CCBST 15TH CANADIAN CONFERENCE ON BUILDING SCIENCE AND TECHNOLOGY

HYGROTHERMAL PERFORMANCE OF EXTERIOR BLANKET INSULATION PAPER # 39

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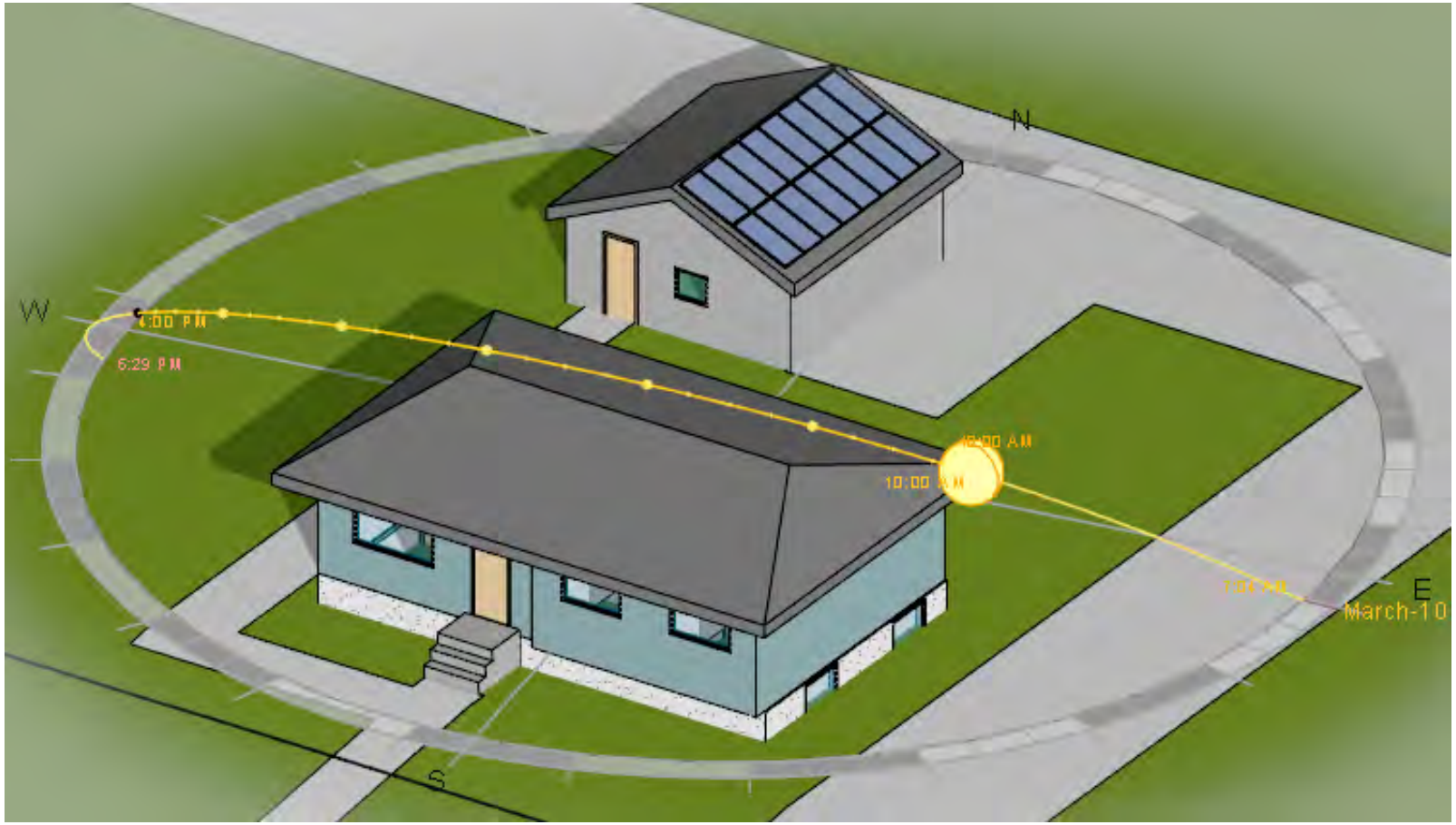
Agenda

- Exterior Blanket Insulation
- The Case Study
- Installation Process
- Research Objectives
- Research Methodology
  - Instrumentations and Data Logging
  - Simulation
- Results
  - Field Measurements
  - Simulation
- Conclusion

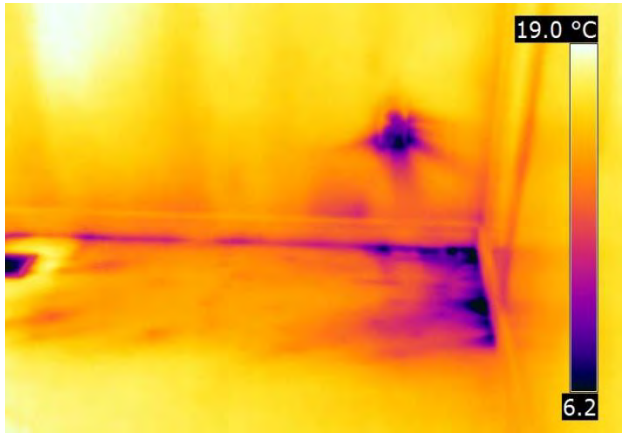
Exterior Blanket Insulation

- Blanket Insulation attached to Spun Bonded Polyolefin Membrane
- R5, 33 Perms
- Air and water management
- Continuous exterior insulation
- Vapor-permeable
- Allows drying to the outside
- Breathable compared to other rigid insulations
- Recently introduced to the Canadian market
- No research was found on the hygrothermal performance of this type of insulation in the Prairies weather .

The Case Study



The Case Study

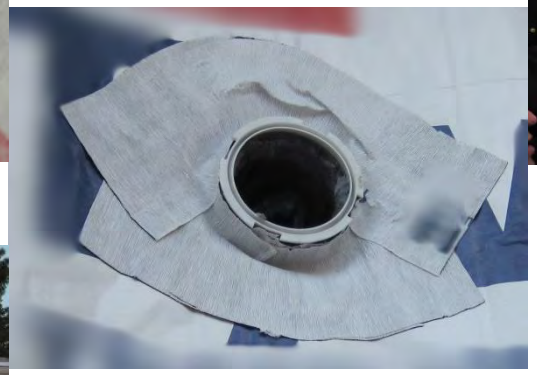


Removing Stucco

Installing Windows

Installing Battens

Installing Blanket Insulation



Installing Cement Boards

Research Objectives

- To assess the hygrothermal performance of blanket insulation for Calgary Climate.
- Compare the actual hygrothermal performance to a simulated performance.
- Compare exterior blanket insulation to other types of exterior insulations using simulation.

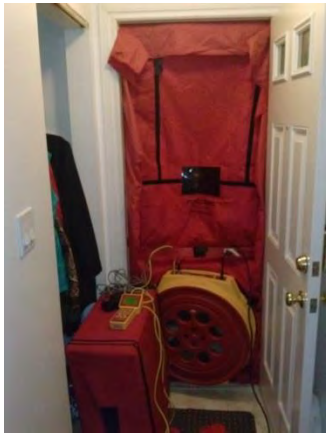
Research Methodology

- Moisture Performance
  - Moisture Content
  - Condensation Potential
  - Simulation
- Thermal Performance
  - Temperature Profiles
  - Simulation
- Air Leakage
  - Blower Door Test
  - Thermal Imaging

Instrumentations

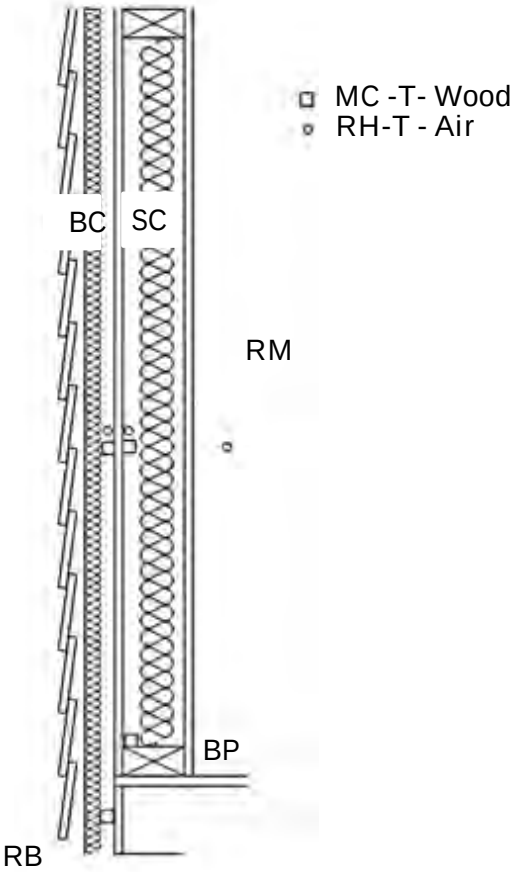
Moisture Content with Temperature Sensor

