

What is the impact of cool (highly reflective) pavement on urban heat? ^(A)

Holistic assessment of “Cool Seal” in City of Phoenix (COP) residential neighborhoods.

1. Methodology

- (A) Cool Pavement (CP) vs. Asphalt
- (B) Spectroradiometer: Spectral reflectivity (monthly)
- (C) MaRTy, biometeorological cart: T_{MRT} , T_{sfc} , T_{air} (3 single-days, time-detrended)
- (D) iButtons: T_{sub} (long-term)
- (E) car transect example (Maryvale)
- (F) Vehicle traverses: T_{air} , T_{sfc} (3 single-days, time-detrended)
- (G) Community Survey: Perception (May/June '21)

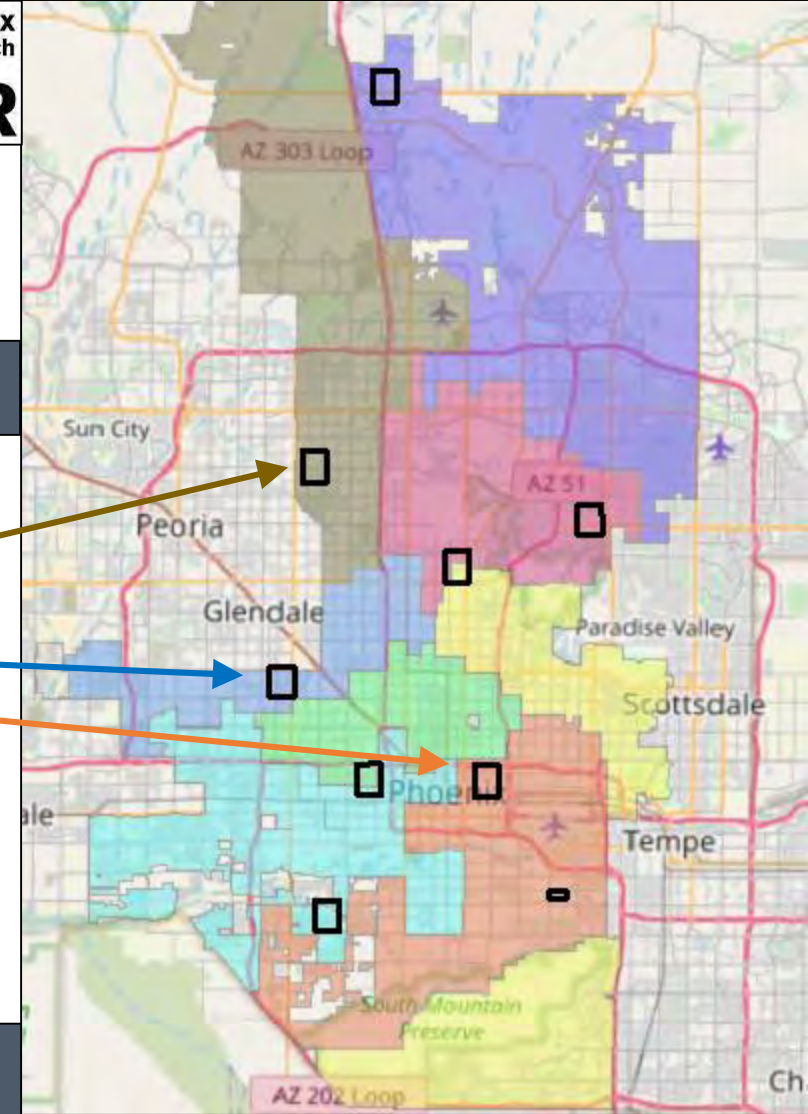
2. Heat metrics

- T_{air} – air temperature
- T_{sfc} – surface temperature
- T_{MRT} – mean radiant temperature
- T_{sub} – subsurface temperature

