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Working together for clean air

An evaluation of a new method for measuring low level vertical temperature structure

Kipp & Zonen MTP-5HE

Test and Demonstration

- **MTP5-HE collocated at**
  - **PSCAA RASS/Profiler site on NOAA CAMPUS**
  - **Hanford WA 400’ ft Met tower**

- **Demonstrate**
  - **Accuracy**
  - **Ease of operation**
  - **Reliability**
  - **Ability to meet operational needs of PSCAA**

MTP 5-H
Harsh climate

- **Height range up to 600 m**
- **Height resolution 50 m**
- **Rotating Teflon™ scanner window minimizes cleaning**
- **Frequency 59.6 GHz, 3º view, Double Side-Band (DSB)**
- **Very good accuracy**
- **Wide ambient operating temperature range**
- **Long-life scanner motor, typically 5 years operation**

MTP 5-HE
Harsh, Extended range

- Height range up to 1,000 m
- Height resolution varies from 50 m to 120 m
- Frequency 56.7 GHz, 3º view, narrower bandwidth, Single Side-Band (SSB)
- Improved specification of radiometer to maintain signal to noise performance
- Mist, cloud and heavy rain slightly degrades accuracy of temperature measurement

MTP 5-P
Polar

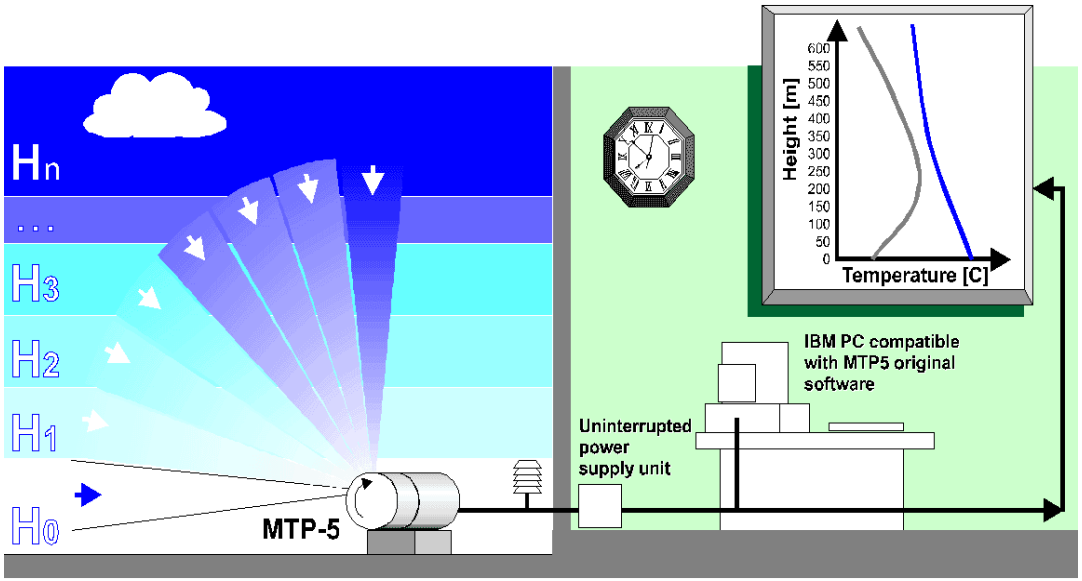
- **For operation in Polar regions**
- **Height range up to 600 m**
- **Height resolution 10m in lowest part of scan**
- **Frequency 60.4 GHz, <1º view**
- **Large parabolic dish antenna with very narrow beam angle**
- **Modified 2AP sun tracker for antenna and radiometer scan**
- **For use in Arctic and Antarctic**

MTP 5- H/HE- What Does It Do ?

- Real-time measurement of air temperature in the Planetary Atmospheric Boundary Layer
- Heights up to 1,000m above the instrument (depends on model type)
- Simple automatic operation
- Self-calibrating
- Minimal maintenance