Relative Humidity with Air Temperature Sensor

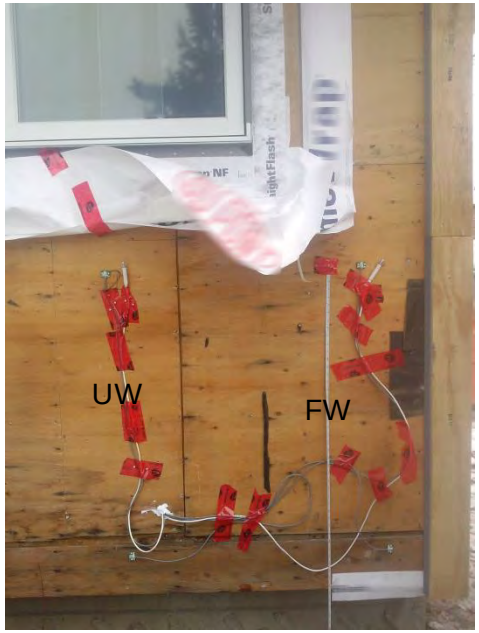


Blower Door Test Equipment

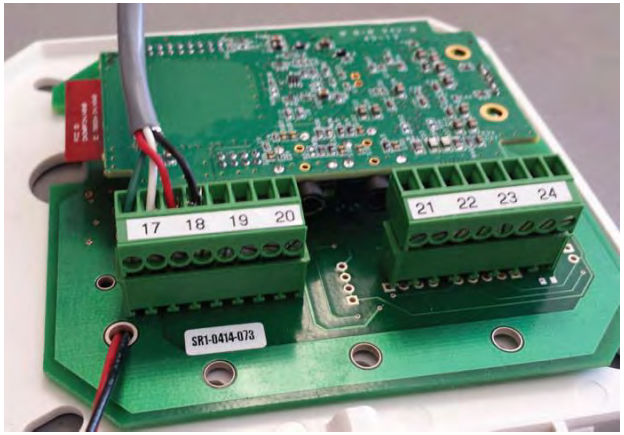
Measurement Locations



FW: Full Wall
UW: Under Window
RM: Room
BC: Batten Cavity
SC: Stud Cavity
BP: Base Plate
RB: Rim Board
MC: Moisture Content
T:Temperature
RH: Relative Humidity



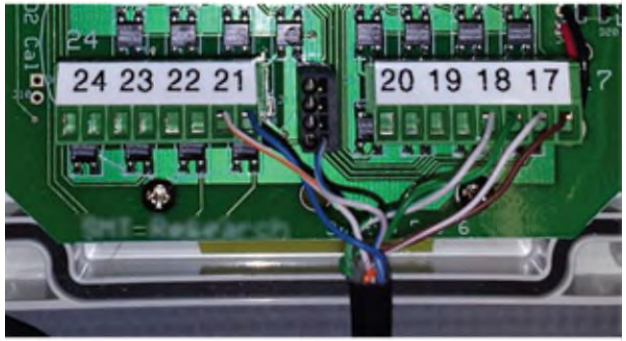
Data Loggers



8 Resistance Channels

4 Resistance 4 Voltage

Wireless Gateway



4 moisture content sensor wiring

Simulation Assemblies

Blanket Insulation	Thickness (m)
Cement Board	0.0125
Spun Bonded Polyolefin Membrane	0.0002
Low Density Glass Fibre Batt Insulation	0.0381
Plywood	0.015
Low Density Glass Fibre Batt Insulation	0.089
PE-Membrane	0.001
Gypsum Board	0.0125
Total Thickness (m)	0.168
R-Value (m2K/W)	3.3

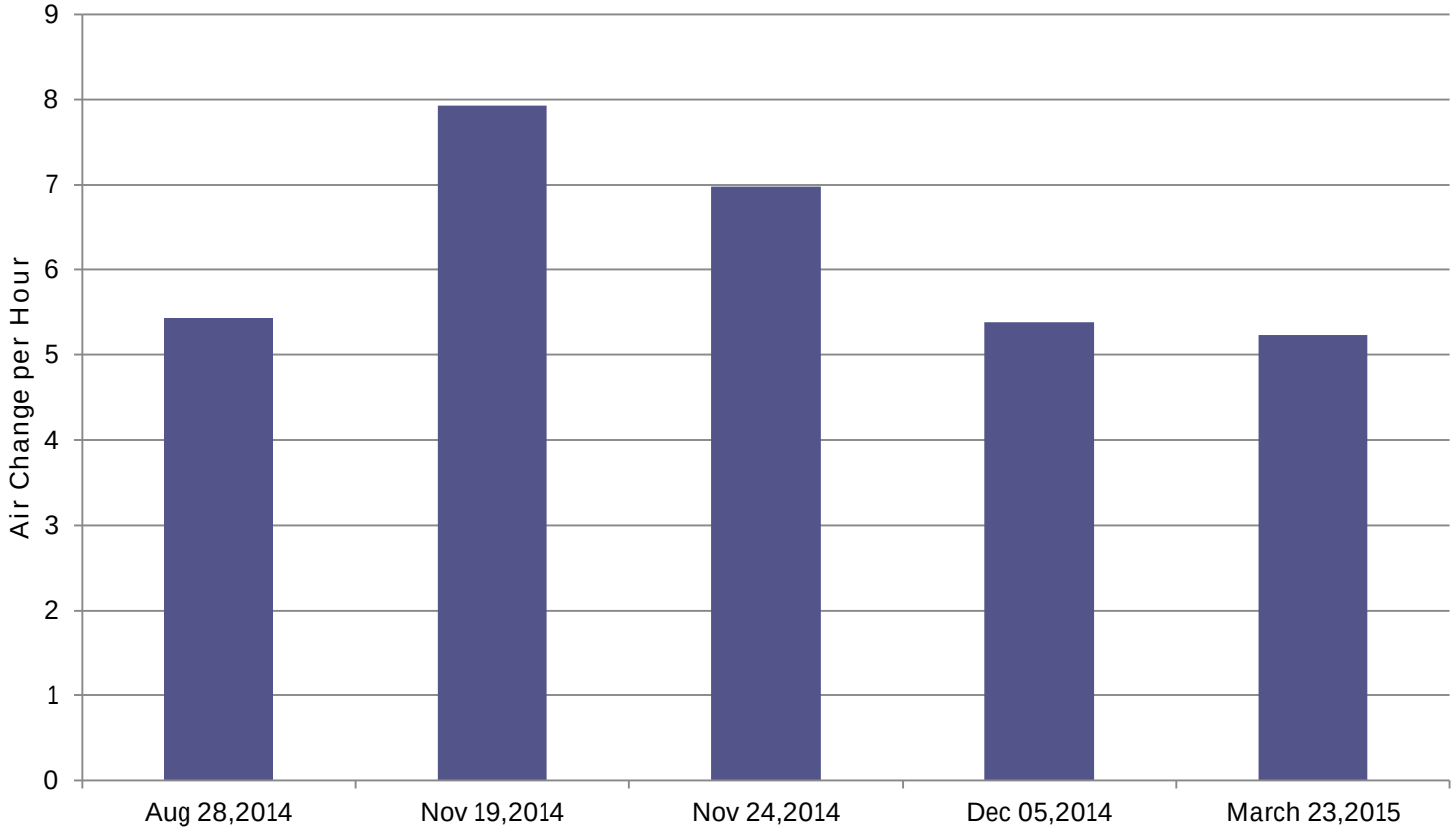
Extruded Polystyrene	Thickness (m)
Cement Board	0.0125
Extruded Polystyrene Insulation	0.023
Spun Bonded Polyolefin Membrane	0.002
Plywood	0.015
Low Density Glass Fibre Batt Insulation	0.089
PE-Membrane	0.001
Gypsum Board	0.0125
Total Thickness (m)	0.153
R-Value (m2K/W)	3.3

Rockwool	Thickness (m)
Cement Board	0.0125
Rockwool	0.032
Spun Bonded Polyolefin Membrane	0.002
Plywood	0.015
Low Density Glass Fibre Batt Insulation	0.089
PE-Membrane	0.001
Gypsum Board	0.0125
Total Thickness (m)	0.162
R-Value (m2K/W)	3.3

