METEOROLOGICAL TEMPERATURE PROFILER

MTP-5

ecology and urban climat

always with a profile
WHY WE NEED TEMPERATURE PROFILE?

J.M. Wilczak et al.

- Vertical mixing: what is the depth of the boundary layer?
- Horizontal transport: where does the wind move the pollution?
- How much pollution is present?
MTP-5 is makes measurements up to 1000 m above the instrument and gives the same performance in all weather conditions. It is compact and operates from 12 VDC. The rotating scanner assembly is protected by a special cover that has very good microwave transmission. The cover sheds precipitation and allows compensation for dirt during the self-calibration. It is:

• CONTINUOUS MEASUREMENTS,
• UNMANNED,
• NO CONSUMABLES

MTP-5 is ideal for use in urban environments, ecology and at airports.

HOW WE CAN MEASURE THE BOUNDARY LAYER TEMPERATURE PROFILES?

1) Radiosonde
   does not give the possibility of the continuous measurements, high operational cost

2) MetroTower
   strong location restriction, very high cost

3) Tethered Balloons
   strong limitation in the weather conditions, high Operational cost

4) RASS is depend on weather condition and there are no data on the first 100m

5) MultiChannel padiometer
   No profile without radiosondes (pos.1)
An angular-scanning, single-channel microwave radiometer, such as the MTP-5, with its working frequency at the molecular oxygen band centre can provide continuous measurement of ABL temperature profiles practically in all weather conditions. For altitude up to about 1 km, the accuracy of temperature profile recovery is about 0.2-1.2°C (depend on type of profile). MTP-5 data are very useful for many applications: forecasting of air pollution at urban area, mesoscale weather forecasting, forecasting of dangerous meteorological conditions, investigation of urban heat island, etc.

WHY MTP-5?
UNMANNED, SELF-TESTED and SELF-CALIBRATED TECHNOLOGY!

«RPO« ATTEx»
rpo.attex@gmail.com
www.attex.net
WHY MTP-5? EXPERIENCE!

Since 1992 about 93 devices in 14 countries are working to measuring of the temperature profiles. During 1995-2010 we have developed and done promotion of MTP-5 with support Kipp&Zonen. About 30 of them in Russia. For such routine tasks as Meteorological service with nowcasting and short forecasting.
WHY MTP-5? ACCURACY!

### MTP-5 Meteorological Temperature Profiler

**Altitude range:** 1000 m

**Displayed height interval:**
- **H version:** 50 m in range 0–1000 m
- **HE version:** 25 m in range 0–100 m, 50 m from 100 to 1000 m

**Measurement interval, minimum:** 5 minutes

**General measurement frequency:** 56.6 GHz

**Field of view:** 2.5°

**Accuracy of temperature profile RMS T[°C]:** 0.2° ± 1.2 or better (depend on type of profile)

**Accuracy in determination of the height %:** 25%

**Weight:** 20 kg

**Power consumption:** Maximum 12 VDC, not more than 100 W average 60 W

**Power requirements:** 220 VAC/ 110 VAC, 1A/ 2A, 50 - 60 Hz

**AC/DC power supply:**

**Ambient temperature range:** -40 °C - +50 °C

**Calibration:** self-calibrating

**Member of:** HMEI

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**Example with RASS comparisons**

**The Federal Service for Hydrometeorology and Environmental Monitoring (ROSHYDROMET)**

**Methodology Recommendations for the use of data from MTP-5 profiler**
The Federal Service for Hydrometeorology and Environmental Monitoring (ROSHYDROMET)

The Federal State Institution “The Russian Federation Hydrometeorological Research Center

The Federal State Budgetary Institution “Central Aerological Observatory

Methodology Recommendations for the use of data from MTP-5 profiler

Moscow, 2010
Modelling of Air pollution in Bergen City
Igor Esau & Tobias Wolf, GC RieberPhD Fellow

(a) MTP vertical temperature profile and [NO₂] at Danmarksplass and Rådhuset for 7 days in January 2013; (b) Simulation of the air pollution (red color) with the PALM model at 30 m spatial resolution.

METEO SERVICE: MODELING MODELING:
PALM Nansen Environmental and Remote Sensing Center, Norway
WRF Moscow State University, Central aerological observatory
COSMO Hydrometeorological centre of Russia
Regional and federal meteorological and ecological services

URBAN CLIMATE: ECOLOGY, FORECAST, HEAT WAVE and etc

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MTP5 - METEOROLOGICAL TEMPERATURE PROFILER

URBAN CLIMATE: ECOLOGY, FORECAST, HEAT WAVE and etc
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23/07/2001 - 24/07/2001

[Graph showing temperature and height data with labeled measures and locations such as Dolgoprudny, Zvenigorod, Roshydromet, and Moscow.]

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Долгопрудный Зима 2006

Долгопрудный Лето 2006

Москва Зима 2006

Москва Лето 2006
http://www.arpa.veneto.it/bollettini/htm/profilatori.asp

Padova tetto del Dipartimento

40km

Rovigo palazzo della Regione
APPLICATIONS for ECOLOGY

MTP 5 has an important application in monitoring air pollution. It offers a simple, fast and economical solution for forecasting and for the process of issuing public information. Also it can be used to help predict the dispersion of gasses in the case of accidental or unscheduled releases. The illustrations (on right) show relative levels of air pollution. In the case of a temperature inversion (red), typically in the early morning, the gasses and aerosols are trapped close to the ground. During the day, the profile becomes adiabatic (green) and the pollution concentration decreases as the gasses and aerosols escape to higher levels.
Environmental services: air pollution forecast and warning
WHY WE NEED TEMPERATURE PROFILE?

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MTP-5 METEOROLOGICAL TEMPERATURE PROFILER

Moscow 02.02.2009
Москва 08.08.2010

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URBAN CLIMATE: ECOLOGY
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Company’s history of / effort of validation/data QA

2003 3 MTP-5 Taipei, Taichung and Kaohsiung EPA Taiwan
2012 Nansen Environmental and Remote Sensing Center, Norway
2007 3 MTP-5, Padova, Rovigo and Belluno. Regional Agency of Environmental Protection of Veneto - Centro Meteorologico Teolo (ARPAV/CMT)

Modelling of Air pollution in Bergen City
Igor Esau & Tobias Wolf, GC Rieber PhD Fellow

(a) MTP vertical temperature profile and [NO$_2$] at Danmarkspllass and Rådhuset for 7 days in January 2013; (b) Simulation of the air pollution (red color) with the PALM model at 30 m spatial resolution.
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WHY MTP-5? EXAMPLES OF THE DATA!

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