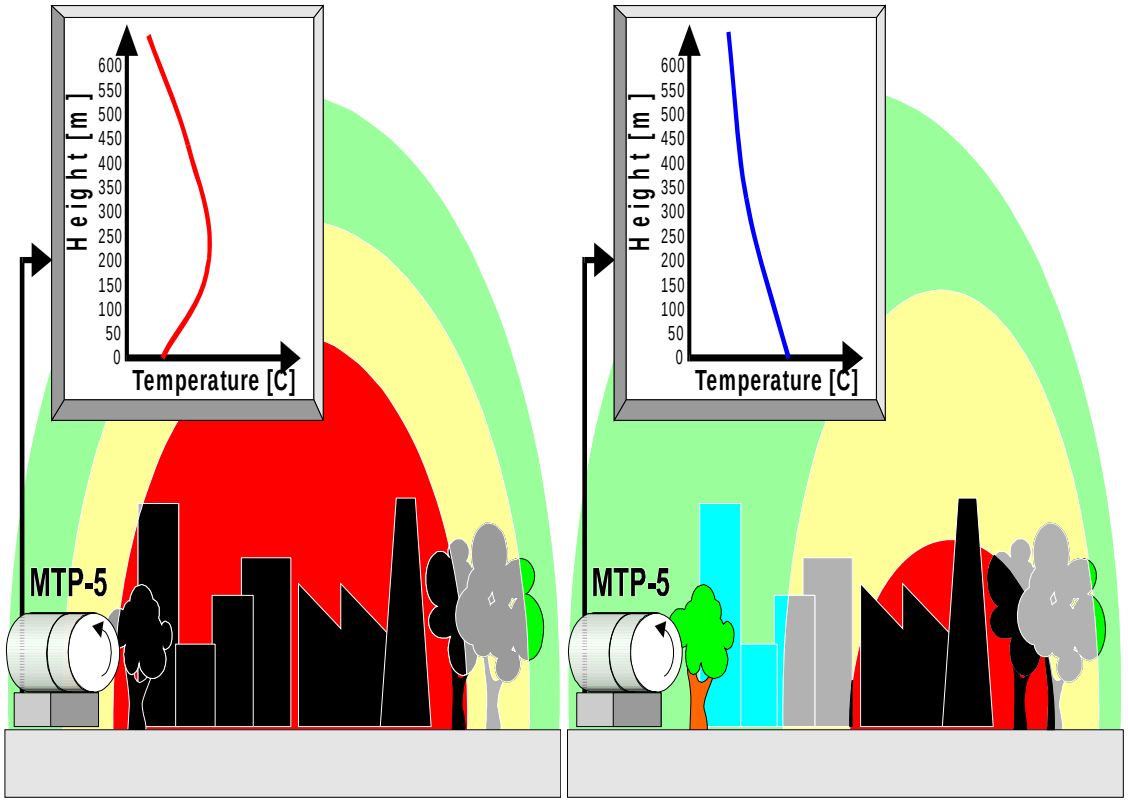
MTP 5-H/HE

What Is The Method ?



- **Passive Microwave Receiver**
- **Measures 5 mm wavelength thermal radiation from the atmosphere from 0 - 90° elevation**
- **Software derives temperature profile**

MTP 5h/HE- What Is It For ?



- **Air pollution forecasts**
- **Emergency response**
- **Weather now-casting (1-5 hrs)**
- **Atmospheric chemistry studies**
- **Model Validation**

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MTP5- HE

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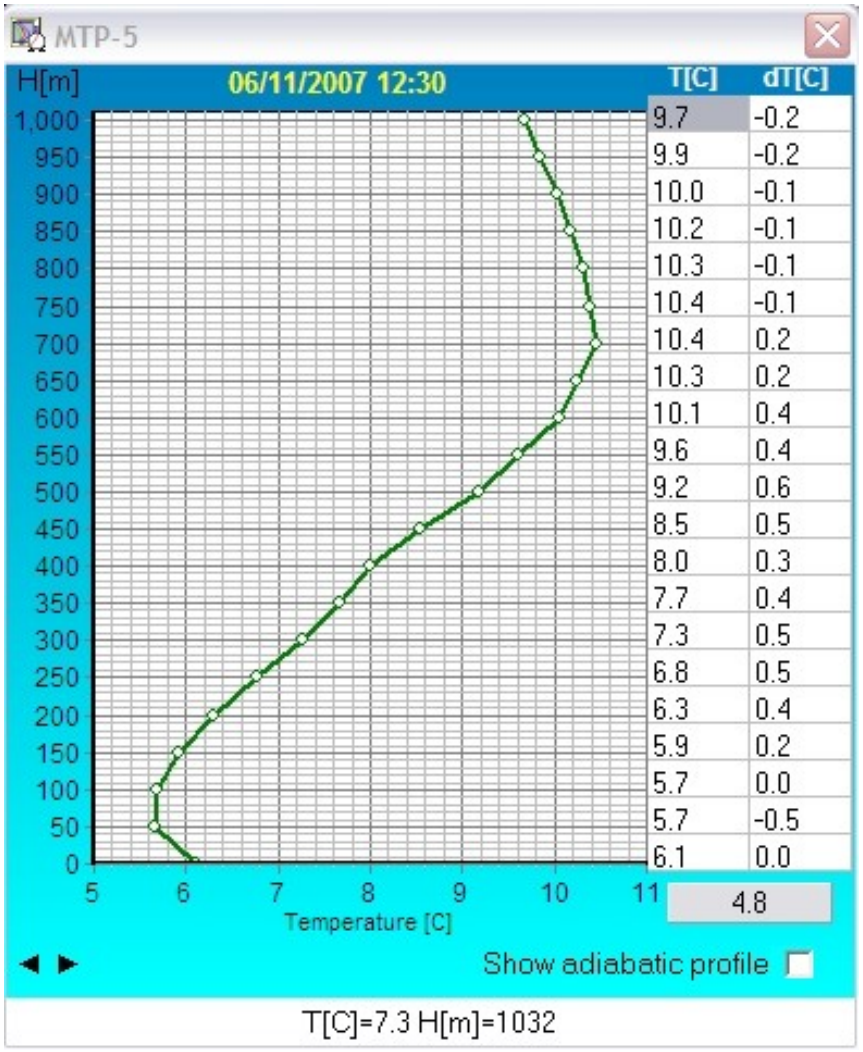
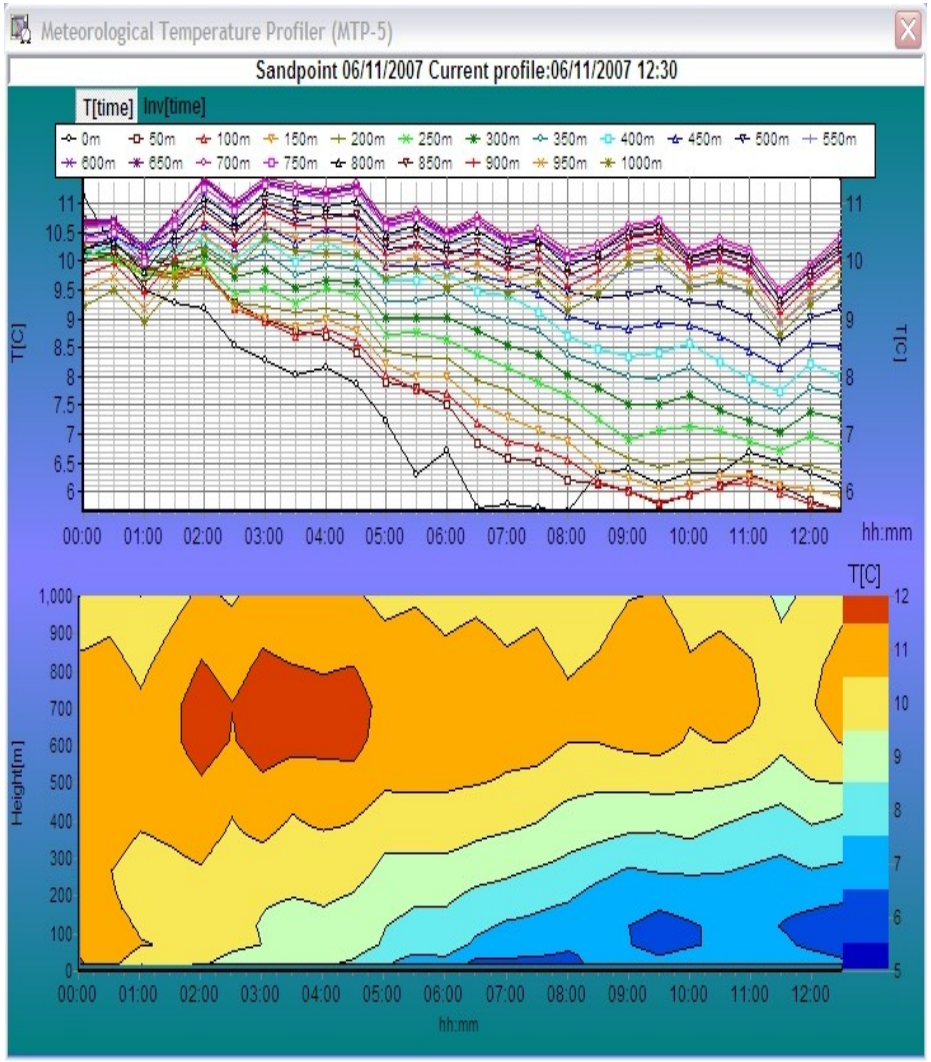
Siting considerations

