pscleanair.org
Puget Sound Clean Air Agency

Working together for clean air

A New Future in Meteorological Measurements

We've come a long way from dust buckets!

Expectations of Air Monitoring Networks Has Changed

- **Networks must support a suite of complex air quality management needs**
  - **Real-time reporting, Forecasts**
  - **Action days**
  - **NAAQS determinations at refined resolutions**
  - **Strategy Development based on modeling**
  - **Research**
  - **Health Studies**

Understanding the Atmospheric Processes that Influence Air Quality

- **Most areas have developed mature networks to collect criteria pollutants**

- **Few networks have developed the necessary infrastructure to ascertain meteorological conditions needed to understand today's air quality management needs**

- **NWS upper air sites are sparse and do not provide adequate diurnal information**

Is Your Network Complete?

- **Can we consider networks that do not provide detailed meteorological data as adequate?**
  - **Vertical profiles**
- **What can be done to improve this shortfall?**
  - **The presumption is that it is too expensive**
  - **Focus on PAMS network assessment**
  - **Develop new mechanisms for funding**

What is the return on investment?

- **Some examples from our experience based on RASS and RWP's**
- **Program credibility led to new triggers for controlling wood smoke**
- **Providing detailed meteorological data not found in AQS played a significant role in modifying a recent PM 2.5 non-attainment area.**
- **Reliable observations to support forecasts**

Puget Sound Clean Air Network

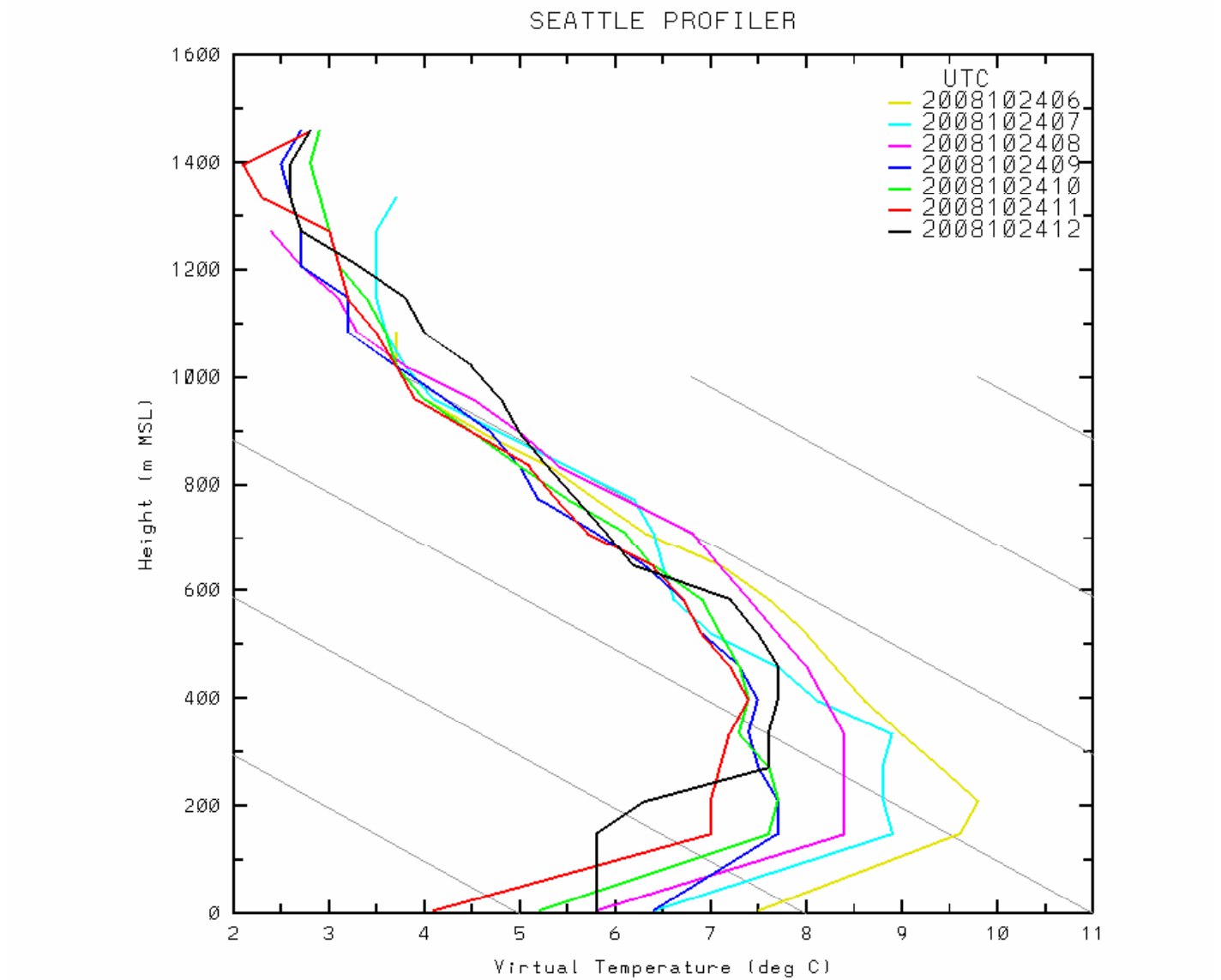
- **Meteorological Data collected at most sites**
  - **Wind Direction and Speed (Sonic)**
  - **Temp, Pressure and Humidity at many**
- **Vaisala LAP-3000 XM with Digital IF Upgrade**
  - **Provides mixing heights and vertical winds**
- **Mission critical Information**