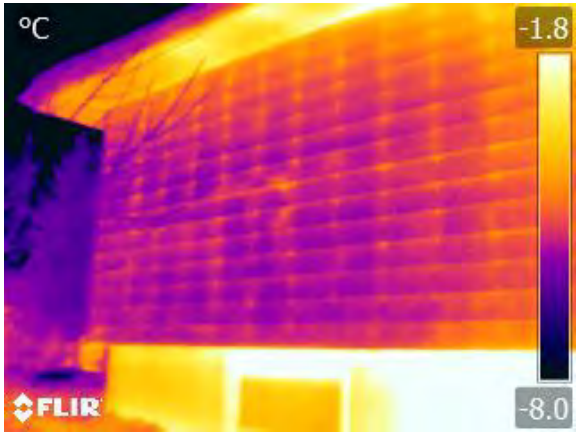
Field Measurements

Results

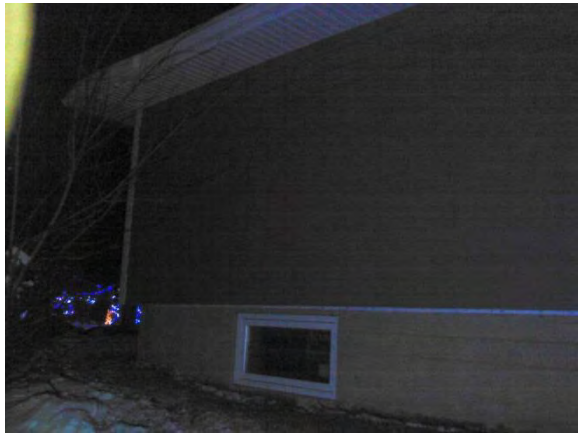
Blower Door Test Results



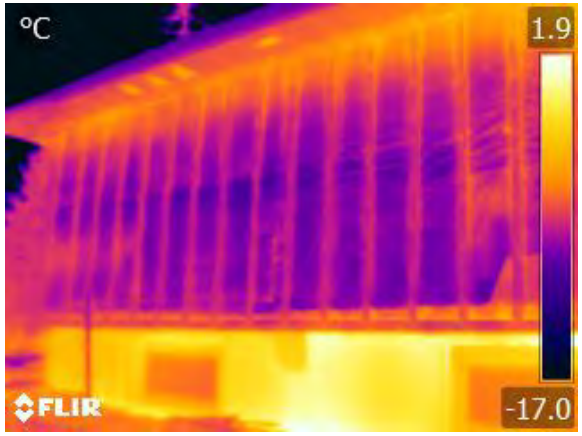
Thermal Bridging



East wall siding completed (infrared)



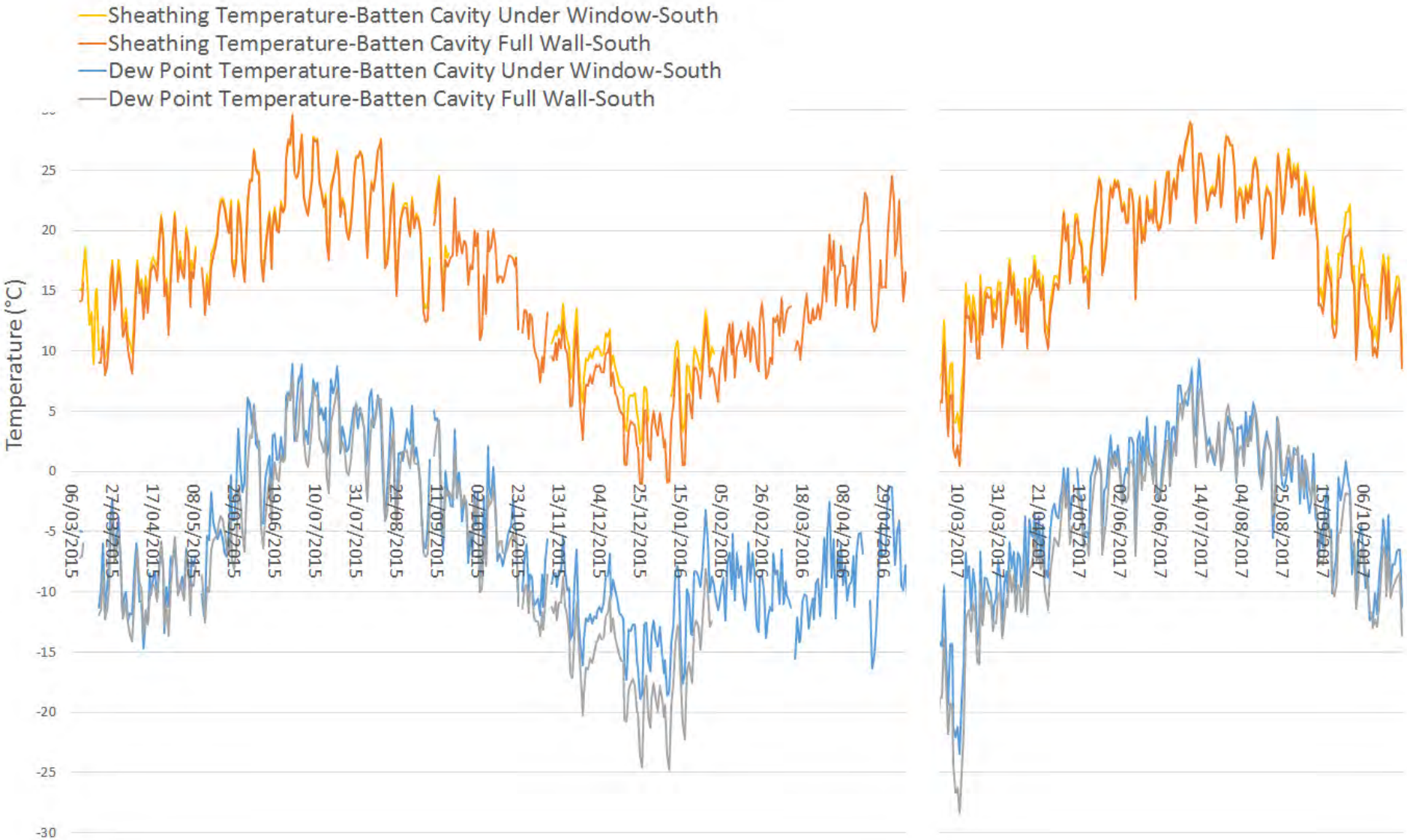
East wall siding completed



East wall with battens installed over studs (infrared)

East wall with battens installed over studs

Sheathing and Dew Point Temperature Profiles-Measurements



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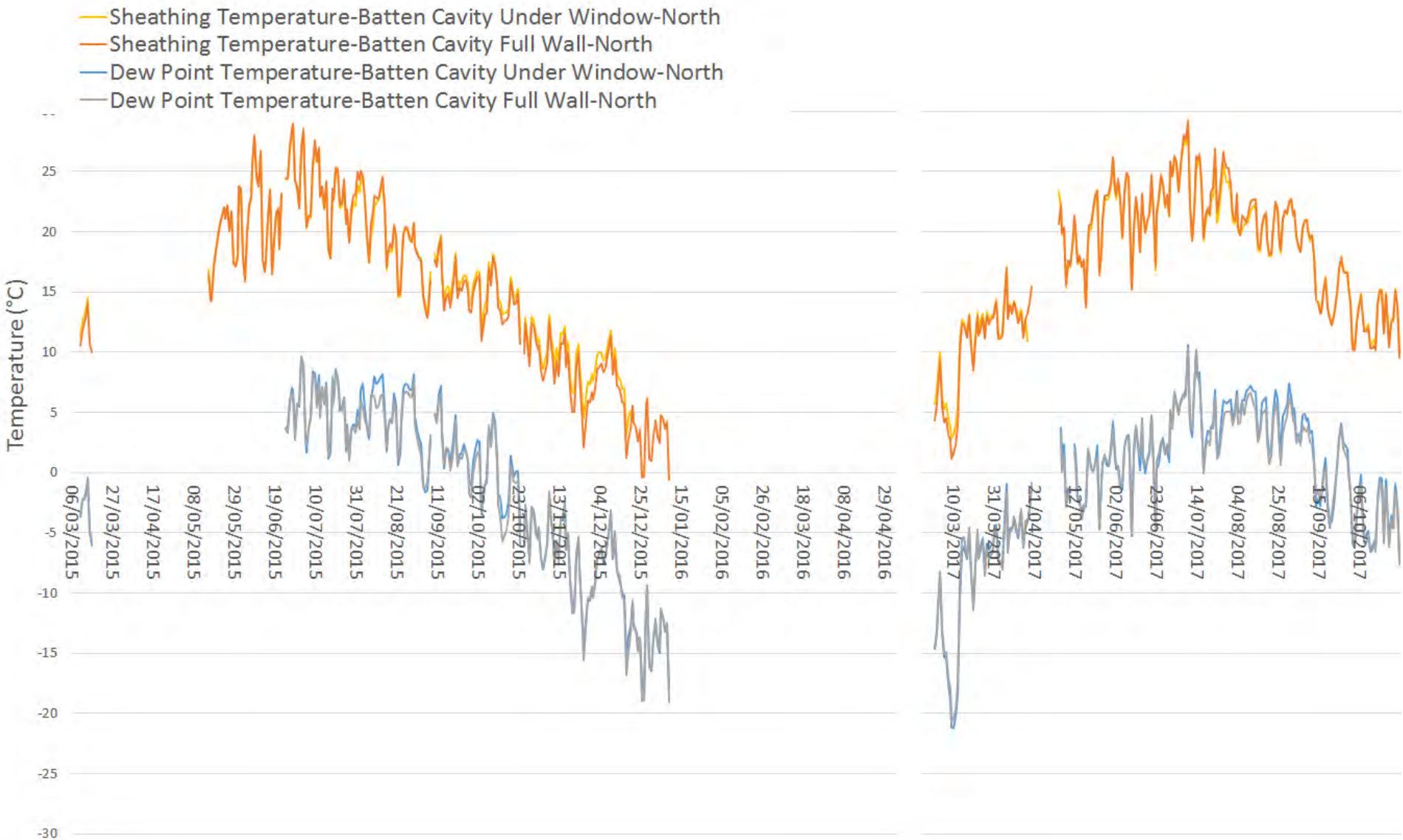