Output Graphics





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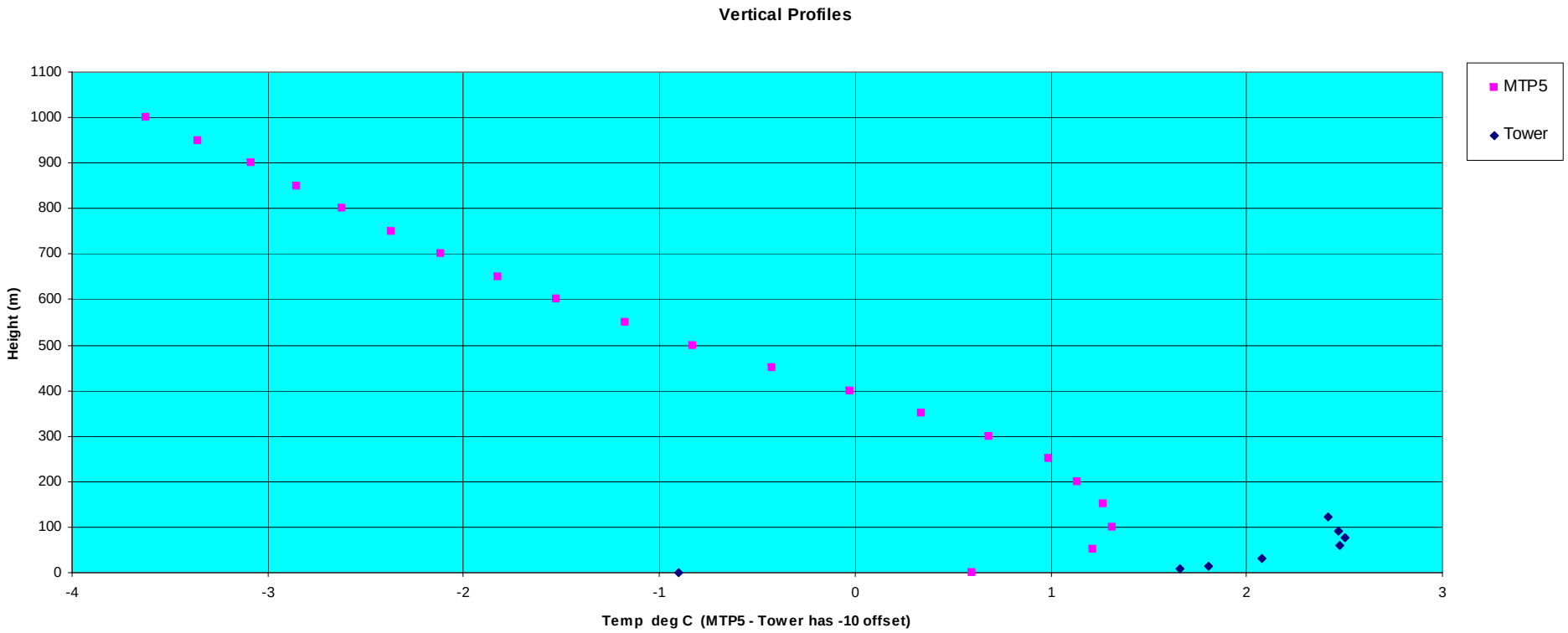
MTP5-HE vs Hanford tower



