

Pyranometer Inquiry

Insolation as an Instructional Tool
in Atmospheric Sciences

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San Antonio, Texas
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Allan Wade Geery

- North-central Arkansas, rural school
- Middle school science teacher 13 years
- GLOBE Teacher for 8 years
- GLOBE Certified Trainer since 2004
- Students enter data under four UserID's

Vocabulary Words

- Pyranometer - (from the Greek “pyr” meaning fire and “ano” meaning sky) a device used to measure solar radiation.
- Insolation - the power of sunlight reaching a horizontal plane at the Earth’s surface measured in watts per square meter.

“surrogate” pyranometers

- Limited electromagnetic spectrum bandwidth
- Less expensive materials
- Single miniature silicon solar cell

Apogee PYR-P

- Calibration Standard
- About \$170
- Spec Sheet available

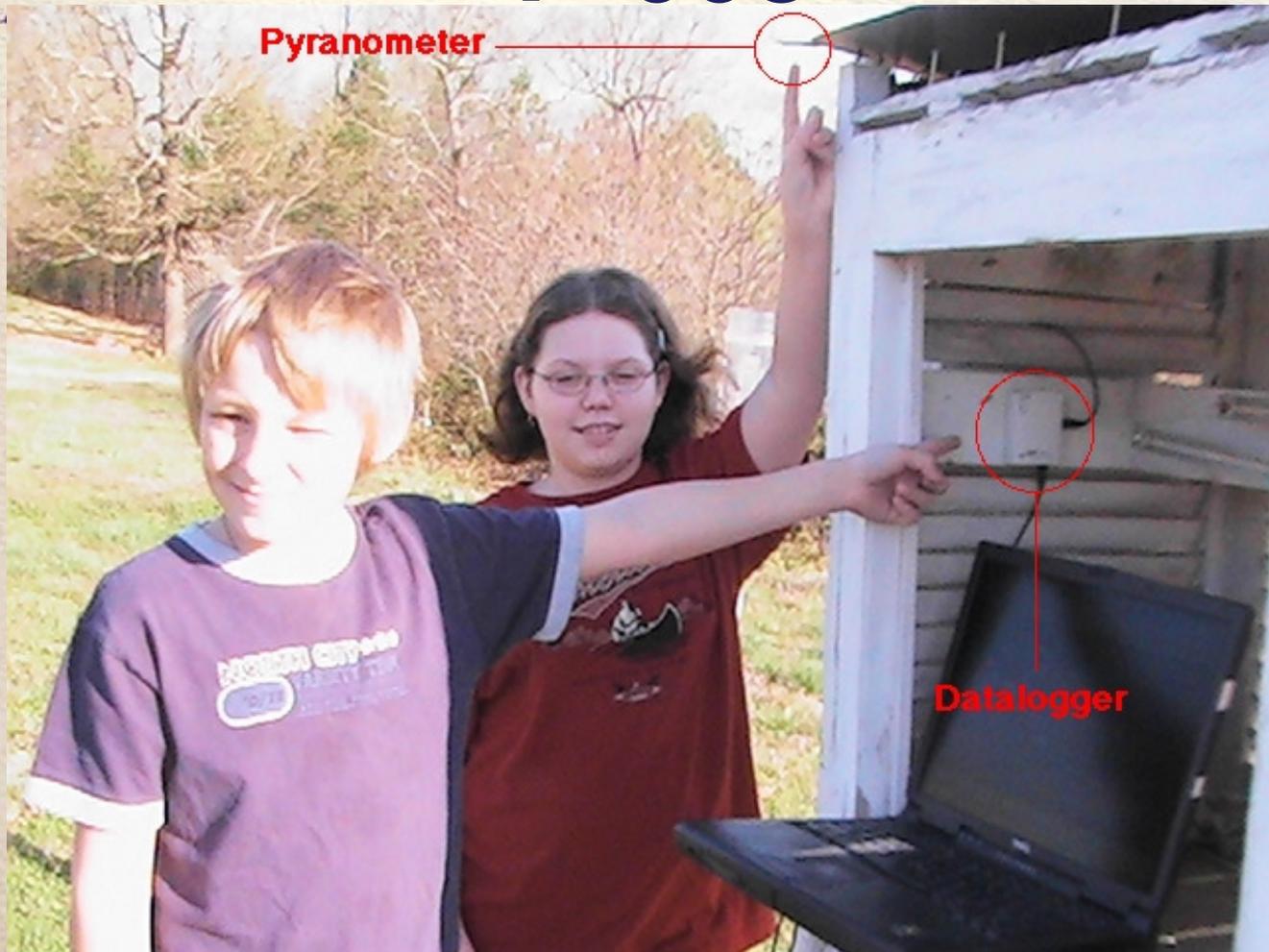


IESRE Pyranometer

- Low cost, \$20
- Kit form
- Easy construction



P-003



Pyranometer

Datalogger

a Datalogger is Required

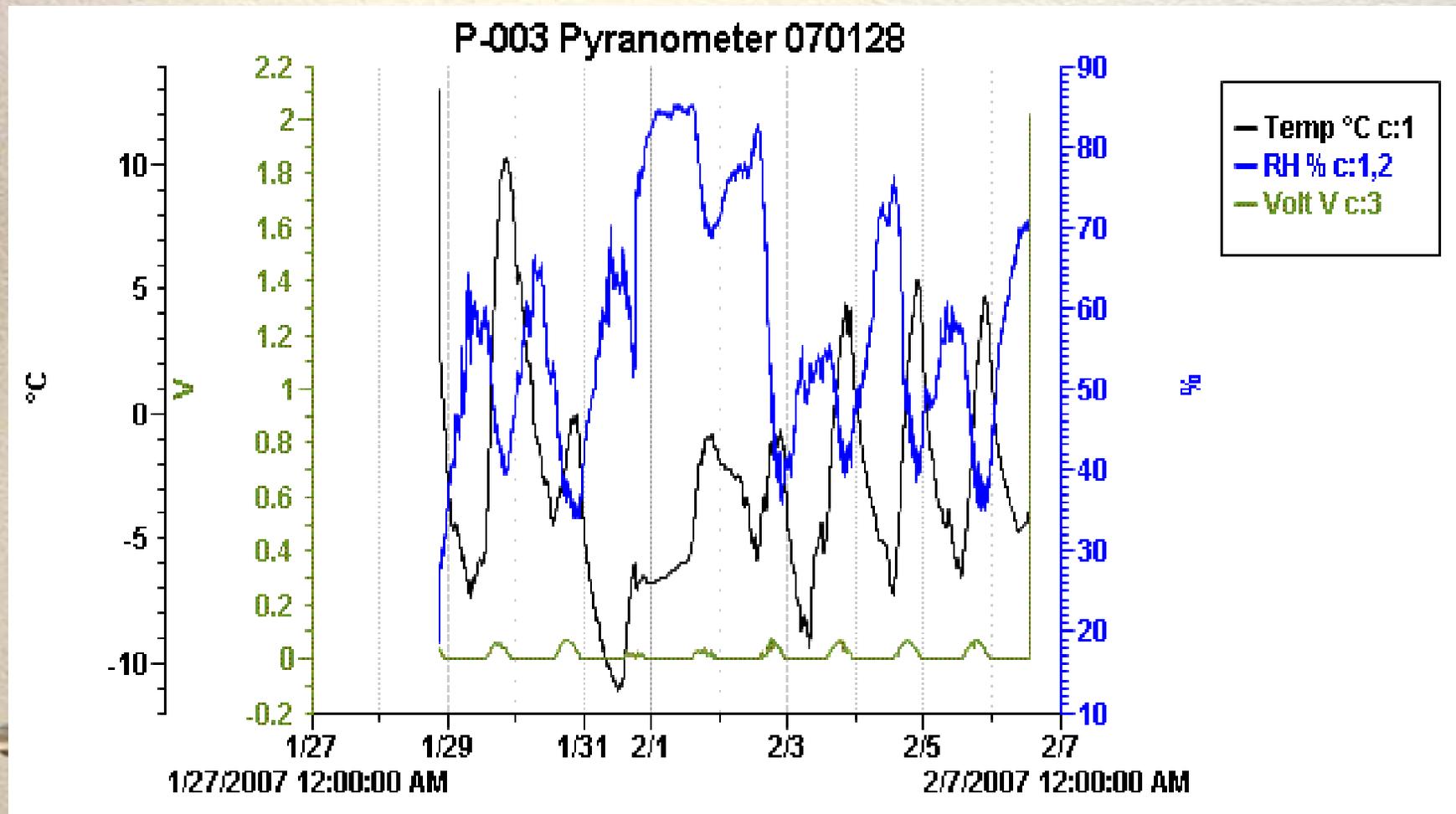
- HOBO U12 series, 12 bit, USB interface