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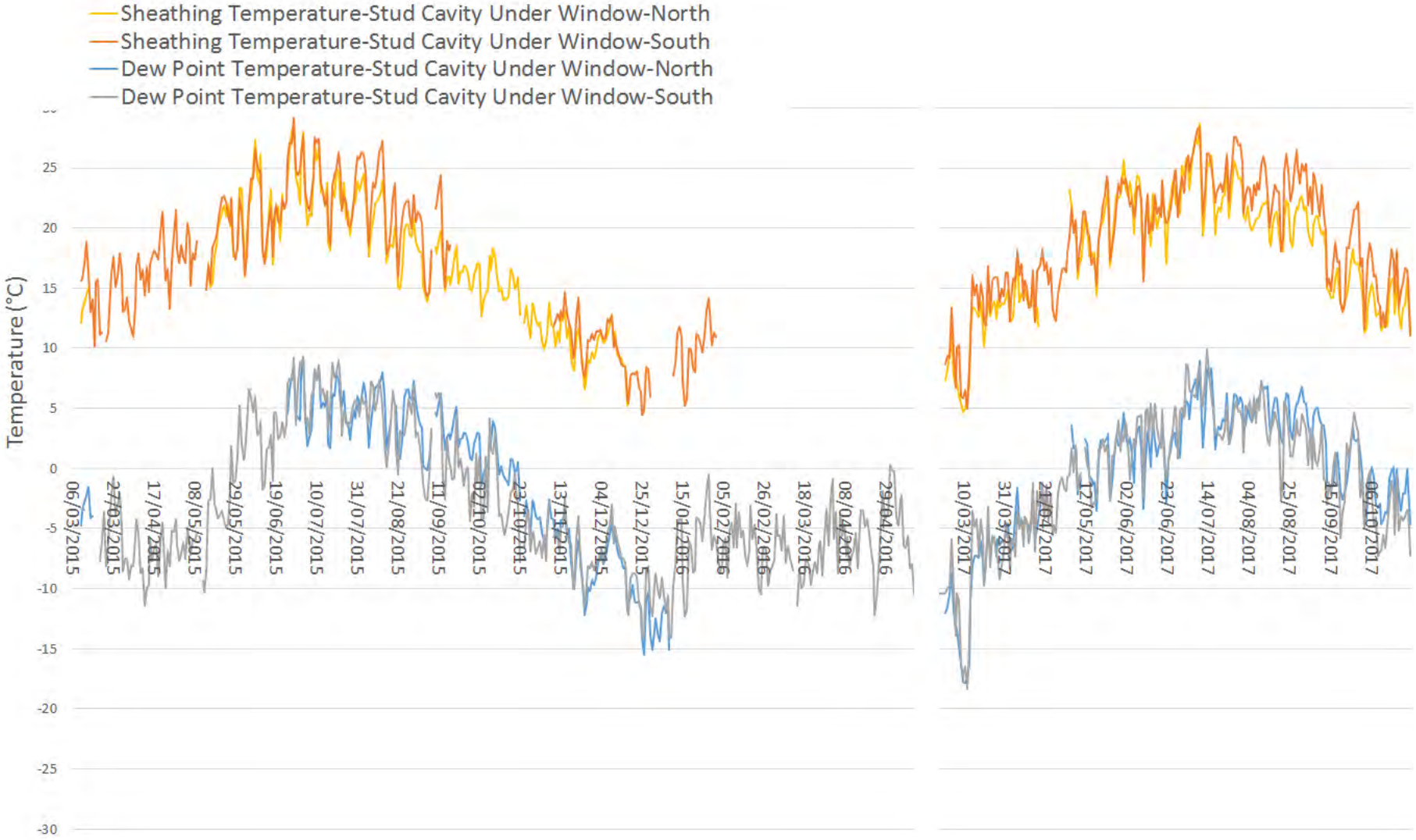
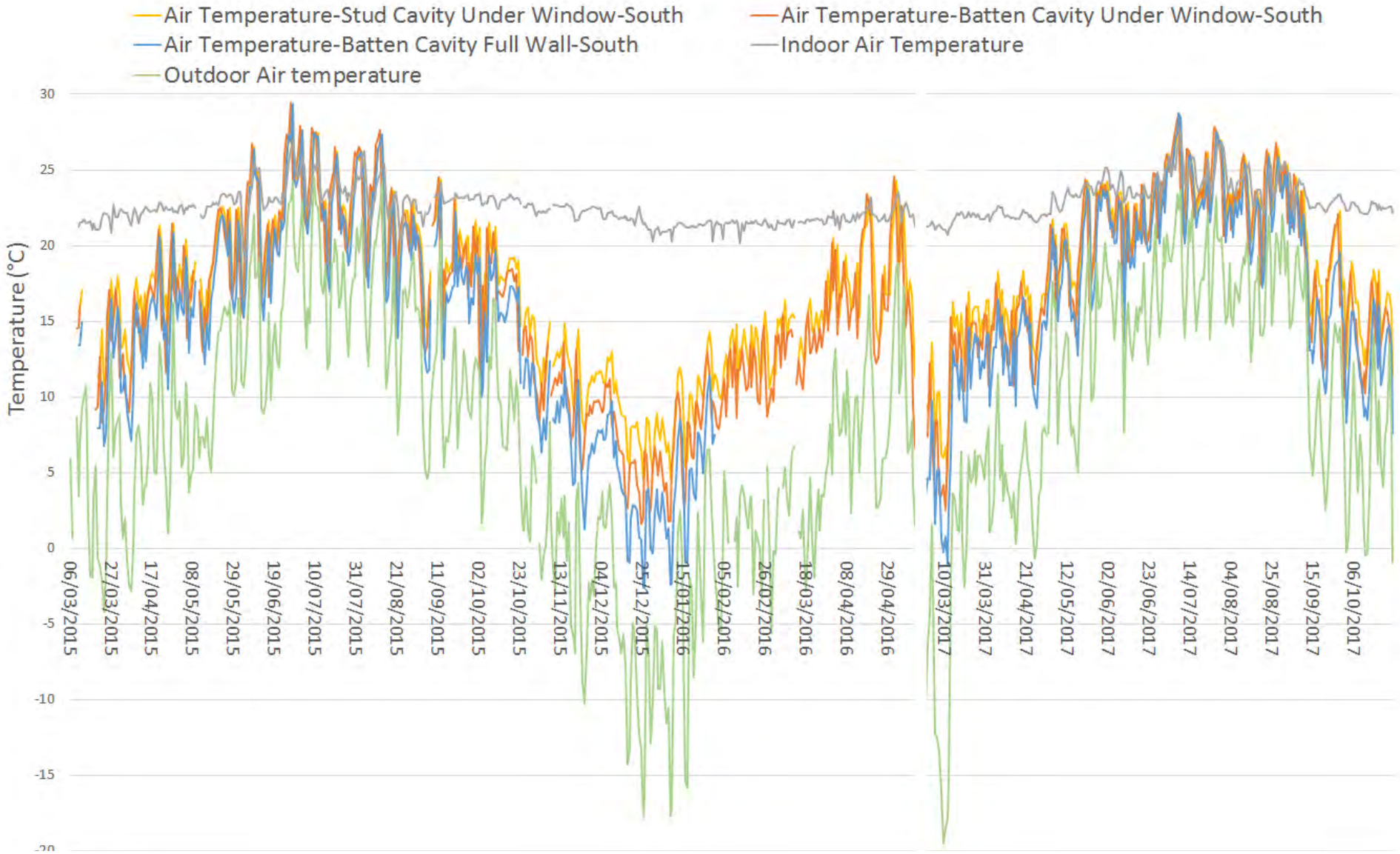
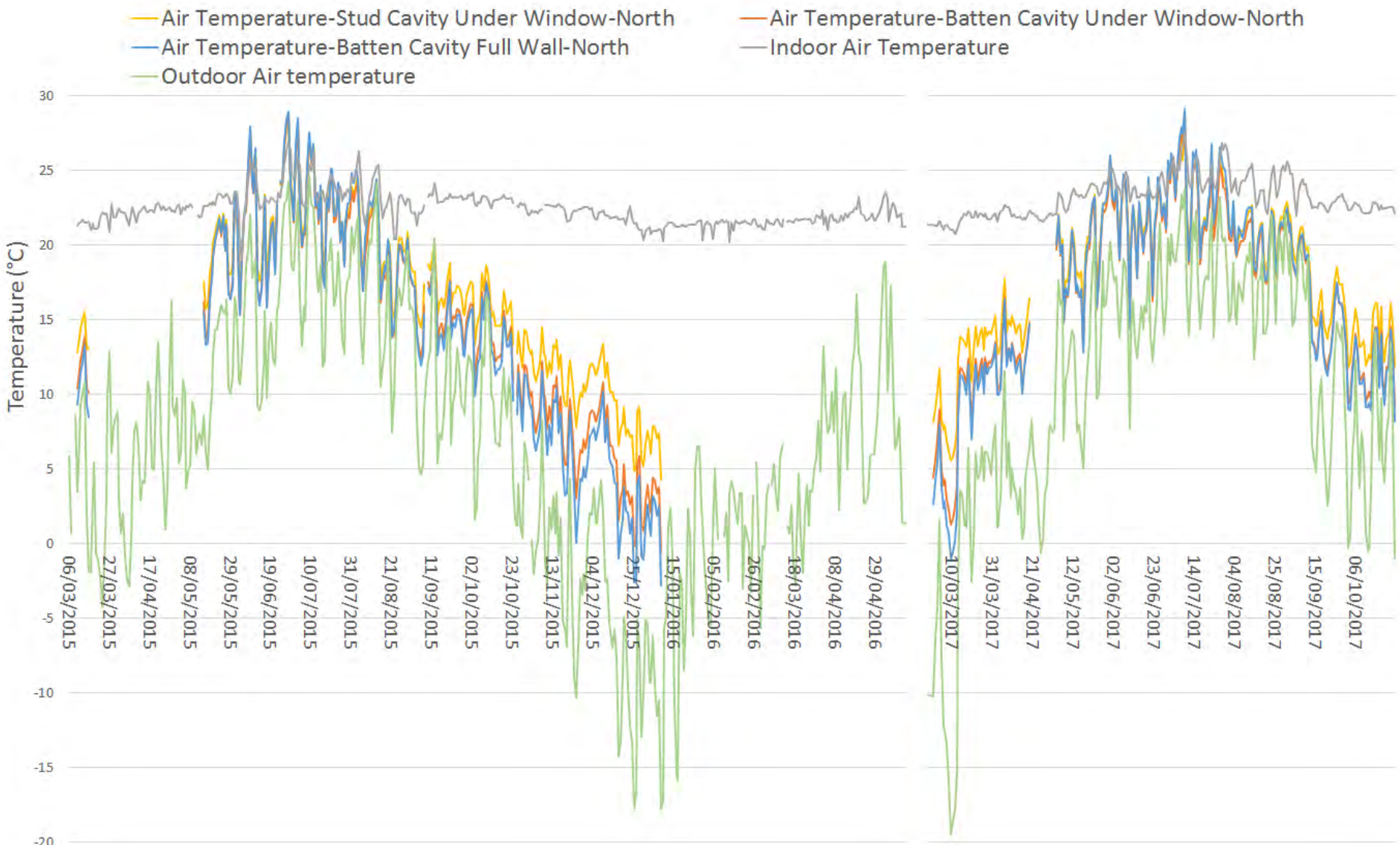