Vaisala RASS and RW Profiler

Vaisala RASS and RWP

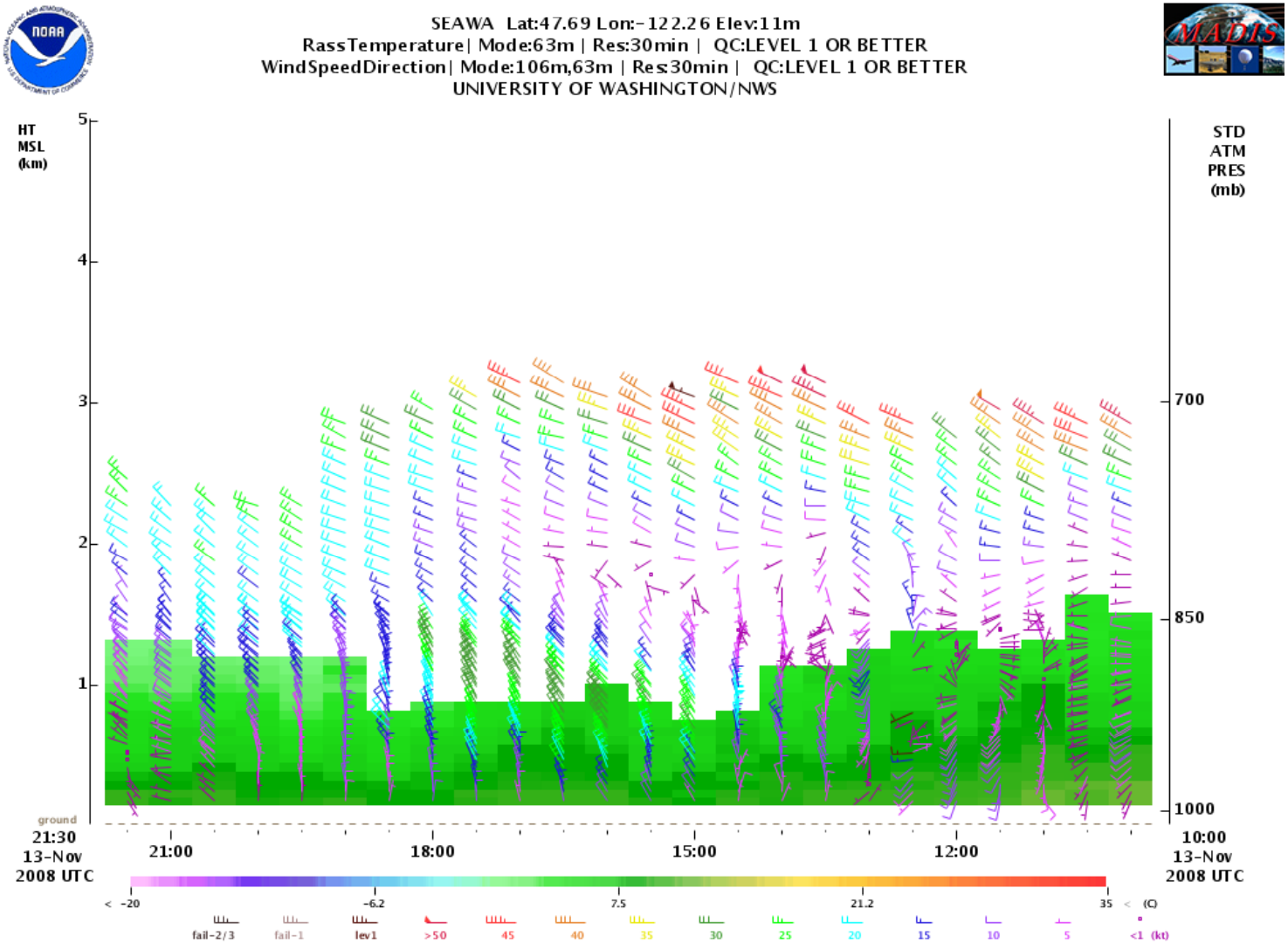
- **Installed in 1994**
  - **Many early problems**
  - **Several Upgrades and repairs**
- **Latest upgrade in 2007 (Digital IF)**
  - **~ $130K with some additional repairs (relays)**
  - **Added 5-8 years to it's lifespan**
- **System is performing better than ever!!**

Vertical Temp Profile-U of WA



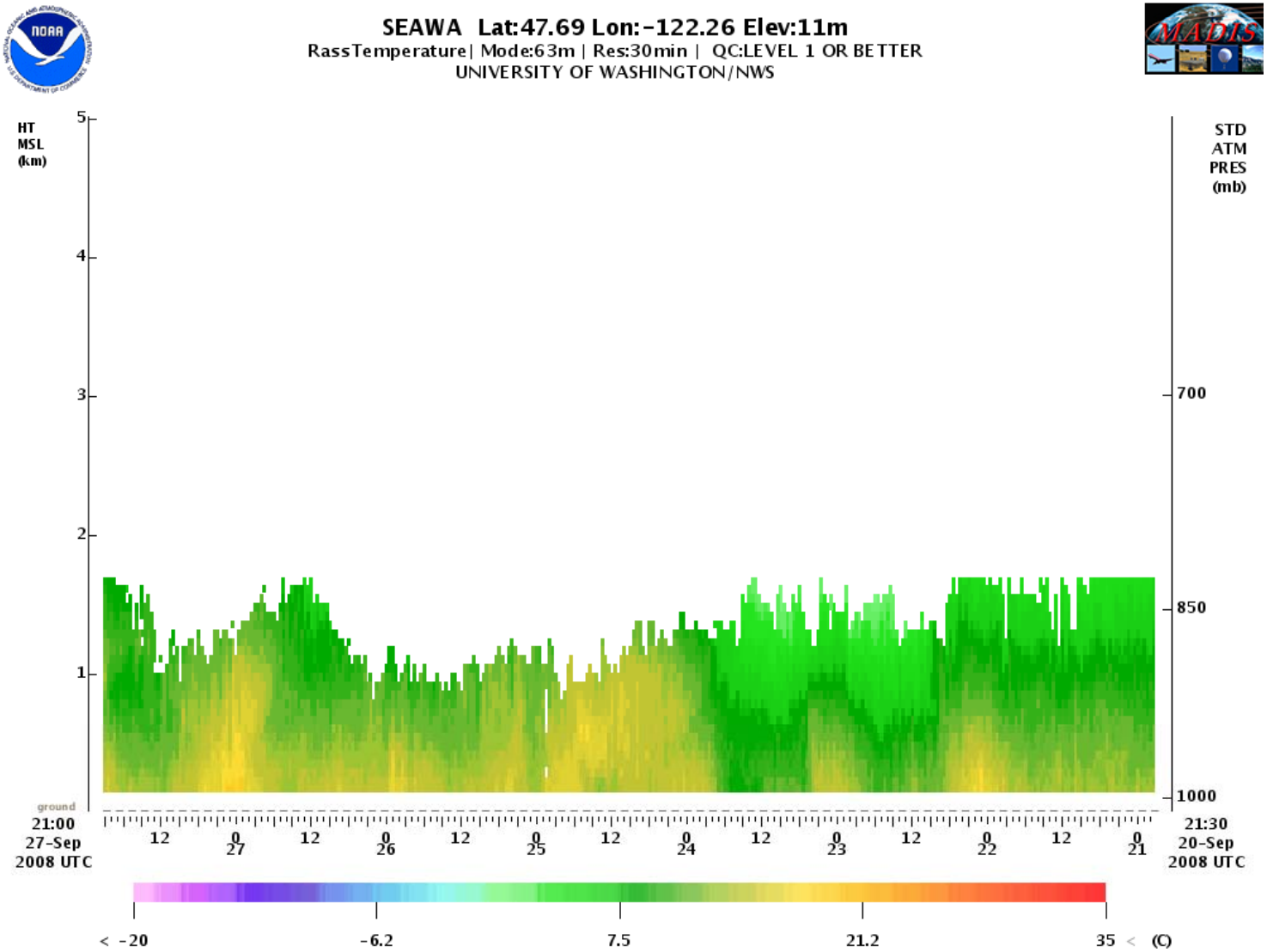
pscleanair.org
Puget Sound Clean Air Agency

