MP-3000A Microwave Radiometer Profiler
Technical Specifications and Characteristics

Microwave radiometer profilers have become important contributors to improved short term forecasting because of their ability to "see" the three dimensional air temperature, humidity and liquid structure that defines local weather. Recent developments of Internet-based control, display and forecast tools, allows this passive all-weather, all-sky remote sensing technology to provide forecasters with continuous upper-air surveillance for accurate Nowcasting and weather forecasting.

Radiosonde and microwave profiler temperature and humidity profiles observed at the same time and location have been proven to be ***comparable in accuracy*** when used to characterize cell volumes in numerical weather models. At the same time, continuous radiometer profiles can be ten times more accurate than radiosonde data with 12-hour latency. Microwave profilers combining advanced neural network retrieval methods also provide liquid profile data that are crucial for accurate short-term precipitation forecasting, and are needed to reduce large uncertainties in cloud models essential to regional and global climate research and prediction.

Instrument Characteristics

Frequency agility and hyperspectral neural network methods are desired for optimum cost-effective microwave profiler performance in all environmental conditions. It has been demonstrated that these methods automatically suppress radio-frequency interference (RFI) and microwave receiver noise, minimize radiometer parts count, size, weight, and power requirements, and ensure long-term cost-effective reliability and accuracy. Optional zenith infrared sensing providing cloud base temperature data is needed to optimize retrieved profile accuracy in all weather conditions. Internally mounted infrared sensors are preferred for this purpose, so as to ensure long-term reliability and accuracy - internal mounting protects the infrared sensor from saline corrosion, wind-driven sand and freezing environmental conditions.

The instrument design is modular with numerous field replaceable components so as to ensure long-term cost-effective performance and ease of field repair. Advanced neural network methods, combined with frequency agility, elevation scanning, and rain effect mitigation methods, are used to ensure optimum performance in all environmental conditions including heavy precipitation.

Monitoring, Nowcasting and Forecasting Applications

- Continuous Temperature, Humidity and Liquid Water Profiling
- Convection, Lightning and Precipitation
- Fog, Turbulence, Aircraft and Surface Icing
- Urban Pollution and Airborne Dispersion

- Aviation Weather Decision Support
- Marine Weather Decision Support
- Satellite Propagation Delay, Attenuation and Scattering
- Weather Modification and Cloud Seeding Research and Operations
- Cloud Physics and Climate Research
- Radiosonde Humidity Error Correction

MP-3000A Specifications

Profile Range	Temperature, water vapor, relative humidity and liquid water profiles to 10 km height.
Data Processing and Display	Browser-based click-and-zoom radiometer control and display, including real-time profiles, integrated vapor and liquid, infrared temperature, microwave brightness temperatures, cloud base height, and surface meteorology. Database display and analysis software supporting real-time and archival data. Facility for automatic generation and display of forecast indices must be provided.
Calibrated Microwave Channels	21 calibrated channels in 22-30 GHz (K-band) and14 calibrated channels in 51-59 GHz (V-band).Furthermore, the instrument must be software programmable to any of 4,000 K-Band channels (2 MHz spacing), and 2,000 V-Band channels (4 MHz spacing). Any of these channels can be factory calibrated.
Frequency Channels for Zenith Retrievals	22 observation channels used for standard zenith profile retrievals: ▪ 8 Channels (22-30 GHz range) ▪ 14 Channels (51-59 GHz range)
Brightness Temperature Accuracy	0.2 + 0.002*│TkBB-Tsky│ K (for external cryogenic target calibration with no error)

Radiometric Stability		<1° C per year (typical)
Radiometric Resolution		0.1 to 1° C depending on integration time
Sample Time		variable, typical 10 sec
Integration Time		0.01 to 2.5 sec (user selectable in 10 msec increments)
Angular Coverage		All-Sky (with optional Azimuth Positioner)
Surface Measurement Range & (Accuracy)		
	Temperature	-50 to +50 C (0.5^{o} C @25° C)
	Relative Humidity	0 to 100% (2%)
	Barometric Pressure	800 to 1100 mb (0.3 mb) standard 600 to 1100 mb (0.5 mb) optional (required for operation above ~1,600 m altitude)
Cloud Base Temperature Measurement		
	Infrared Temperature (IRT) Sensor (optional)	0.5 C + 0.7% of difference between IRT sensor housing and observed temperature
Electrical/Mechanical Characteristics		
Operating Temperature		-40° C to +45° C (standard) Extended upper range to +50° C (optional)
Power		100 to 250 VAC @ 50 to 60 Hz 200 Watts (typical @ 25° C) 400 Watts max (cold start)
Power Supply		85-264 VAC (50-60 Hz)
MTBF		>20,000 hrs
Weight (without Tripod)		29 kg
Dimensions (Instrument)		86 x 53 x 31 cm