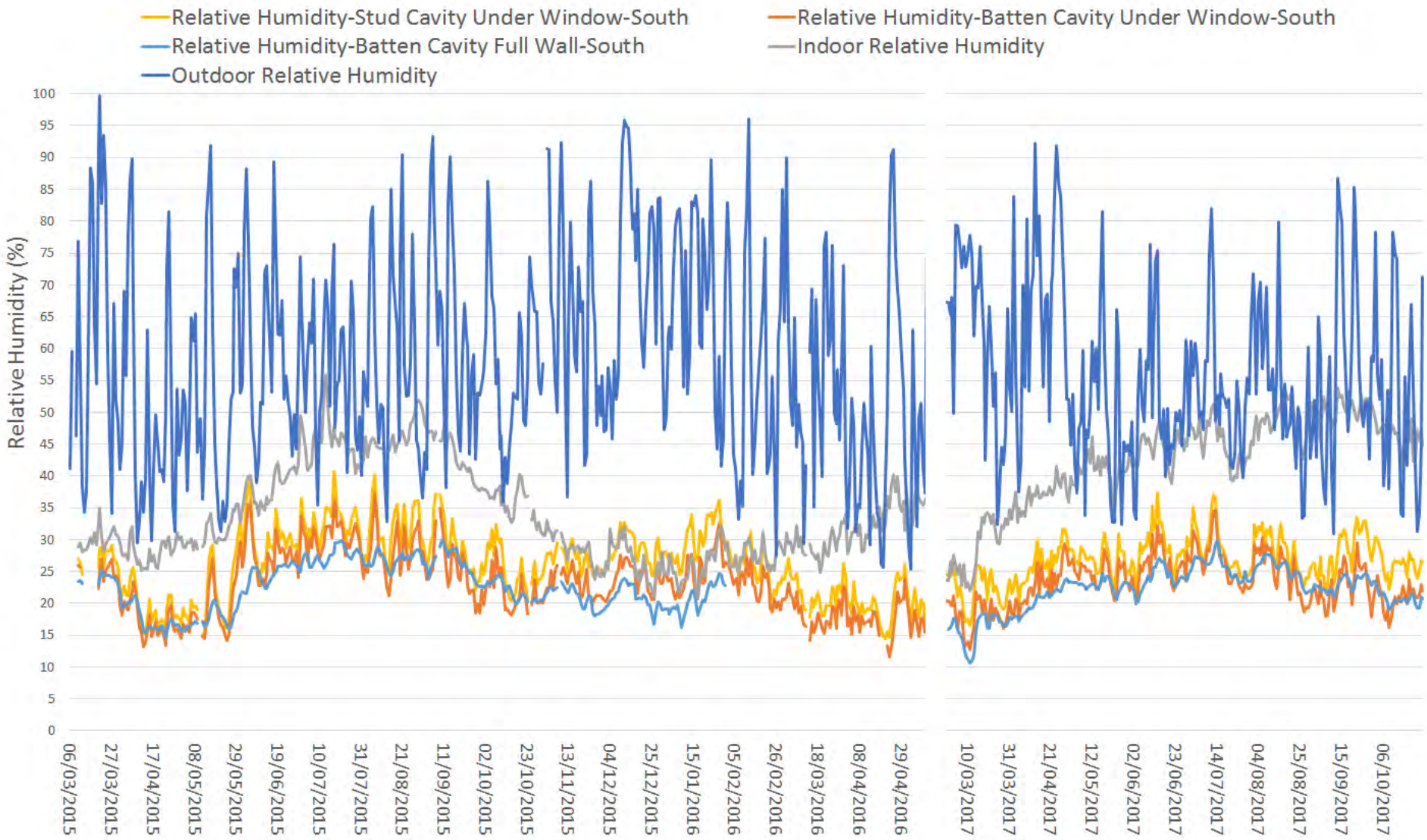
Air Temperature Profiles-Measurements



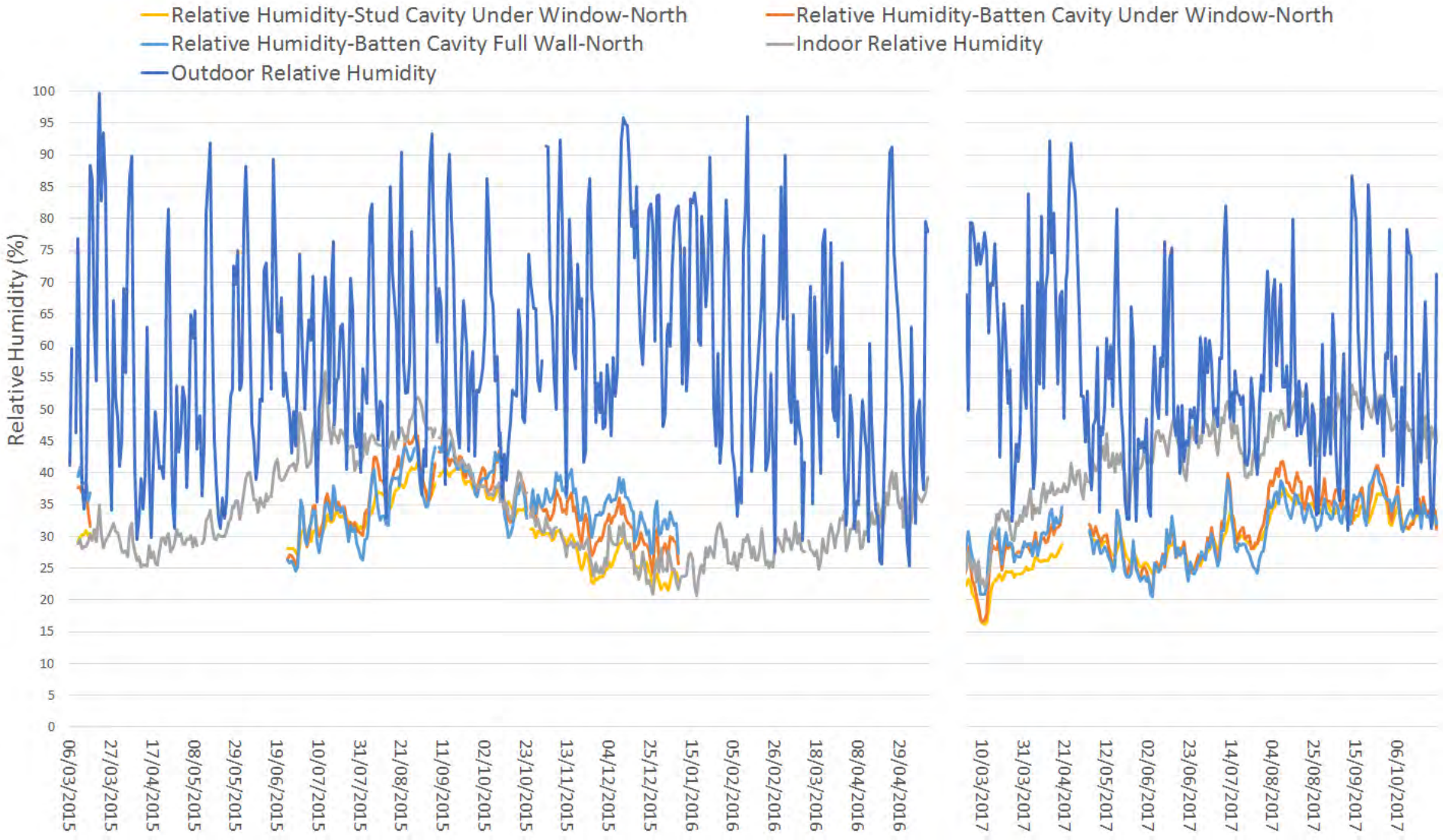
Air Temperature Profiles-Measurements



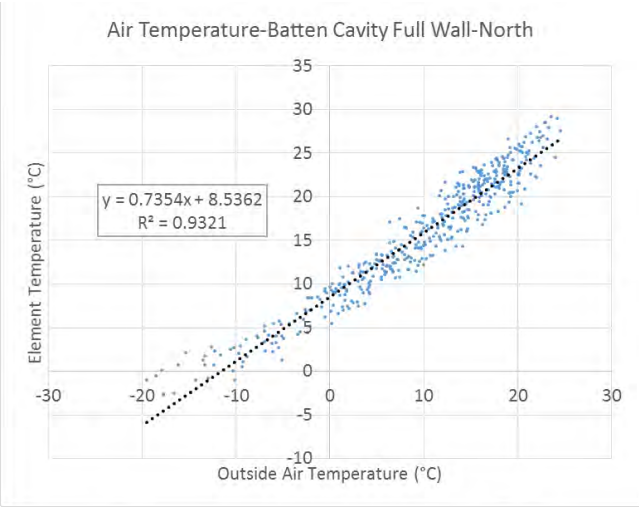
Relative Humidity Profiles-Measurements

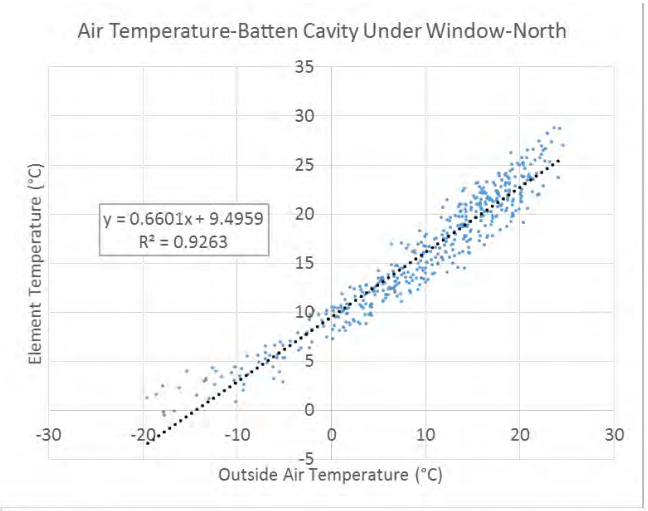