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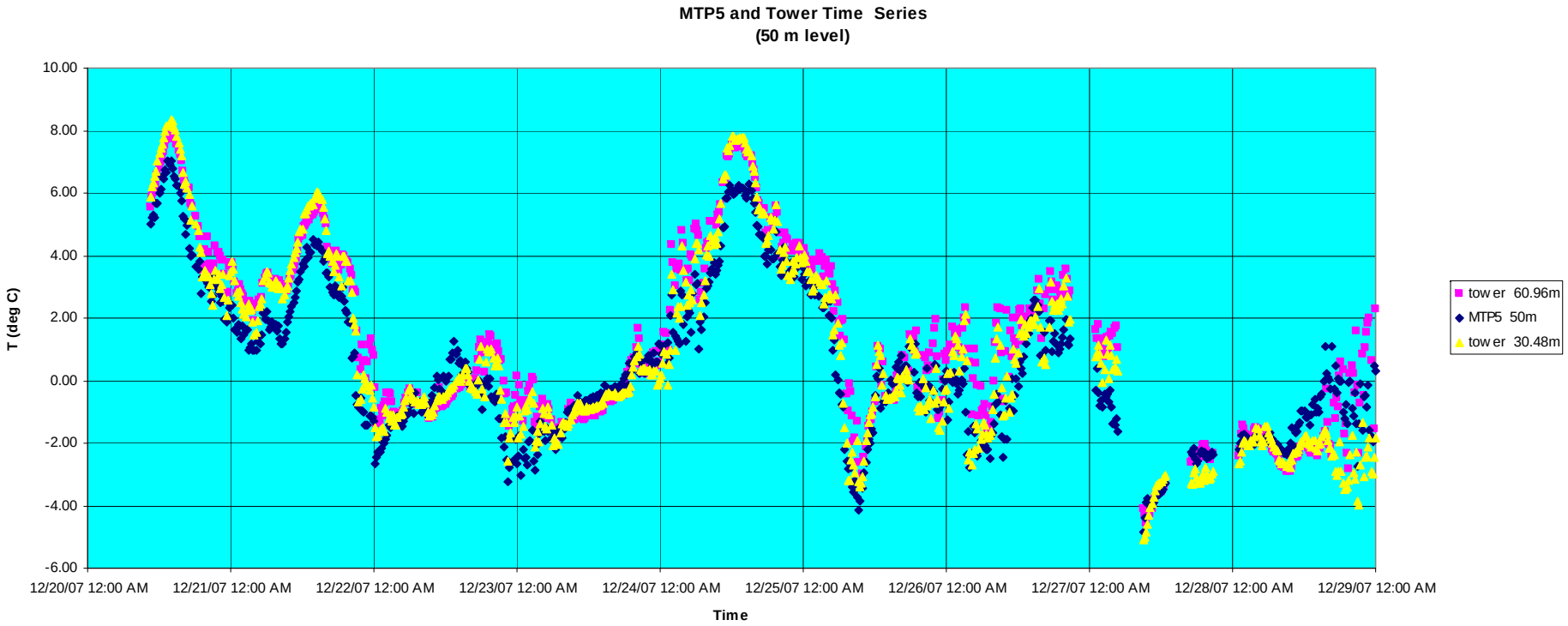
MTP5-HE vs Hanford tower



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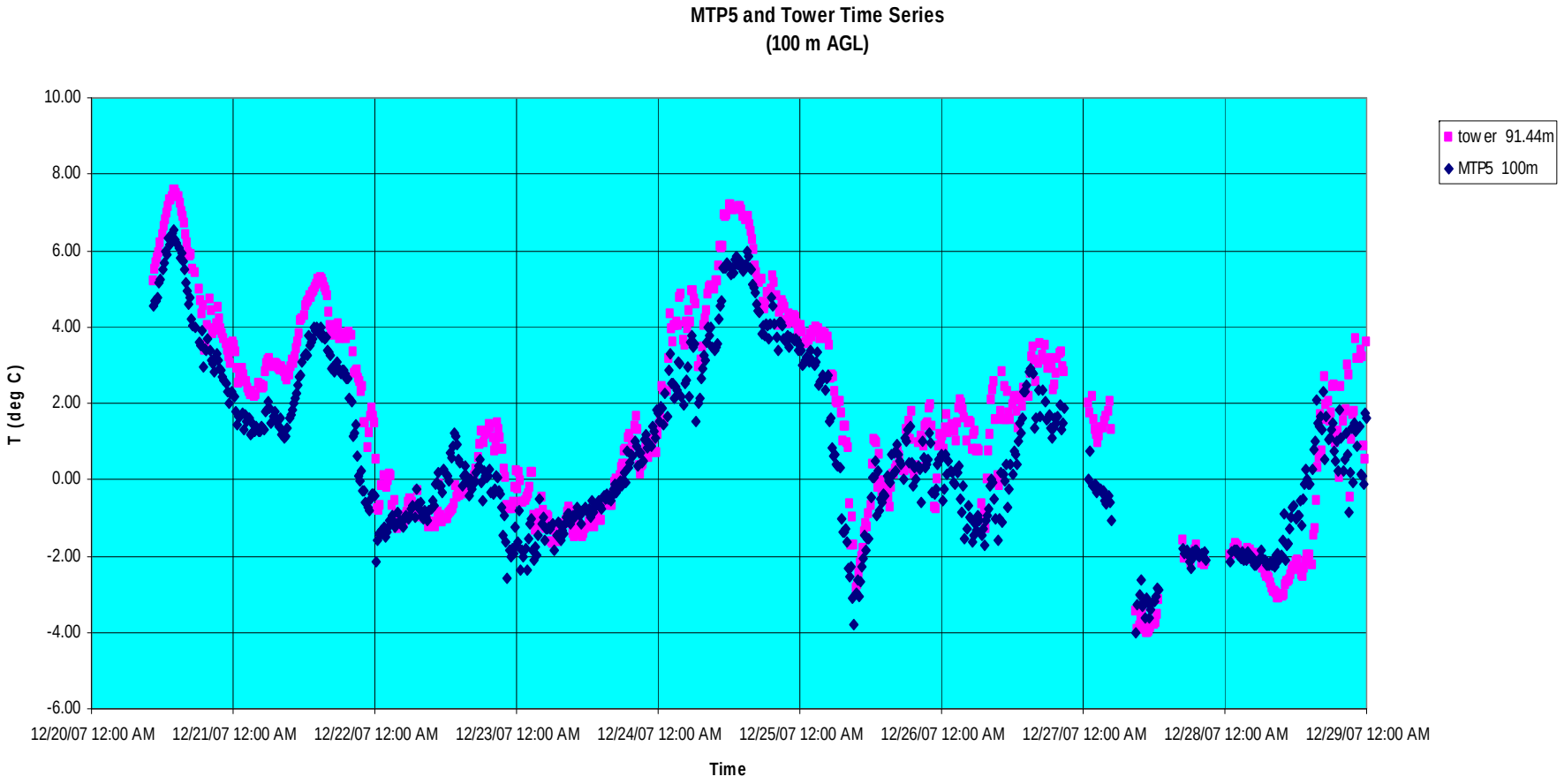
MTP5-HE vs Hanford tower



