

Neutral cluster and Air Ion Spectrometer

NAIS



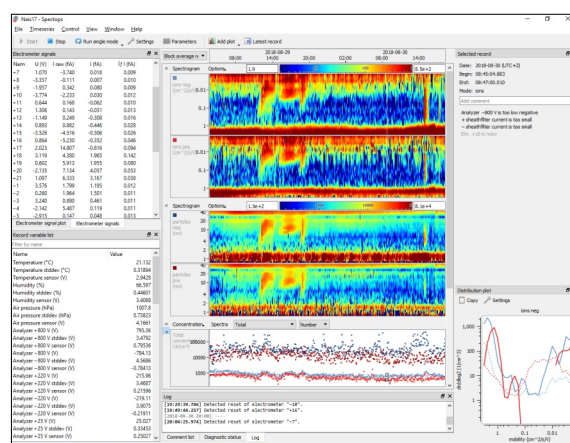
A parallel multichannel aerosol spectrometer for measuring the mobility distribution of ions (from 3.2 to 0.0014 cm²/V/s, from 0.8 to 40 nm size equivalent) and size distribution of aerosol particles (from 2 to 40 nm) with a maximum time resolution of 1 second. The NAIS is based on the principle of parallel differential mobility analysis.

The instrument is easy to deploy, operate and maintain. It can measure for long periods without requiring human attention and works well in a wide range of environmental conditions: from polluted downtowns to clean forests, on mountaintops and on board aircraft.



Applications

- Long-term continuous field measurements of aerosol and ion distributions.
- Research of temporal development of particle and cluster distributions (nucleation, particle formation, particle growth).
- Study of formation and development of ambient air pollution.
- Measurement of rapidly varying aerosol and ion distributions in laboratory experiments.



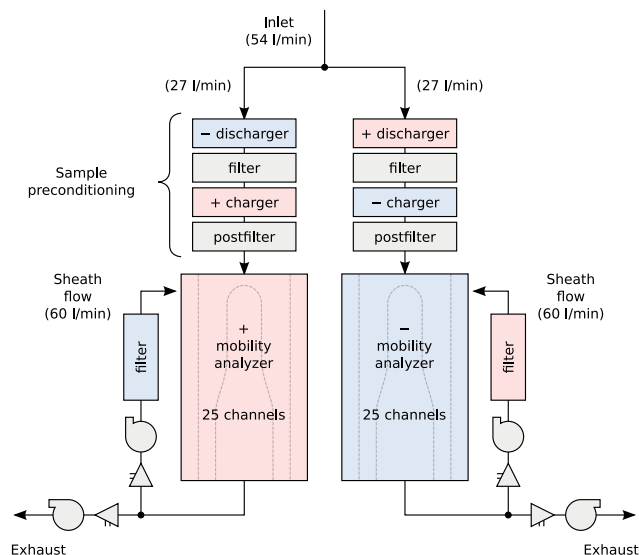
Screenshot of the NAIS measurement program



Examples of NAIS measurement locations: (a, b) on board the DLR Falcon research aircraft; (c, d) Amazon rainforest near Manaus, Brazil; (e) the NAIS carried to a measurement site in the Himalayas; (f, g) on board the Zeppelin airship

Measurement Principle

The instrument contains two almost identical analyzer columns. In both columns the sample is first passed through a software controlled charger-filter unit which allows the instrument to alternate between detecting naturally charged particles (ions) or all particles (both charged and uncharged). Subsequently the sample is mobility-classified in a parallel differential mobility analyzer and measured simultaneously by 25 electrometers. One analyzer detects positively charged particles, the other negatively charged. The size and mobility distributions are derived by a mathematical deconvolution procedure from the 25 electrometers of the corresponding analyzer.



Advantages

- The measurement process is completely automatic and thoroughly monitored to guarantee reliable results.
- The airflows are automatically adjusted to take into account the effect air pressure on particle mobility. This allows the instrument to operate in a wide atmospheric pressure range from 300 to 1200 hPa making it suitable for mountain top measurements, aircraft based measurements and chamber experiments.
- The instrument is simple to deploy. All parts of the instrument are contained in the single enclosure. No external pressurized air, vacuum or liquid connections are required.
- The instrument does not consume or produce any harmful materials.
- Regular maintenance of the instrument involves only cleaning which takes a maximum of 1 hour and can easily be carried out in the field. The maintenance interval can reach several months in clean conditions.

Specifications

Measurement Range

Particle distribution ~2 to 40 nm
Ion distribution 3.2 to 0.0013 cm²/V/s
(0.8 to 40 nm size equivalent)

Sample Flow Rate 54 l/min

Time Resolution 1 second
1 to 5 minute averages
typically used during long-term monitoring

Operating Temperature

-20 to 40 °C

Sample Air Pressure Range

300 to 1200 hPa

Power Requirement 70 W, AC 110/240 V

Communication RJ45 (ethernet), LAN or direct

Dimensions L 580 mm, W 305 mm,
H 810 mm

Weight 60 kg

Consumables None

Servicing Interval 1 to 3 months

For more information please visit www.arel.ee