NOAA's CAP/NPN site



pscleanair.org
Puget Sound Clean Air Agency

NOAA's CAP/NPN site



pscleanair.org
Puget Sound Clean Air Agency

RASS/RWP Issues & Benefits

- **Capital investment costs still very large**
  - **Between >$400K for new units**
  - **Fixed sites, additional infrastructure costs**
  - **Maintenance and upkeep costly**
  - **Noise Issues**
  - **Data gaps**
  - **Wind folding**
  - **Display software additional cost**
  - **Service and support established but costly**

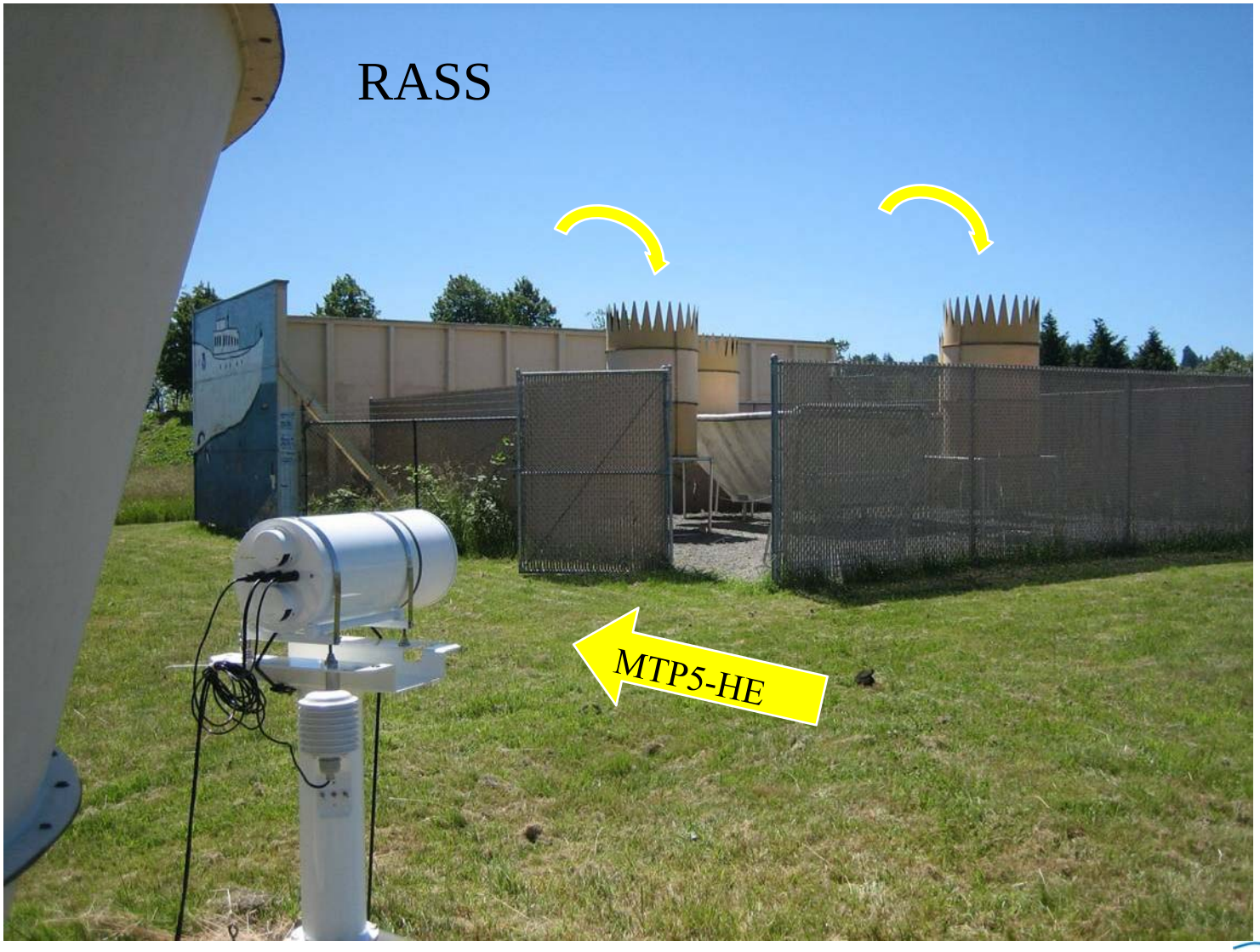
RASS/RWP Issues & Benefits

- **Highly time resolved vertical temperature and winds profiles**
  - **Able to see sub-diurnal changes**
  - **Ability to apply daily changes in mixing height to forecast**
  - **Improve AQ model outputs**