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Sand Point Data

- **Compare RASS vs MTP 5HE**

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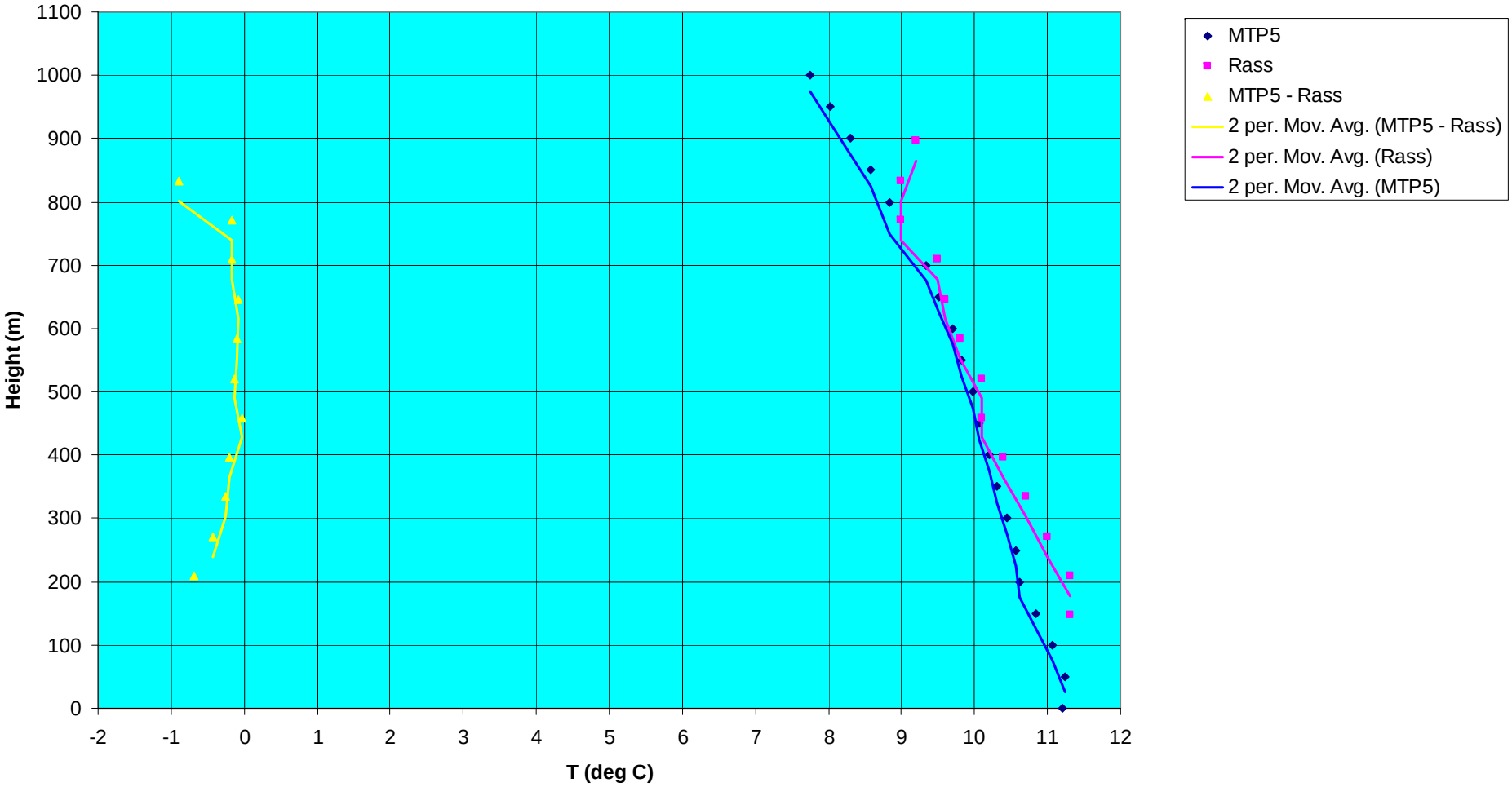
Temperature Profile
(19 Oct 2007 12:30 GMT)