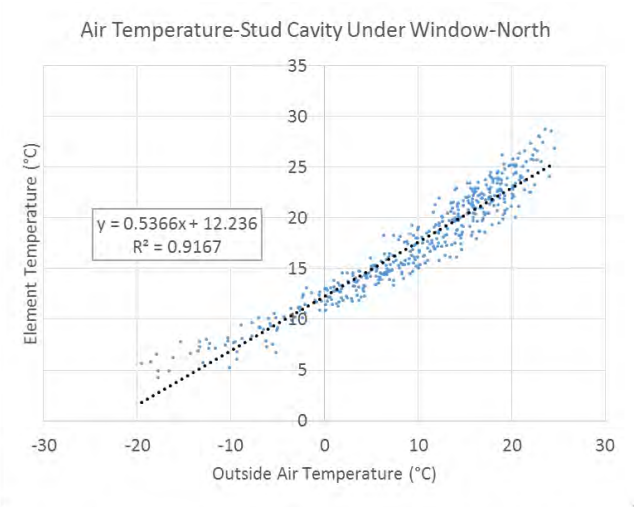
Relative Humidity Profiles-Measurements

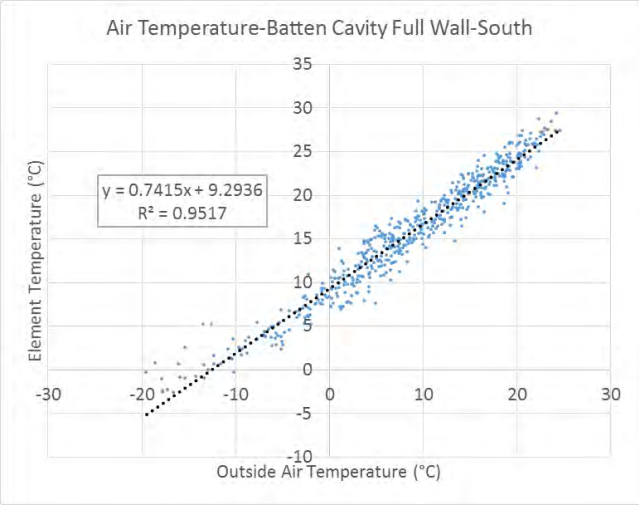


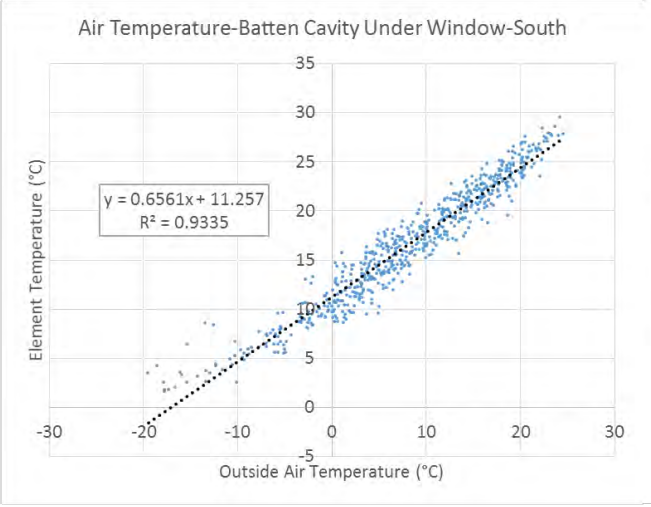
Correlations

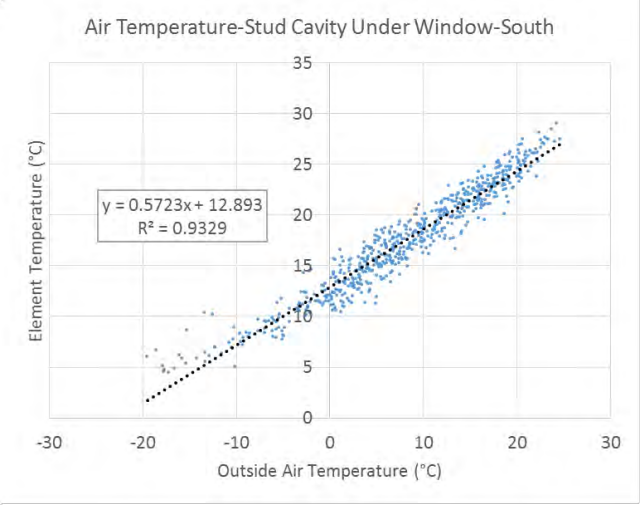