Kipp & Zonen
MTP 5-HE

- 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

Technology Comparison



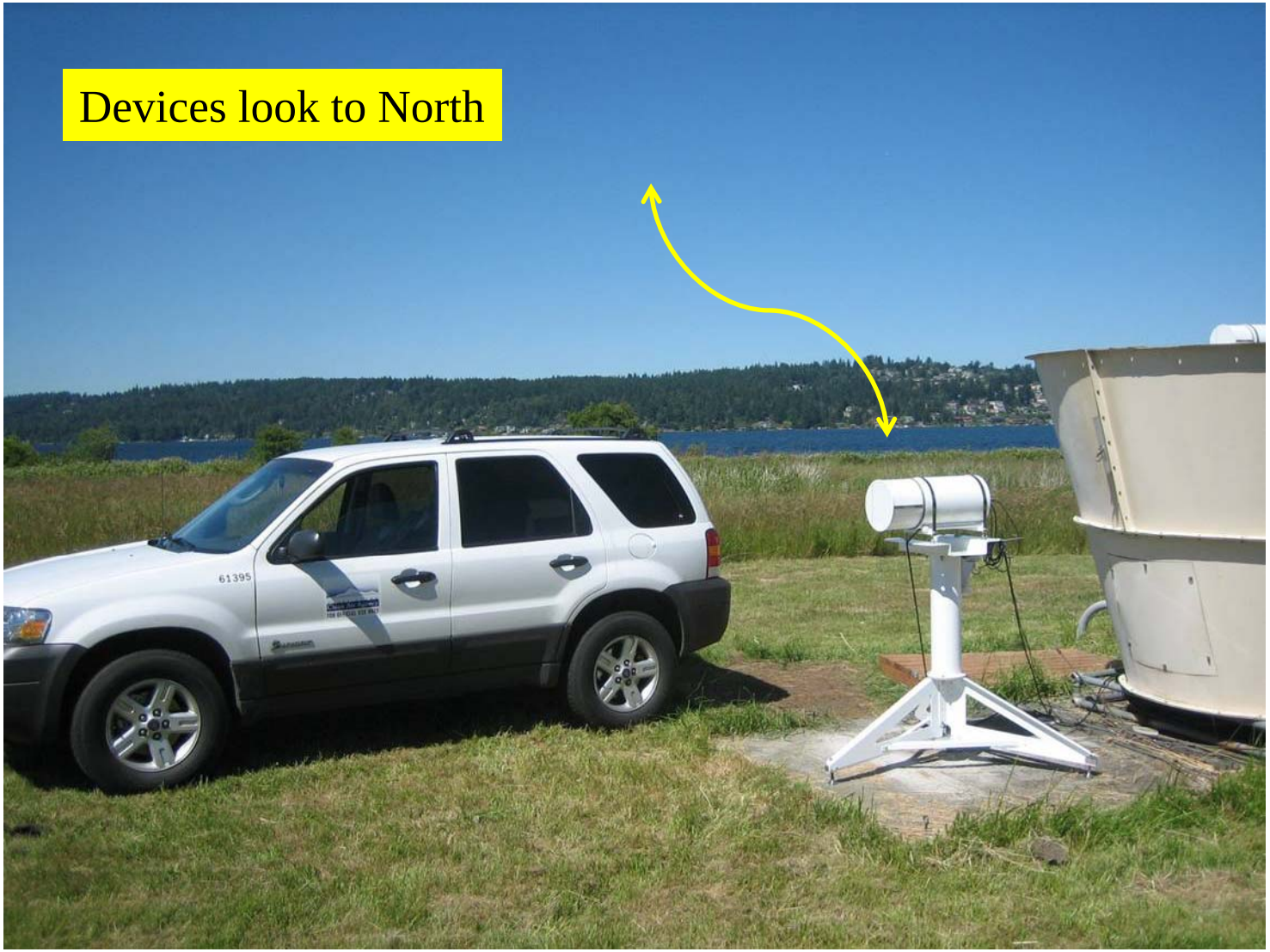
MTP5-HE on Pedestal

MTP5-HE

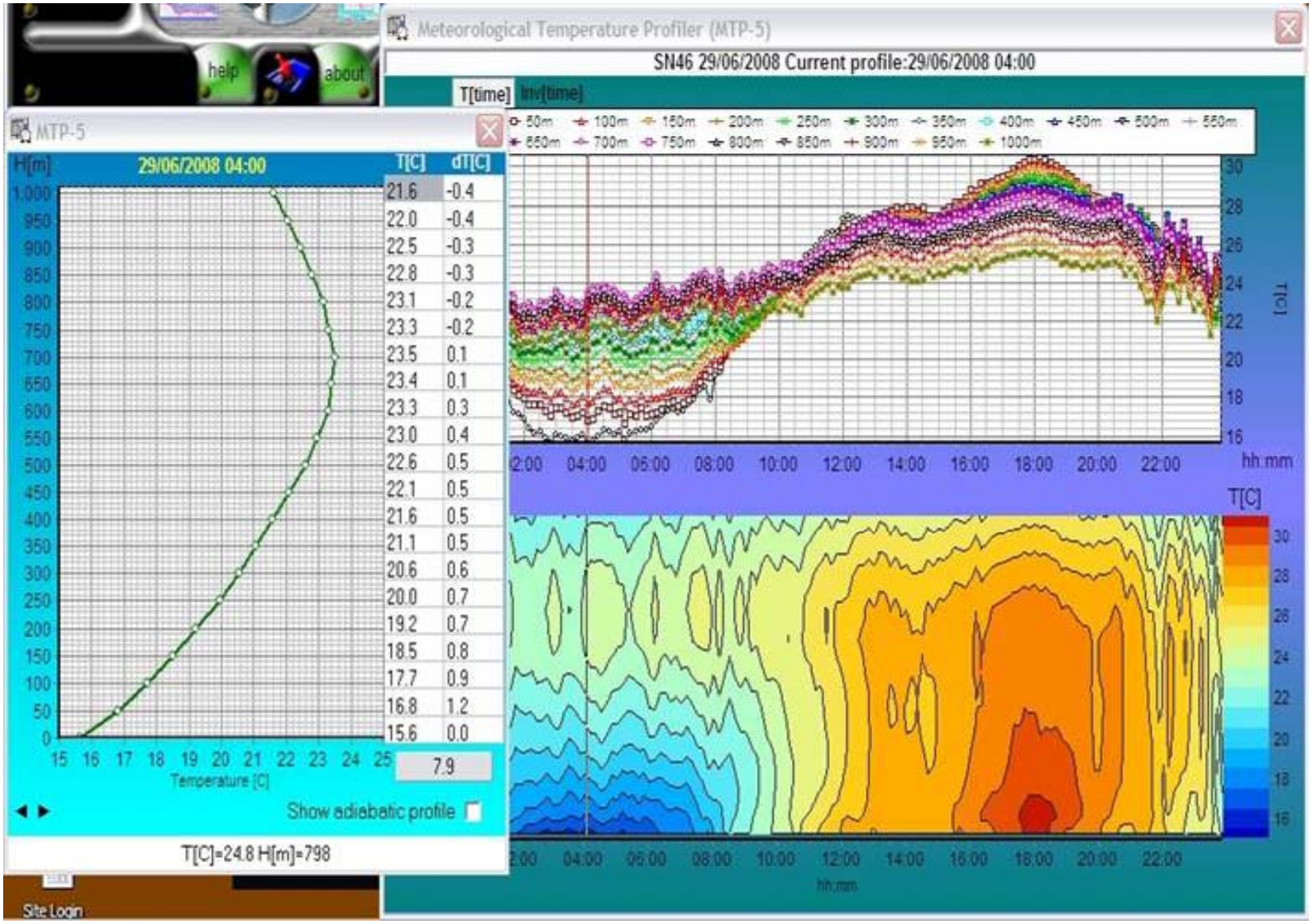