3. Measurements where?

T_{air} , T_{sfc} , and T_{MRT}
only in:
Westcliff
Maryvale
Garfield

Spectral reflectivity, T_{sub} ,
and community survey:
All neighborhoods

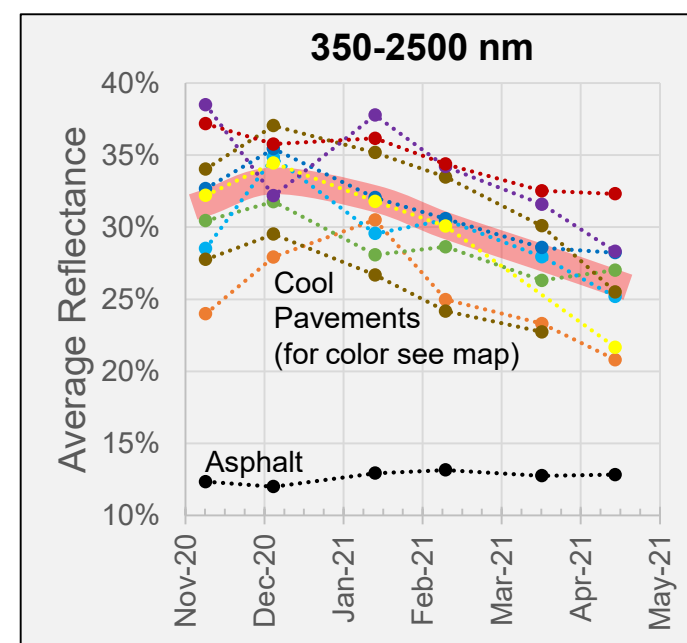


4. Preliminary Results

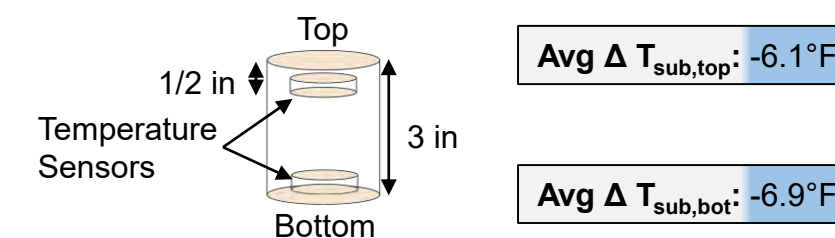
Surface Temperature ^{(E) (F)}

Car (2 loops)	Avg ΔT_{sfc}		
	Garfield (orange)	Maryvale (dark blue)	Westcliff (brown)
Pre-Sunrise	-2.1°F	-1.7°F	-3.9°F
Noon	NA	-10.8°F	-15.9°F
Afternoon	-5.9°F	-9.8°F	-13.1°F
Post-Sunset	-3.8°F	-3.9°F	-5.7°F

Surface Reflectivity ^(B)



Subsurface Temperature ^(D)



Mean Radiant Temperature (street) ^(C)

MaRTy 1+2	Avg ΔT_{MRT}		
	Garfield (orange)	Maryvale (dark blue)	Westcliff (brown)
Pre-Sunrise	-1.1°F	-0.3°F	-1.2°F
Noon	7.5°F	5.7°F	9.1°F
Afternoon	4.2°F	2.5°F	4.0°F
Post-Sunset	-0.9°F	-1.7°F	-1.4°F

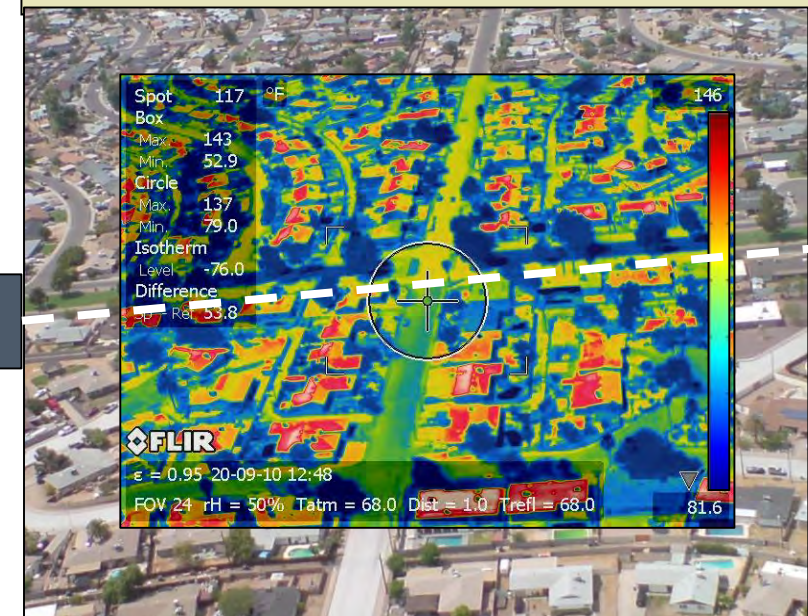
Air Temperature (across neighborhoods) ^{(E) (F)}

Time of Day	Avg ΔT_{air}
Pre-Sunrise	+ 0.03°F
Noon	- 0.26°F
Afternoon	- 0.17°F
Post-Sunset	- 0.44°F

5. Conclusion

- Significantly cooler T_{sfc} during the noon and afternoon hours
- T_{MRT} is similar to concrete sidewalk
- Reflectance higher in visible and near infrared solar spectrum
- Small change for T_{air}
- T_{sub} shows potential reduction in thermal stress
- Community survey soon to be deployed ^(G)

Location of the **eight** neighborhoods in the COP, one in each council district, and the pilot area in Esteban Park that have received CoolSeal treatment.



Visible and thermal images from the helicopter. Red (blue) colors indicate hotter (colder) surface temperatures relative to the temperature range in the image. CoolSeal was applied below white dashed line.