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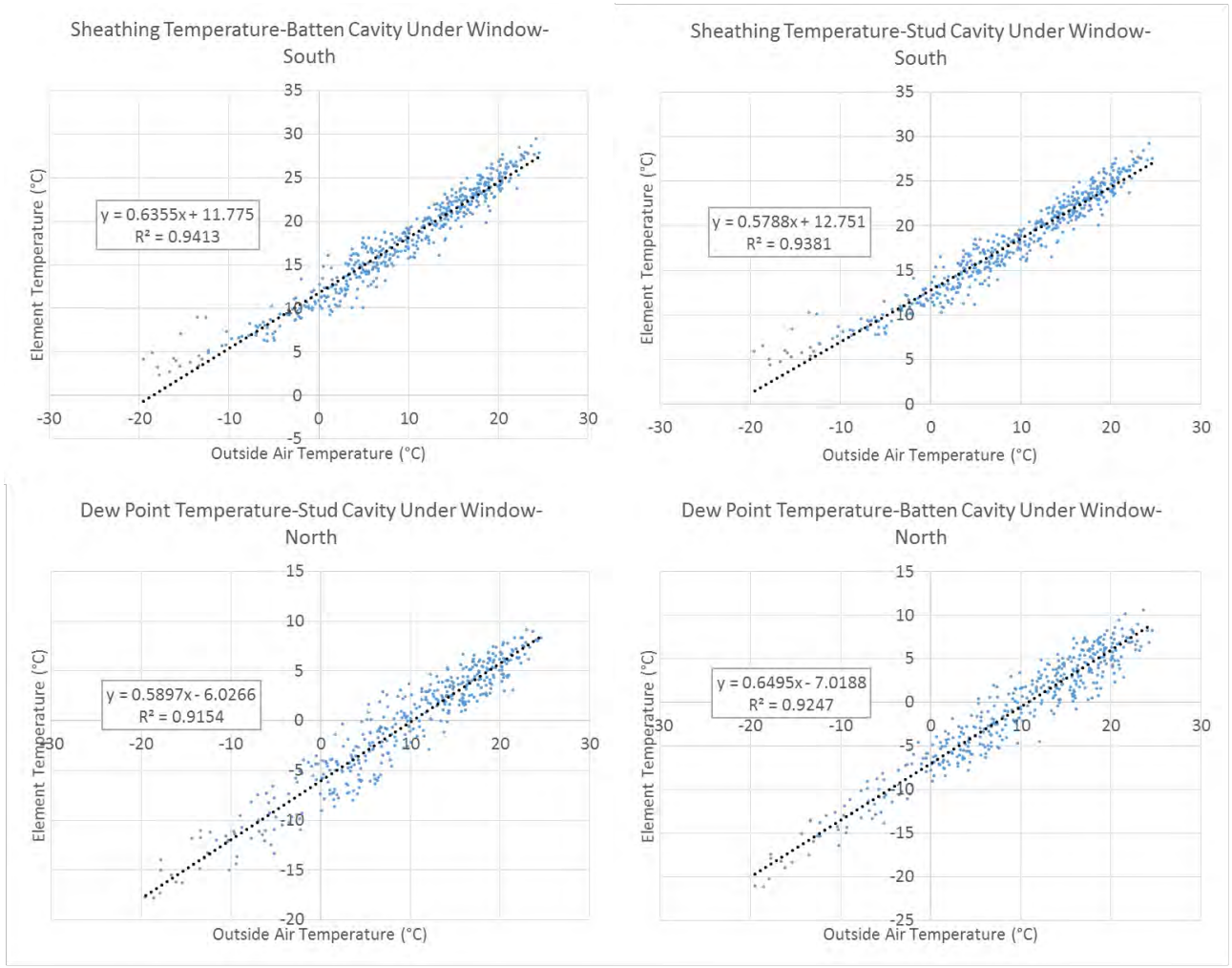

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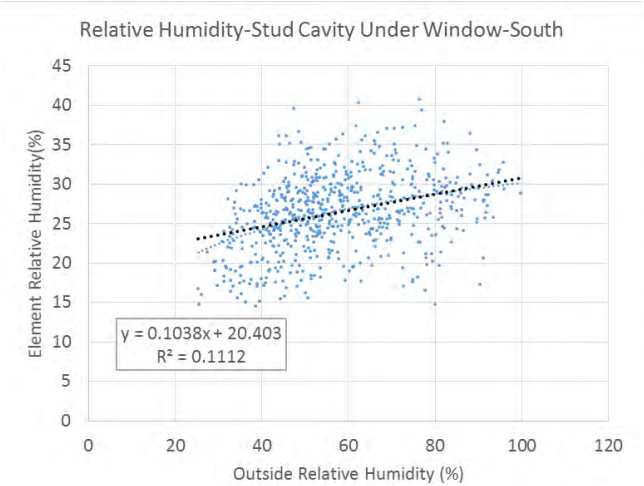
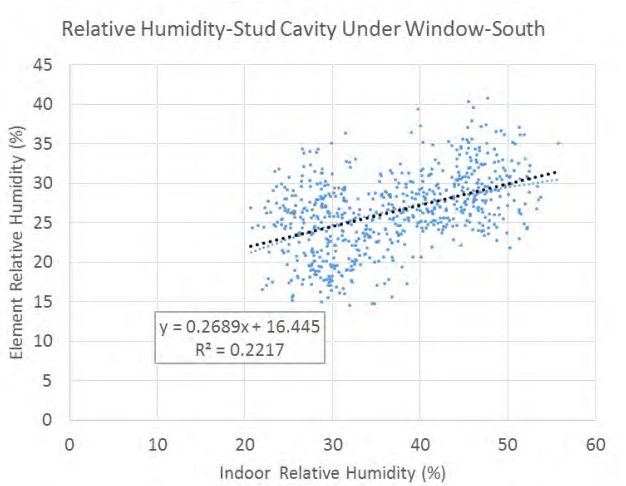
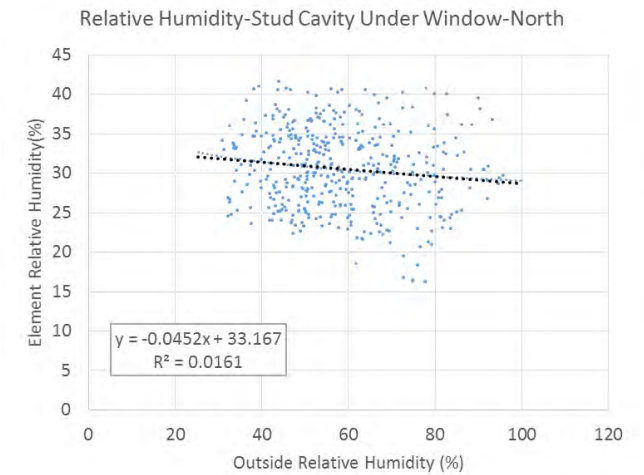
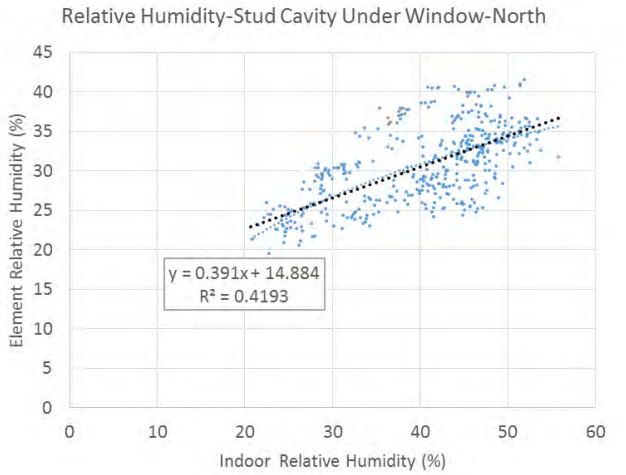