Roof Mount

Thermistor

Site view



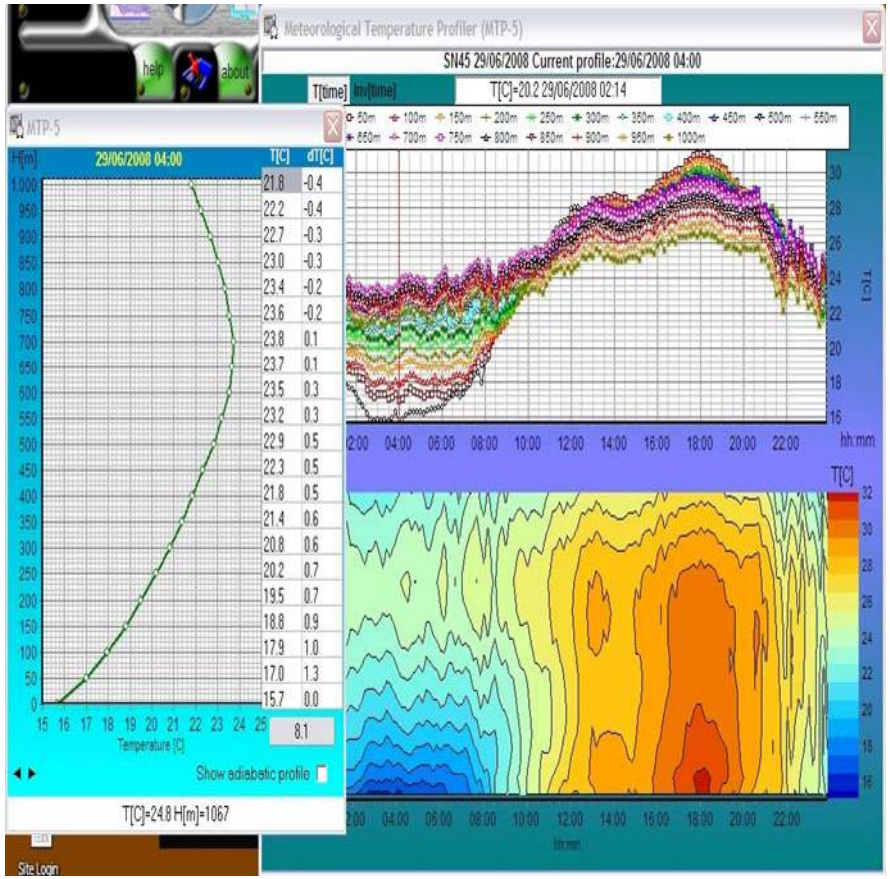
MTPNEWS.exe Display



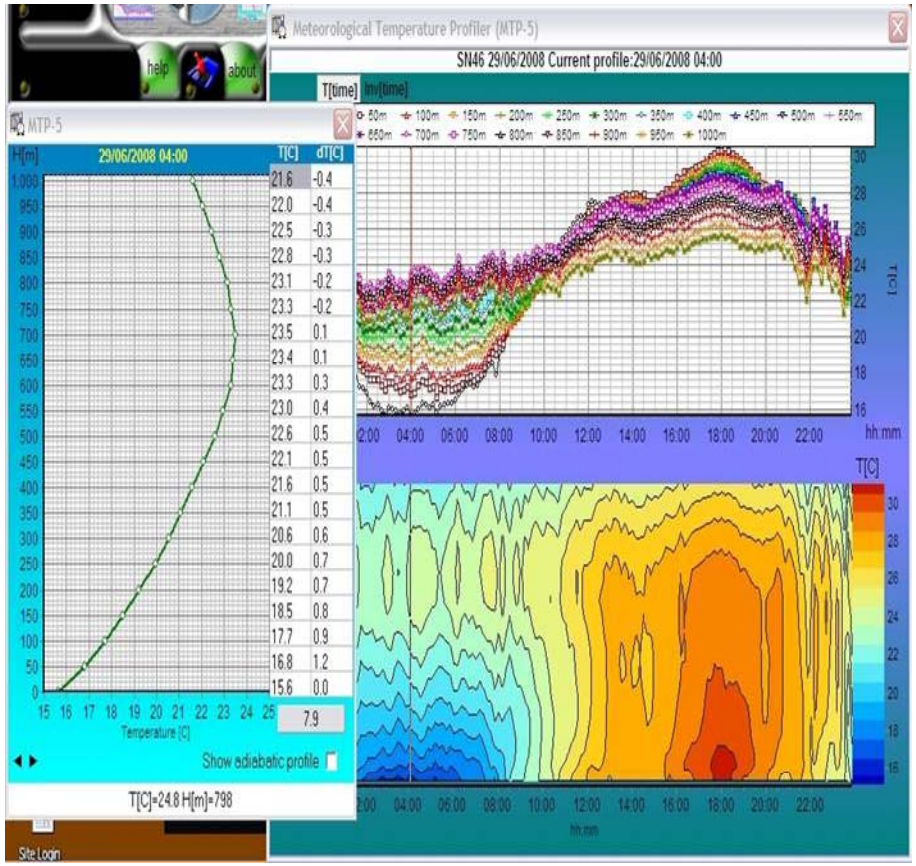
pscleanair.org
Puget Sound Clean Air Agency