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

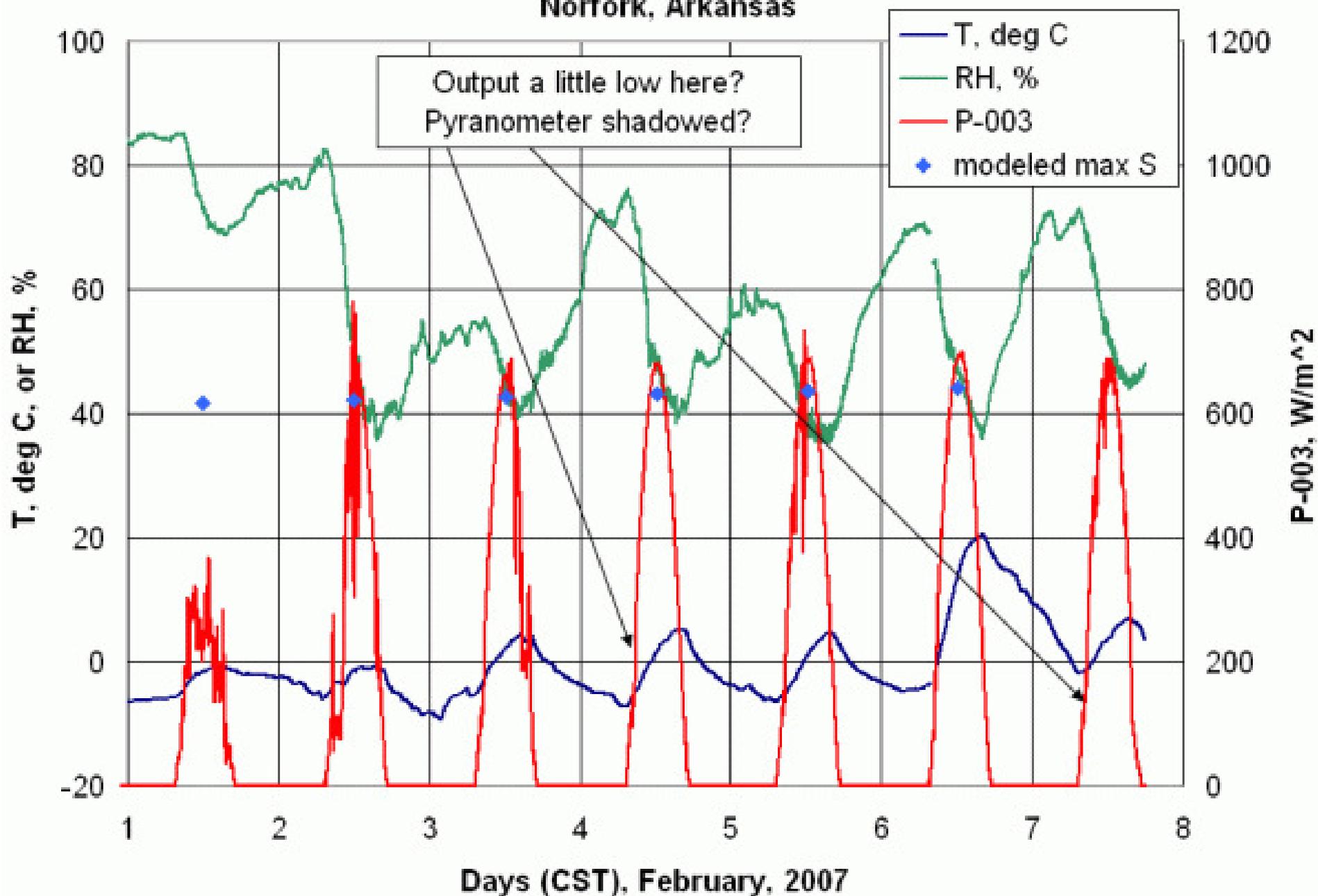
Top view of P-003



Raw data download graph



Norfolk, Arkansas

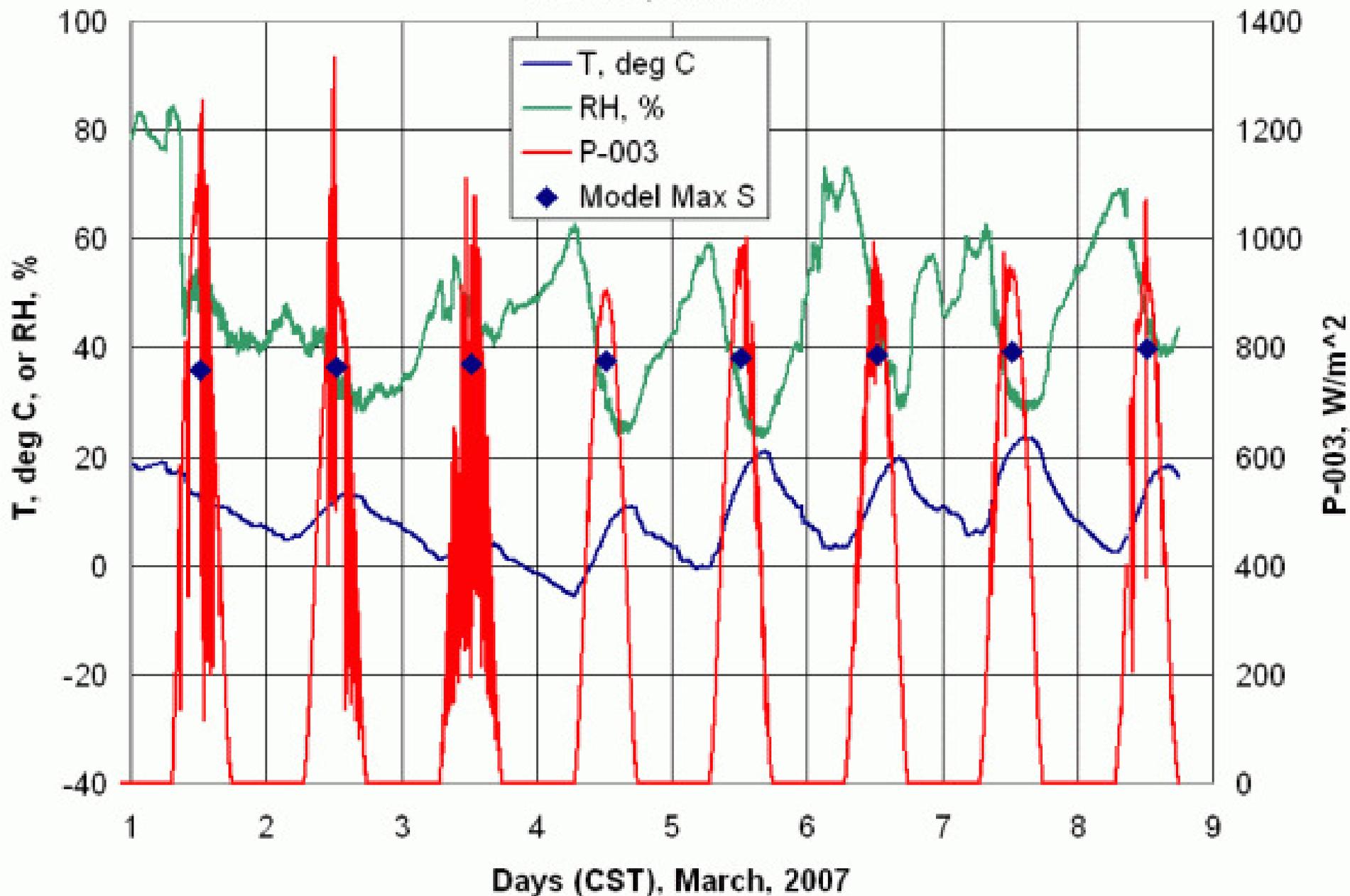




Frost Inquiry Investigation



Norfolk, Arkansas



How can Inquiry be constructed

- Can students relate cloud cover and / or type to pyranometer measurements?
- Can seasons be tracked?
- Can equinox / solstice be observed?
- Insolation vs. climate change observable?

Insolation diversity

- What can a geographically diverse insolation network do for research?
- Can student measurement play an important role in these investigations?
- Will GLOBE adopt this effort?

TERC Study of STSP's

- Ledley, T. S., Haddad, N., Lockwood, J., Brooks, D.R., Developing Meaningful Student-Teacher-Scientist Partnerships, Journal of Geoscience Education, volume 51 #1, January 2003, pages 91-95.

10 Essential Traits

1 Scientific Research Question?

2 Can students work with data?

3 How is data quality checked?

4 What instruments are needed?

10 Essential Traits

5 Are protocols established?

6 Logistical issues addressed?

7 Student learning activities available?

8 Teacher and student training?

10 Essential Traits

9 Additional research questions?

10 Student - teacher recognition?

GLOBE addresses

all of these traits to successful

- Scientist -

- Teacher -

- Student -

- Parthnerships

GLOBE Issues

1. Need an insolation / pyranometer protocol added to other atmospheric measurements
 - Automated data collection
 - Email attachment data entry
 - Binary format preferred

GLOBE Issues

2. Return to a GLOBE focus upon measurement

- “O” in GLOBE stands for Observations
- Ground truth for model validation
- GLOBE’s scientific credibility

GLOBE Issues

3. Instrument Costs

- Pyranometer Kit available for \$20
- HOBO U12 \$100-\$125 depending upon models
- Onset HobowareLite Software \$40

Conclusions

- Pyranometry is both beneficial and valid opportunity for GLOBE
- Study can help answer relevant climate questions
- Student involvement can improve scientific / GLOBE / academic communities
- Data collection is weather independent
- Collaboration gives students ownership of the process

References

Added to notes in powerpoint software
thus are available in hard copy.

URL Linked

Sorry - not displayed on presentation screen

Questions from Audience

Thank You
for your time and attention!