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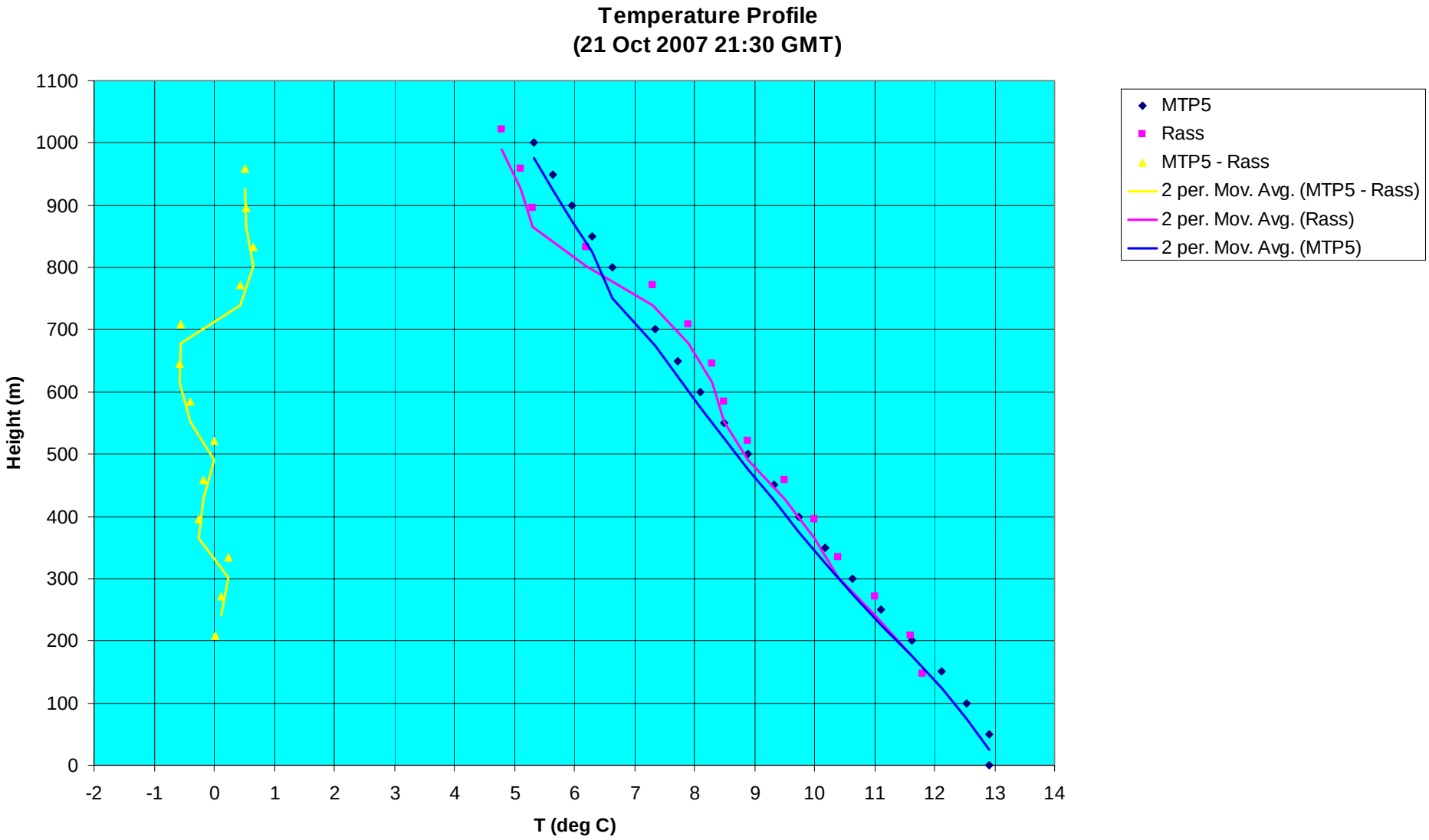