MTP5-HE Collocation-29June 2008

SN# 0045 @ 0400/12UTC



SN# 0046 @ 0400/12UTC



pscleanair.org
Puget Sound Clean Air Agency

MTP5 Summary

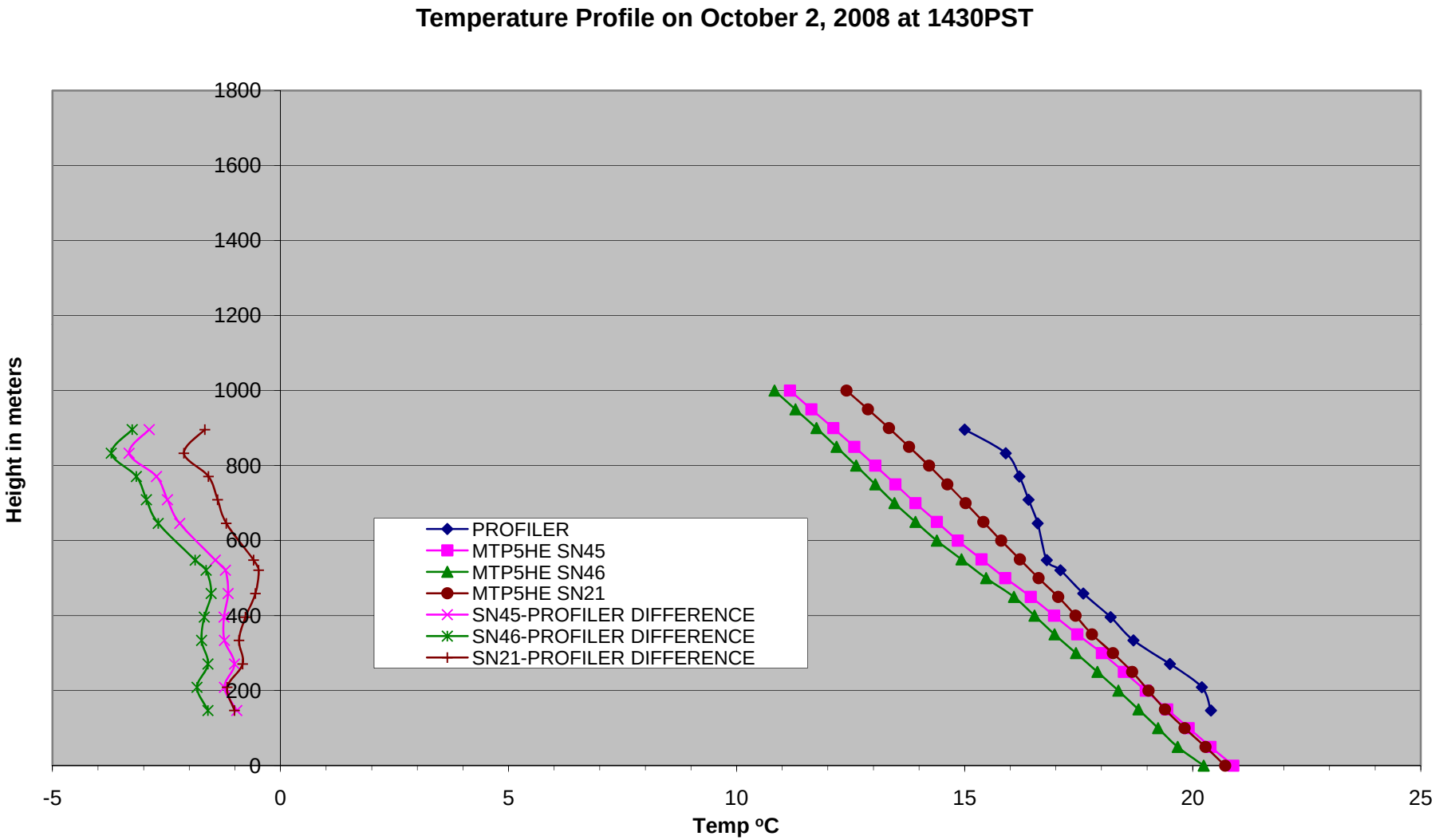
- **Shop tests completed and equipment installed in one day**
- **Time for site install ~ 1hr**
- **Collected first 1000m temperature profile ~ 20 min after power up**
- **Connected for web access/ data transfer ~ 15 min**
- **Data appears to match RASS profiles**
- **Precision between the two MTP5-HE appear to be excellent!**

Virtual Temp & Temp Delta's

- **Important to note that RASS output is expressed in virtual temperature and is ~ 1.5 deg C warmer than other temperature measurements**

