# Measuring the Las Cruces Urban Heat Island

**Bob Endlich** 

<u>bendlich@msn.com</u>

15 Feb 2013 Cruces Atmospheric Forum Las Cruces, NM Acknowledgments:

**Steve McGee: References and good ideas** 

Jon Kahler: Set up, data collection notes, suggestions

http://wattsupwiththat.com/2010/04/04/ measure-uhi-in-your-town-with-this-easy-to-use-temperature-datalogger-kit/

### Watts Up With That?

The world's most viewed site on global warming and climate change



← Quote of the week #33: What, no death spiral?

The great imaginary ice barrier  $\rightarrow$ 

# Measure UHI in your town with this easy to use temperature datalogger kit

Posted on April 4, 2010 by Anthony Watts



#### Components: DPlot Software, NAVIN Mini-Homer, EI-USB-2 Temperature Sensor



#### **EL-USB-2** Temperature Sensor:

Sensor contains T, Td and RH sensor, data logger with USB port. Gray plastic parts shield the sensor head and the USB port. The flag mount (white) enables the sensor to be used in an automobile. The mini CD contains the data logging software; very easy to use.





#### Temperature Data Logger User Interface: Part of the CD software download.



When you download the data, this is the graphic which appears.

You can view, on screen edit, or export the data.

**Export** button: data are exported to Microsoft Excel



From:- 07 February 2013 13:50:54 To:- 07 February 2013 15:09:34

#### **GPS Data Logger:**

#### **NAVIN Mini-Homer**





### **DISPLAY & KEY**

Charging Status Indicator Satellite Icon, Position Fix Quality Indicator

Distance to Location / Time / Compass Heading

Compass Icon

Satellite mode lcon

USB Charging Port

Power / Mode Key

NAVIN AN PN MINIHOMER

Battery Indicator **Distance Unit** Heading Degree Direction Arrow Location Icons (Home, Car, Way Point, Favorite Spot, Restaurant) AM/PM Indicator Clock Icon Mark Key Key Ring

#### **Mini Homer**

Mini-Homer has many functions; the function we used it for was logging GPS data, and later downloading it to computer.

GPS data are viewed, edited and displayed with third party NTRIP Software.

http://www.semsons.com/namiwagpspof.html

#### Support Information:

In order to use miniHomer as data logger and to access geo-tag function, please make sure to install nTrip software and USB driver provided below on your computer.

- MiniHomer User Manual
- Introduction Presentation
- <u>nTrip User Manual</u>
- Windows XP, Vista, 7 USB Driver
- <u>nTrip Software</u>

#### Package Includes:

- miniHomer with built-in battery
- miniUSB download / charging cable
- Quick Guide

#### NTRIP Opening Screen. Use GPS Icon to initialize your GPS (Mini Homer) Use purple arrows icon to download data from GPS to NTRIP.

🔊 New Project - NTRIP





#### Data from mini-Homer plots: Track on Google map, Track Name, Track Data Log. Each logged track point may be examined: Location, Time, Elevation, Speed.









From:- 07 February 2013 13:50:54 To:- 07 February 2013 15:09:34

For Help, press F1				NUM	
Las Cruces	CondronAAF	Track Deints	1		
		Date Time	Elevation (ft)	Speed (mi. / hr)	
Date 2/7/2013 2:22:23 PM		2/7/2013 2:22:13 PM	3839.3	51.6	
Las 180 Speed 50.9 mi. / hr		2/7/2013 2:22:18 PM	3838.9	51.3	
Inti Mesilla Mesil Latitude 32.175217° N		2/7/2013 2:22:23 PM	3838.7	50.9	
Altitude 3838.7 ft	213	2/7/2013 2:22:28 PM	3838.4	50.4	
374		2/7/2013 2:22:33 PM	3838.2	49.7	
372		2/7/2013 2:22:38 PM	3838.1	49.0	
		2/7/2013 2:22:43 PM	3838.0	47.9	
		2/7/2013 2:22:48 PM	3837.9	46.6	
		2/7/2013 2:22:53 PM	3837.9	45.1	
This shows location	a data ac a fur	action of time	3837.9	43.4	
	i udid dS d Tur	iction of time	3837.9	41.3	

**Considerations for the measurement sequence:** 

Northwest to southeast traverse of Las Cruces: Valley Drive south to South Main Street: Seemed best way to sample UHI, little elevation difference. 120 ft in 11 miles.

We chose mid afternoon 1400-1500 to catch maximum temperature and little residual amplitude in the diurnal temperature wave.

We used two independent systems for the test:

**<u>Primary</u>: mini Homer GPS and Easy Log USB, automatically logged** and computer-processed

<u>Secondary:</u> Garmin GPS dash mount and Ford MAFS with dash read out. Jon kept a written log of the data.

Traffic was free moving except in town at the stop lights. There was no signature Of the stop light traffic in the temperature data that we could observe.

The air was well mixed (next graphic) ideal for the measurement



#### **Study Area viewed from Google Earth.**

Mission started on North Valley north of Shalem Colony Rd, at Lujan Hill Rd. South Traverse Valley Drive through Las Cruces; South Main St. to Mesquite, NM. North Traverse: Reverse Course. From Mesquite through Las Cruces to Lujan Hill Road



7 Feb 2013 Weather: 70 Sct 50 mi vis. Winds: Light and Variable, mostly from the SE and SW. There was burning in the Mesilla Valley showing a looping smoke plume, Stability: Cat B – Moderately Unstable. Ideal mixed PBL conditions for the traverse. EPZ sounding an hour later showed a well mixed planetary boundary layer, see below.



## **Results**

The Urban Heat Island with a 3F magnitude was well developed on both traverses. UHI was present, 3F magnitude, with both Dash Thermometer and EL-2 Data Logger



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#### **DPLOT** Northbound Temperature Transect of Las Cruces , 7 Feb 2013





#### **GPS Elevation Measuements**

2/7/2013

We used two GPS uints:

**Primary: Mini-Homer** 

**Secondary: Garmin GPS** 

The results were similar, but not Identical. Probable reason for the Differences:

Different

**GPS satellite reception.** 

**RIGHT: Both GPS units plotted** 

**Red: Mini Homer** 

**Blue: Garmin** 



<sup>2013-02-09-1454</sup> Trimmed.xlsx.grf

## Jon Kahler's Notes converted to Excel

	2/7/2013																						
Time	Dash Temp (F)	Elevation (ft)	Comments																				
			Wx: 80 Sctd 30 mi. 64F																				
			Start Lujan Hill Rd. near the Rio Grande							Las	Cru	ces Urban Heat Island.											
1:51:00 PM	65								Т	emp	erati	ure (	F) vs	Tir	ne o	f Da	y (N	IST)					
1:53:00 PM	65		Pecan Orchards																				
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2:02:00 PM	63		Businesses	63	\$			-															
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2:09:00 PM	66		Enter Main St. traveling south		÷	÷	÷	2 5	5	3	7 7	3	5	2	2 5	5	5	ŝ	ŝ	1 6	5	5	
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2:11:00 PM	65		Union																				
2:12:00 PM	65		Carver																				

#### Graphic sent to me by Dr Falk. The rate of change is 1.0 C in 90 years



#### **Global mean temperature**



"The whole aim of practical politics is to keep the populace alarmed (and hence clamorous to be led to safety) by menacing it with an endless series of hobgoblins, all of them imaginary."

H. L. Mencken