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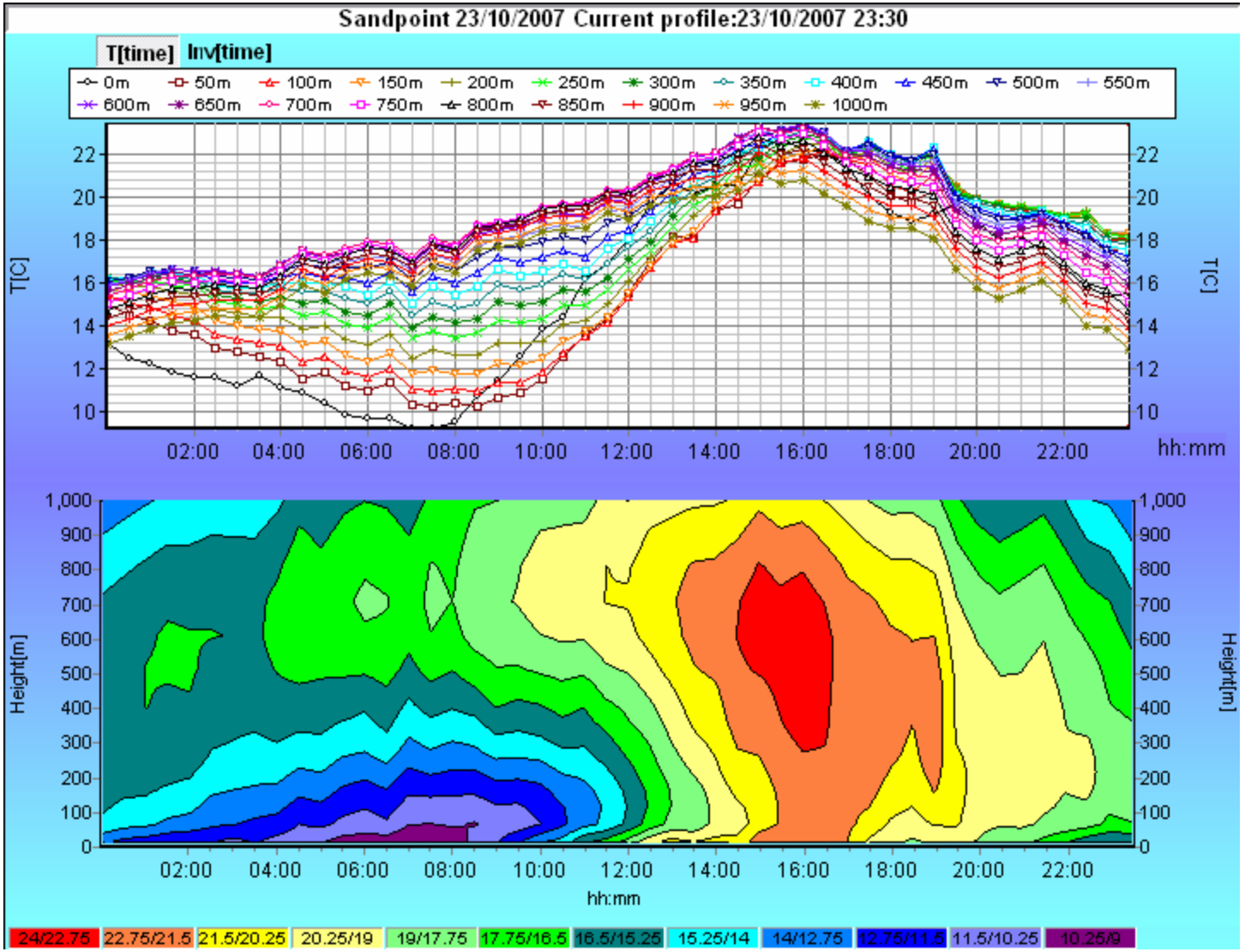
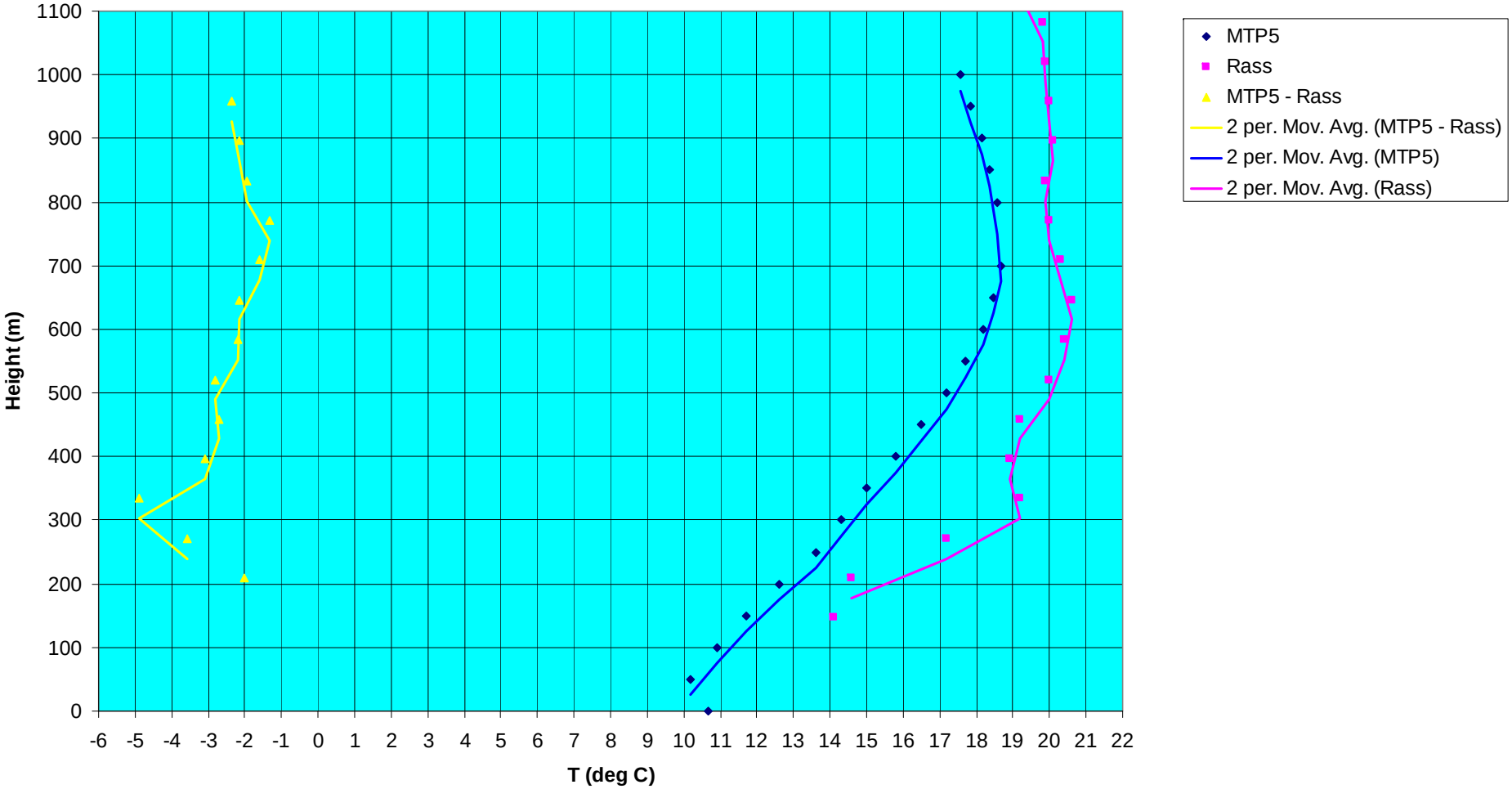