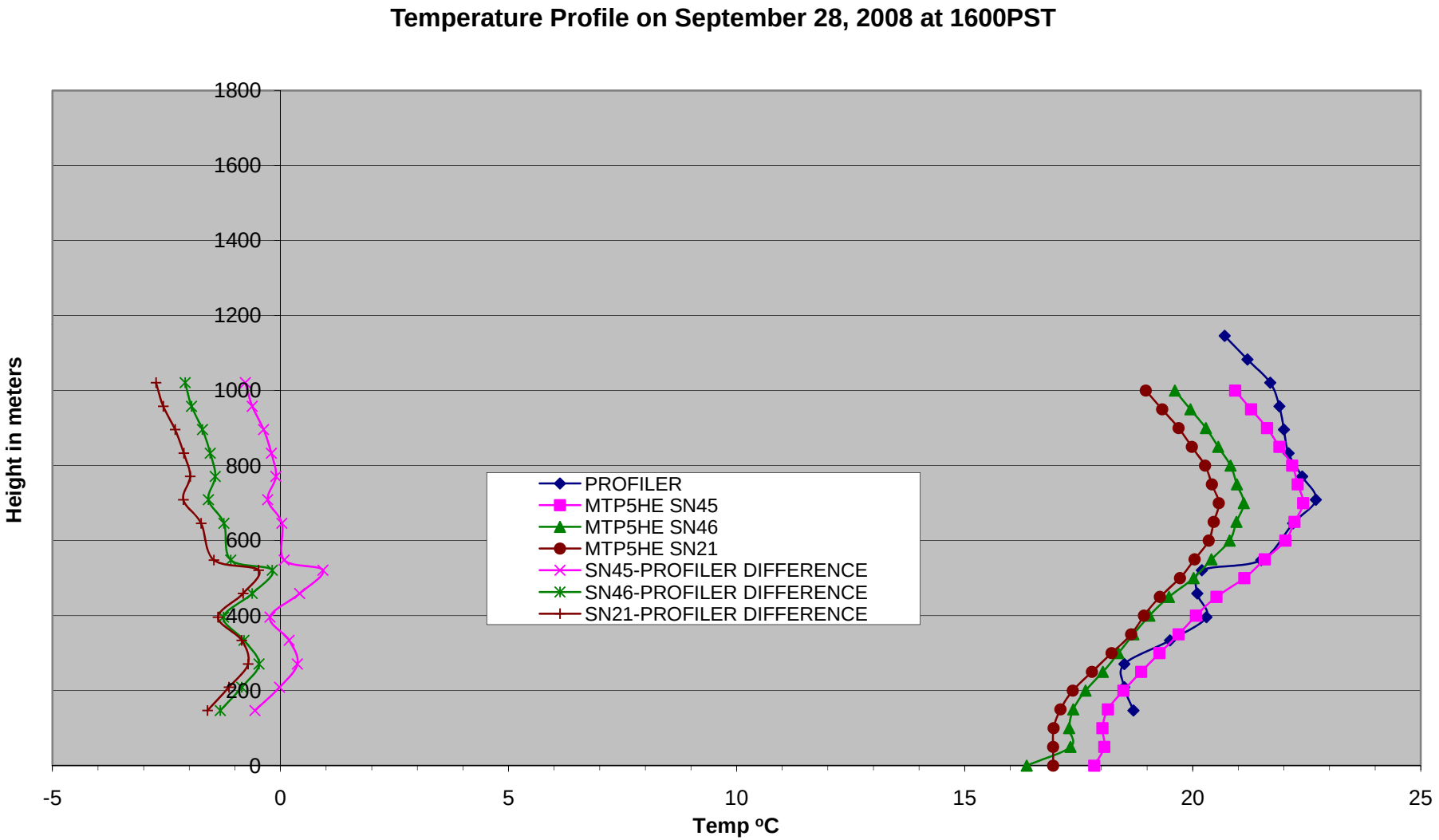
- **Following graphs are uncorrected.**

Individual Scans (2-3 min avg's)



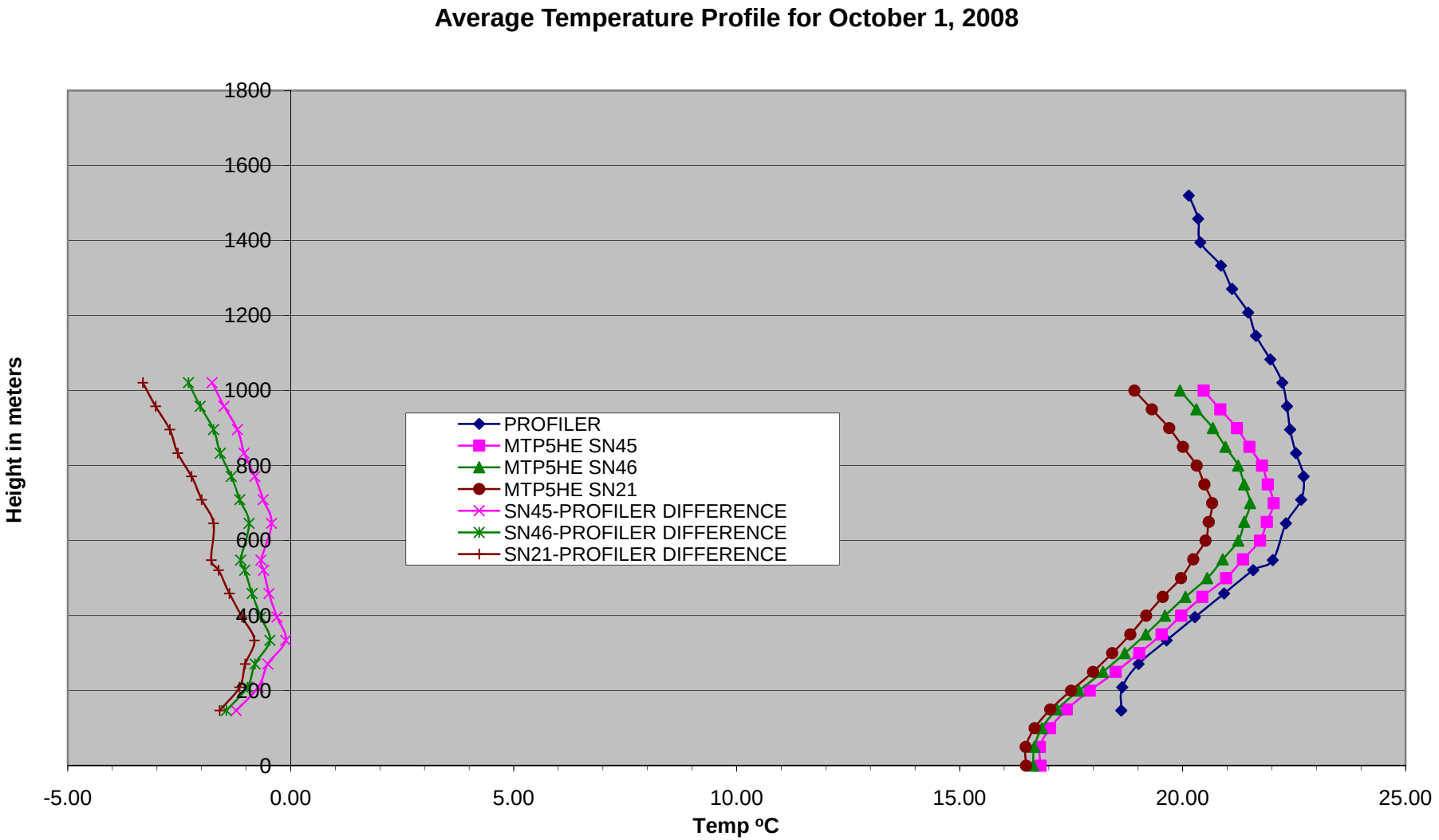
pscleanair.org
Puget Sound Clean Air Agency