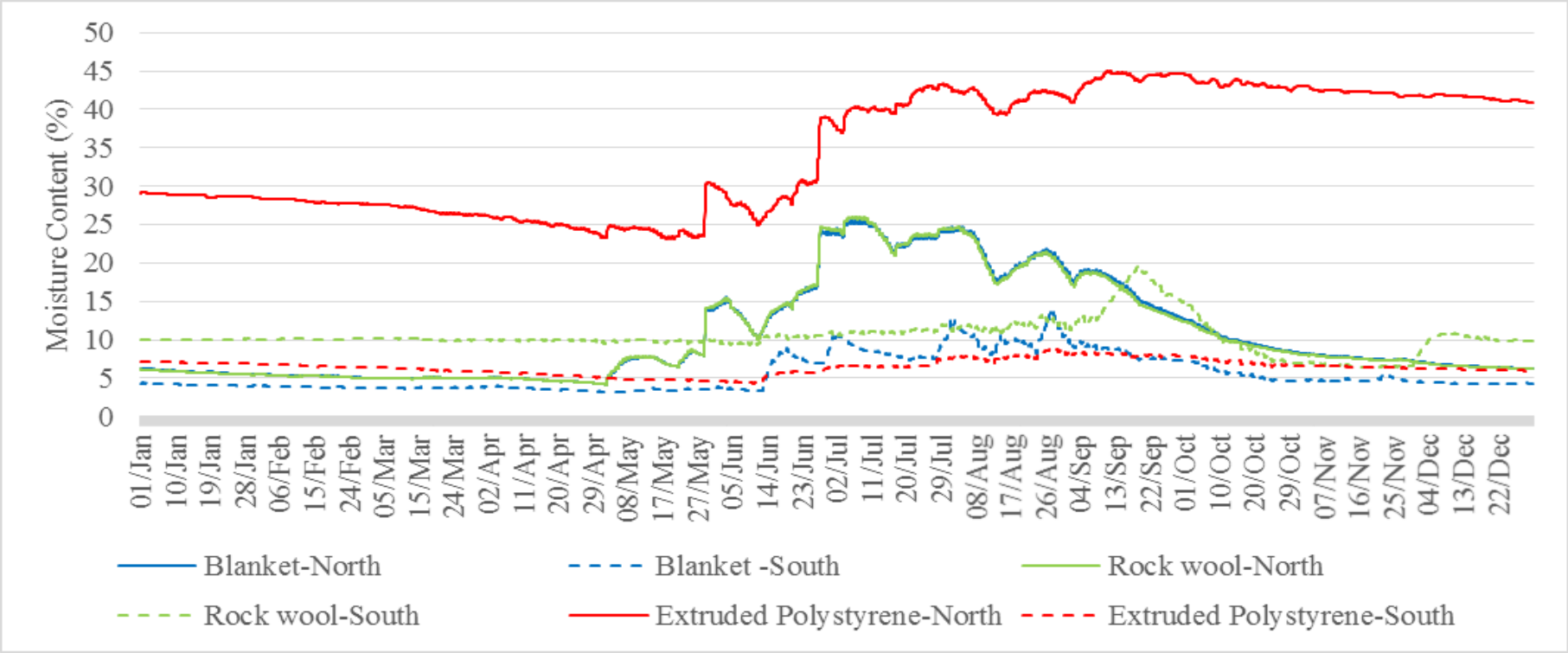




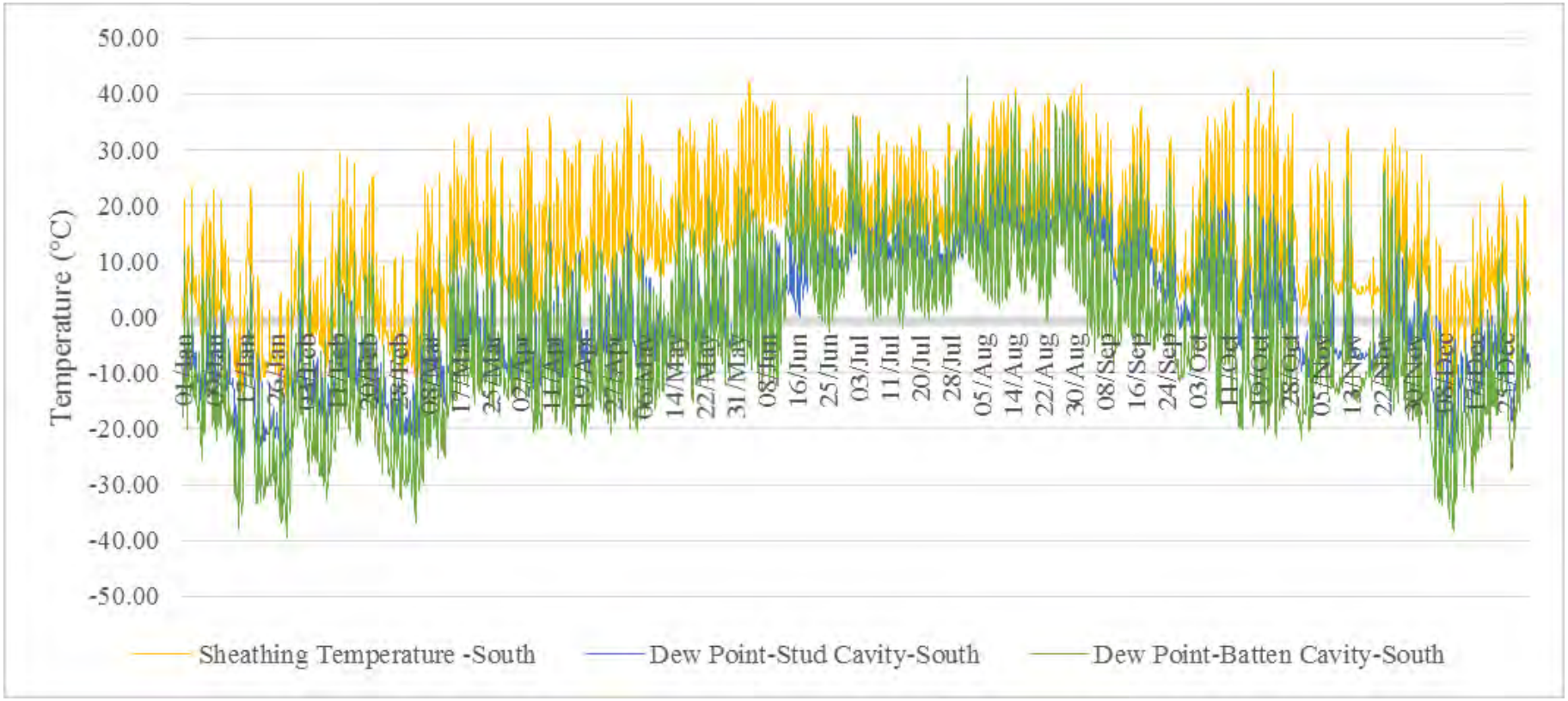
Simulation

Results

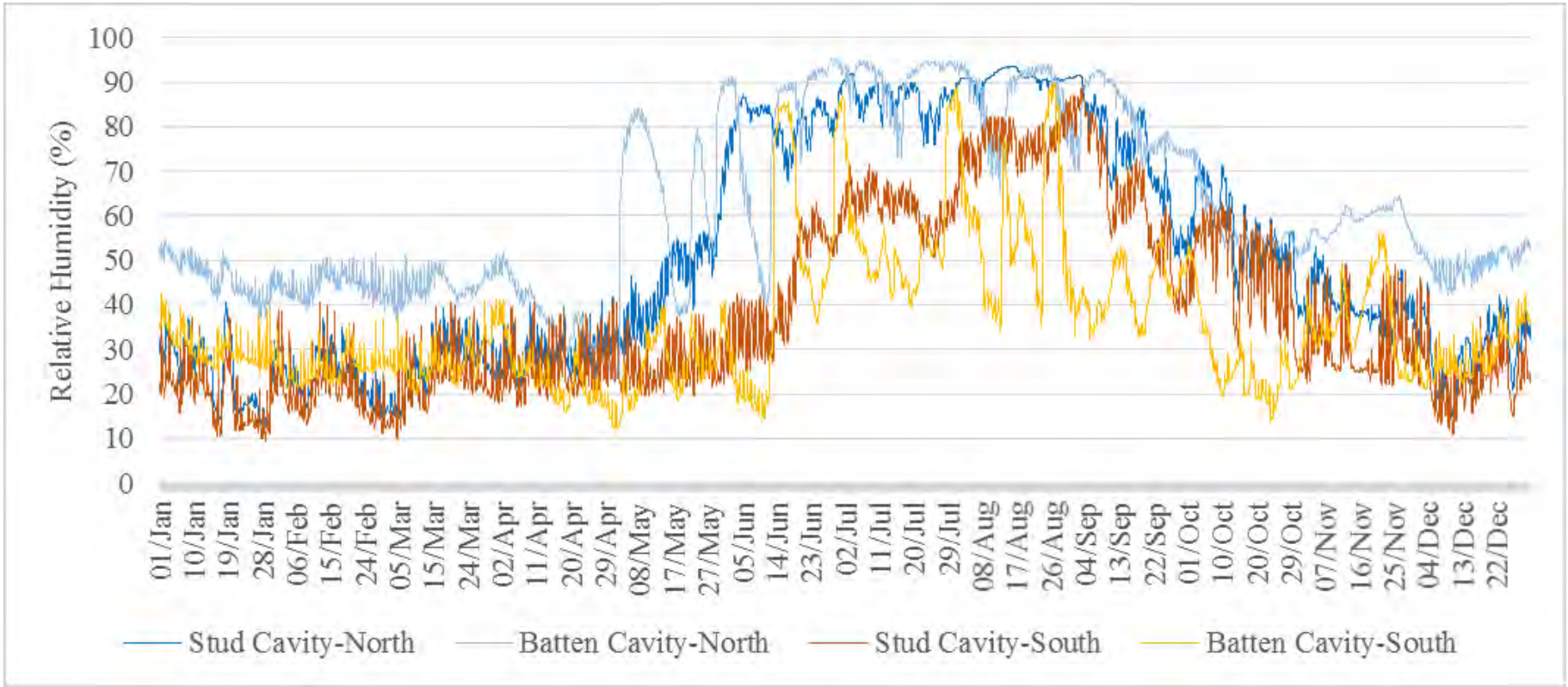
Moisture Content Profile Comparison Between Different Types of Exterior Insulation.



Dew Point and Sheathing Temperature Profiles. South Wall, Blanket Insulation



Relative Humidity Profiles-Exterior Blanket Insulation



Conclusion

- Blanket insulation performed as expected in terms:
  - Keeping the inner wall cavity dry.
  - Keeping the Sheathing temperature above dew point.
- Air leakage improved slightly compared to pre renovation . Both blanket insulation and new windows contributed to this improvement.
- Owner is feeling the house comfortable and not any more drafty.

Thanks

- For the contributions of
  - Cheryl Fryers, Homeowner
  - Randy Kiez, TLAS Infrared
- For everyone

References

- Weather Data Source: Alberta Agriculture and Ruler Development http://agriculture.alberta.ca/acis/alberta-weather-data-viewer.jsp
- Dew Point Claculation: August, E. F., 1828: Ueber die Berechnung der Expansivkraft des Wasserdunstes. *Ann. Phys. Chem.*, 13, 122–137. Equation retrived from http://andrew.rsmas.miami.edu/bmcnoldy/Humidity.html