Temperature Profile
(23 Oct 2007 15:30 GMT)



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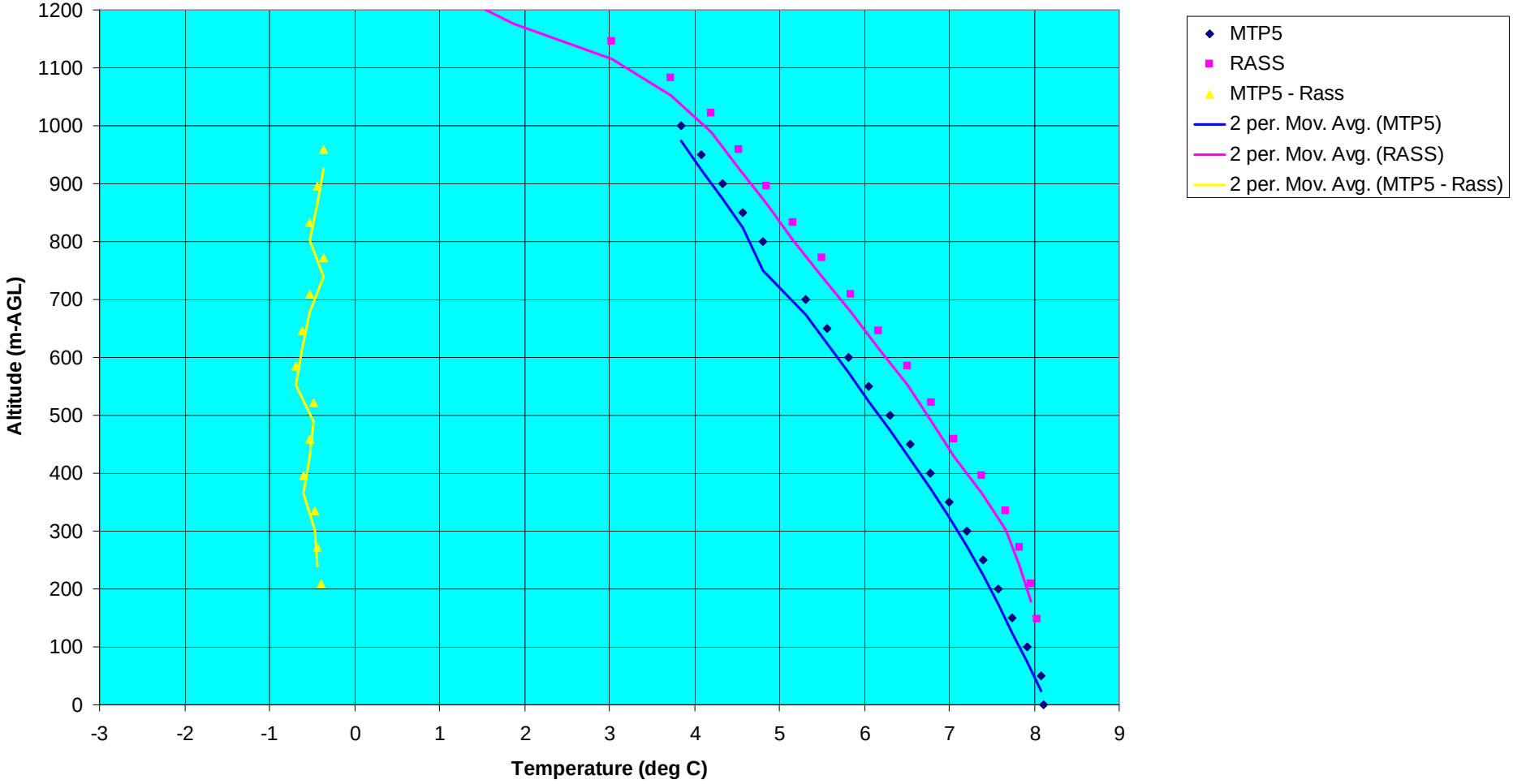
Average Temperature Profiles
(October and November 2007)



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Findings and next steps

- **MTP5- HE met all objectives of the test.**
- **Purchased 2 units (delivery Jun 08)**
- **Deploy in Tacoma WA and Darrington Wa**
  - **Operate for one year**
- **Develop a model evaluation project for BL and air quality considerations**

Acknowledgements

- **Robert Dolce, Kipp& Zonen**
- **Ken Underwood, Minisodar, Inc**
- **Josh Underwood, Minisodar, Inc**
- **Adam Petrusky, Puget Sound Clean Air**

Comment

- **More detailed .ppt on this technology is available upon request**