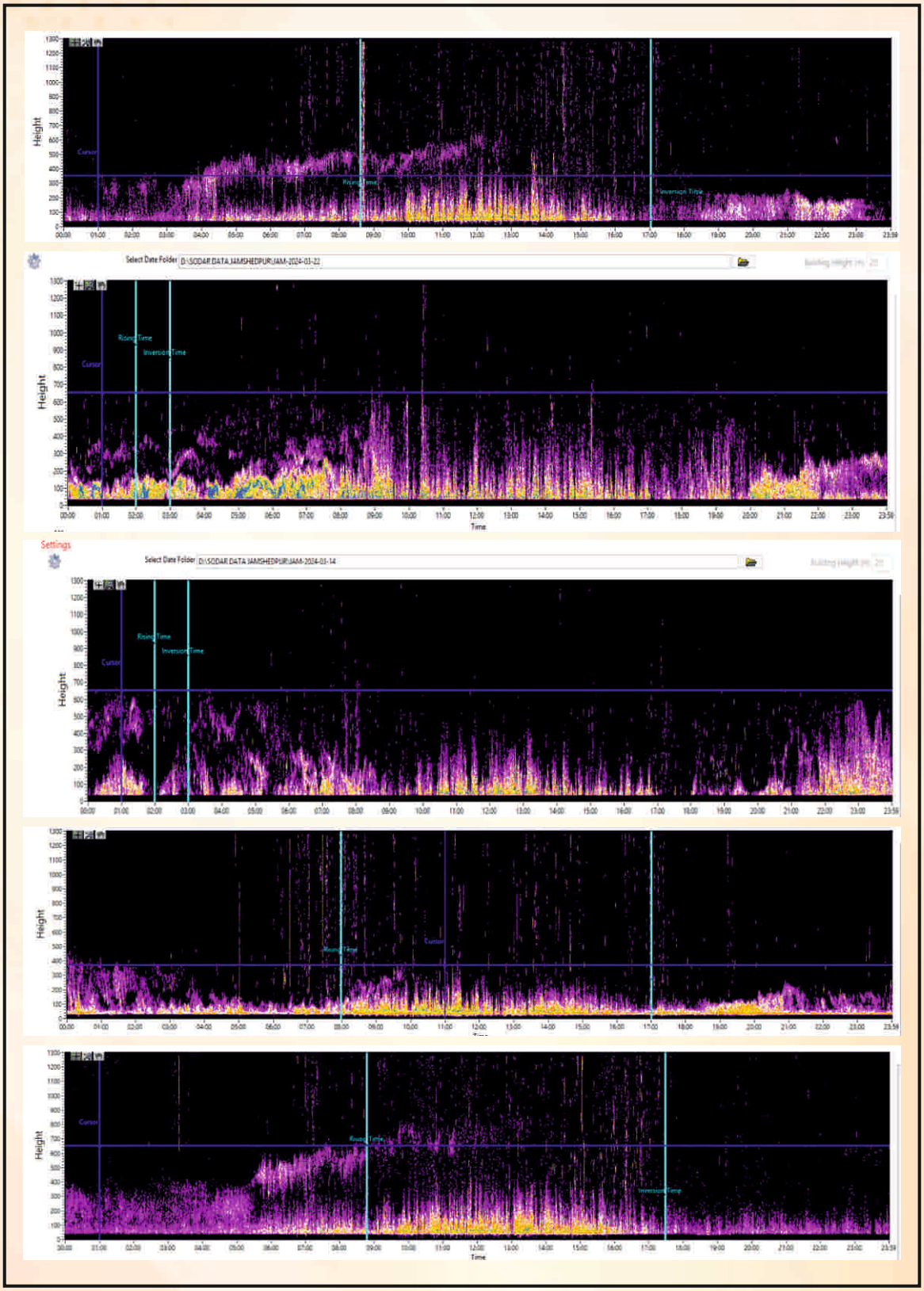
- Air pollution scientist/engineer
- Environment management planner
- Atmospheric physicist
- Dispersion modeler
- Air-traffic controller
- Agriculture scientist
- Communication engineer
- Boundary layer researcher

S.No.	Sites deployed with the SODAR system	State
1	CSIR-National Physical Laboratory (NPL), New Delhi	Delhi
2	Central Pollution Control Board (CPCB), Delhi	Delhi
3	Aligarh Muslim University (AMU), Aligarh,	Uttar Pradesh
4	Rajasthan State Pollution Control Board (RSPCB), Alwar	Rajasthan
5	Punjab Pollution Control Board (PPCB), Sangrur	Punjab
6	Indian Institute of Technology, Roorkee	Uttarakhand
7	Indian Meteorological Department, Hisar	Haryana
8	Maharashtra Pollution Control Board (MPCB), Mumbai	Maharashtra
9	CSIR- (AMPRI), Bhopal	Madhya Pradesh
10	Tata Steel, Jamshedpur	Jharkhand
11	IMD, Delhi	Delhi

MoU signed and SODAR system installed & inaugurated at IMD Delhi on 26th September 2025

The purpose of this MoU is to enhance collaborative research work between CSIR-AMPRI and IMD in climate and environmental studies with emphasis on scientific and societal challenges related to weather, climate variability, forecasting and disaster risk reduction. The MoU facilitates the sharing of SODAR system data across various locations for forecasting, validation, and research initiatives. This collaboration between CSIR-AMPRI and IMD is expected to generate significant advances in the field of meteorology, climate science, and environmental studies, benefiting both research communities and nation as a whole.

SODAR ECHOGRAMS STRUCTURES



Typical signature of rising layer, Prolonged Fumigation, thermal plumes and multilayer structure

For further inquiries please contact:
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