Individual Scans



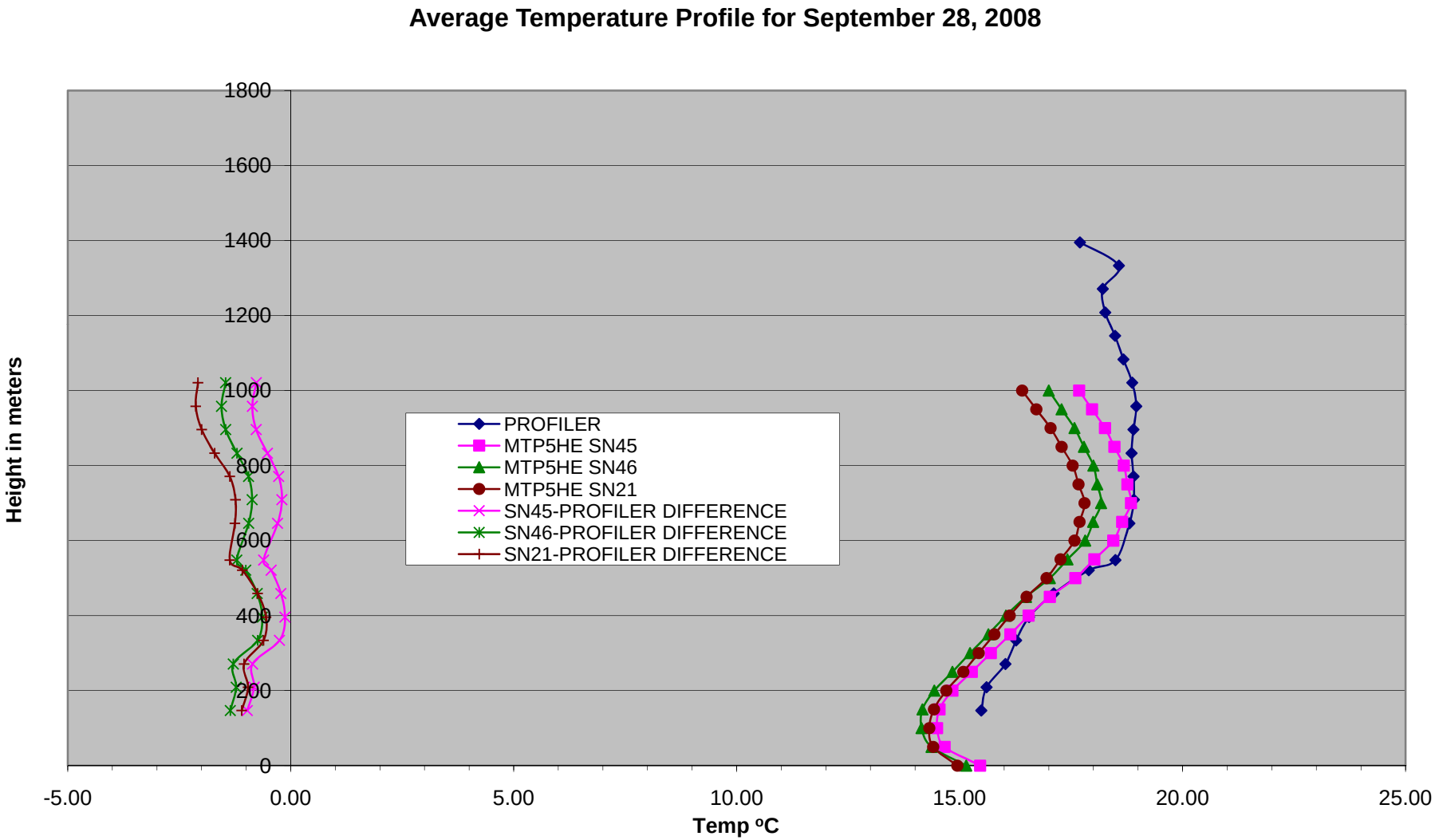
pscleanair.org
Puget Sound Clean Air Agency

Daily Profiles



pscleanair.org
Puget Sound Clean Air Agency

Daily Profiles



pscleanair.org
Puget Sound Clean Air Agency

MTP 5 HE Issues and Benefits

- **Capital Costs very significant**
  - **~ $130K- $140K**
  - **Temperature profile only**
  - **Service and Support unproven**
  - **Calibration**

MTP 5 HE Issues and Benefits

- **Highly time resolved data**
  - **1000m profile every sweep**
  - **Mobility and installation is exceptional**
    - **Setup is less than 1 hour!**
    - **Silent operation**
    - **Displays**

Data Reporting

- **What?, Where?**
  - **Currently no place in EPA data streams**
- **NOAA's NPN**
  - **CAP/MADIS Website**
- **Need to leverage resources!**

Quality Assurance

- **What? How?**

- **This needs to be addressed**
  - **Affordable solutions may be possible**
  - **Develop shared regional resource**
    - **Contract service or capital purchase**

Funding Issue

- **Too Costly for most S/L Budgets**
  - **Need modest investment over time from EPA and others**
- **Base Grant Federal funding make it difficult**
  - **Can't Save $ for capital purchases**
- **PAMs Requirements**
  - **Develop a funding model to support maintenance and new purchases**
- **Incorporate into PM networks**
  - **Possible TAP for project grants**

Next steps- Puget Sound

- **Deploy to air monitoring sites with Air Quality problems.**
- **Create “mini” network (RASS + MTP 5)**
- **Develop data path for submission to EPA, Washington State DOE**
- **Collaborate with NWAIRQUEST for model validation effort.**

Next Steps

- **Stimulate dialogs across S/L networks**
  - **MARAMA Organizations!**
  - **Develop requirements and requests**
    - **Funding sources**

- **Enlist OAQPS Support**
  - **Include in the National Air Monitoring Strategy**
  - **Develop a resource model to support needs**
    - **TAP?**

Summary
Puget Sound Network

- **Deploying MTP 5's at two sites with know PM problems**
- **Create mini-network**
- **Develop data reporting streams to EPA**
- **Be a resource for other S/L agencies**