Los Angeles
Climate Date Report

Niccolò Benghi - ARCH 753-001, Building Performance Simulation

Los Angeles, California

Depending on latitude, elevation, and proximity to the Pacific Ocean, the California's climate widely varies.

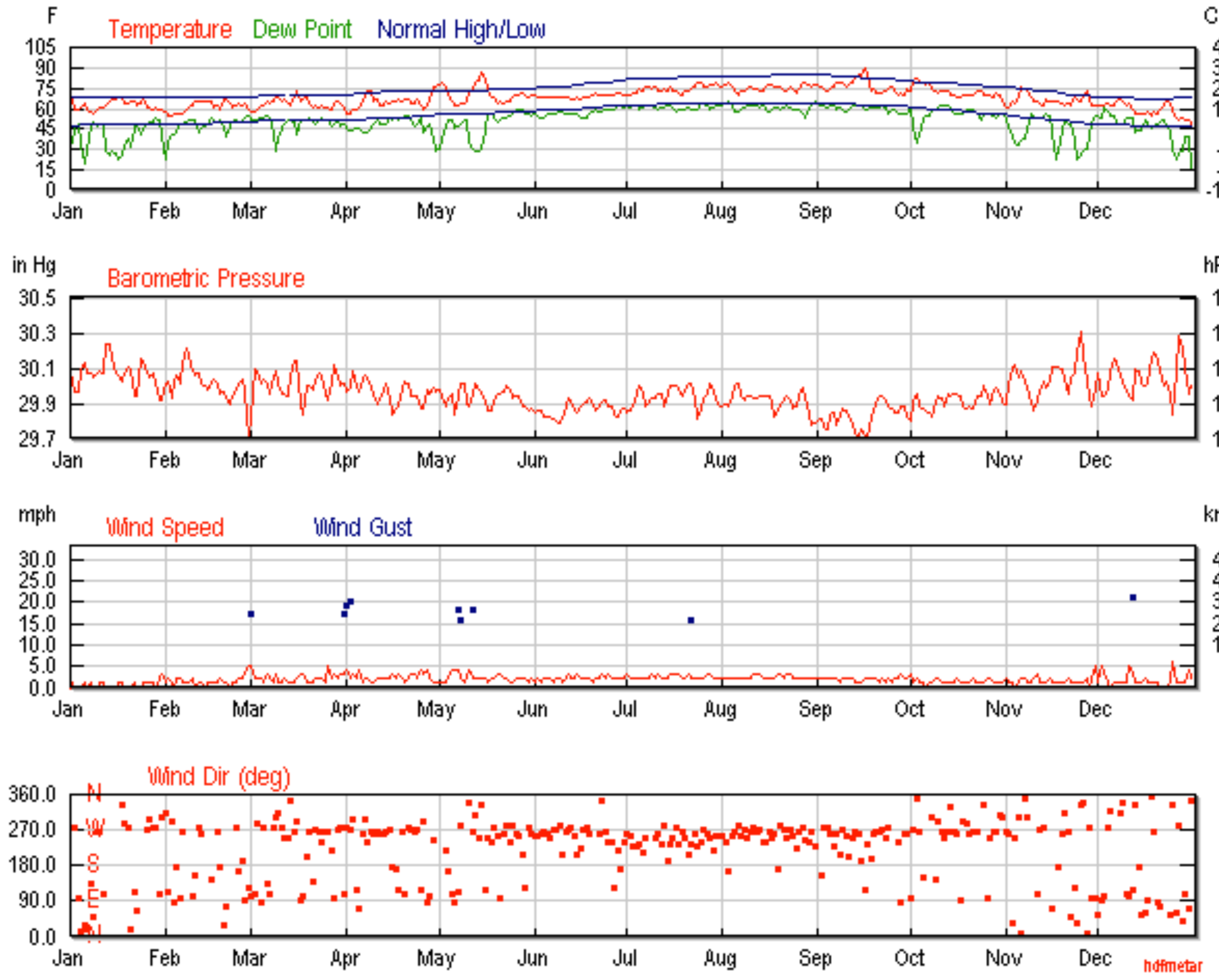
The Los Angeles metropolitan area is noted for its **year-round moderate-to-warm weather**, characterized by hot, dry summers and mildly cold winters with moderate rains. It is important to underline the characteristic weather pattern of late spring (May and June), named May Gray/June Gloom, in which a combination of inland heat, off-shore cool water, and prevailing wind patterns bring foggy and overcast weather to coastal regions.

From 1st, Jan 14 to 31st, Dec 14 from wunderground.com)

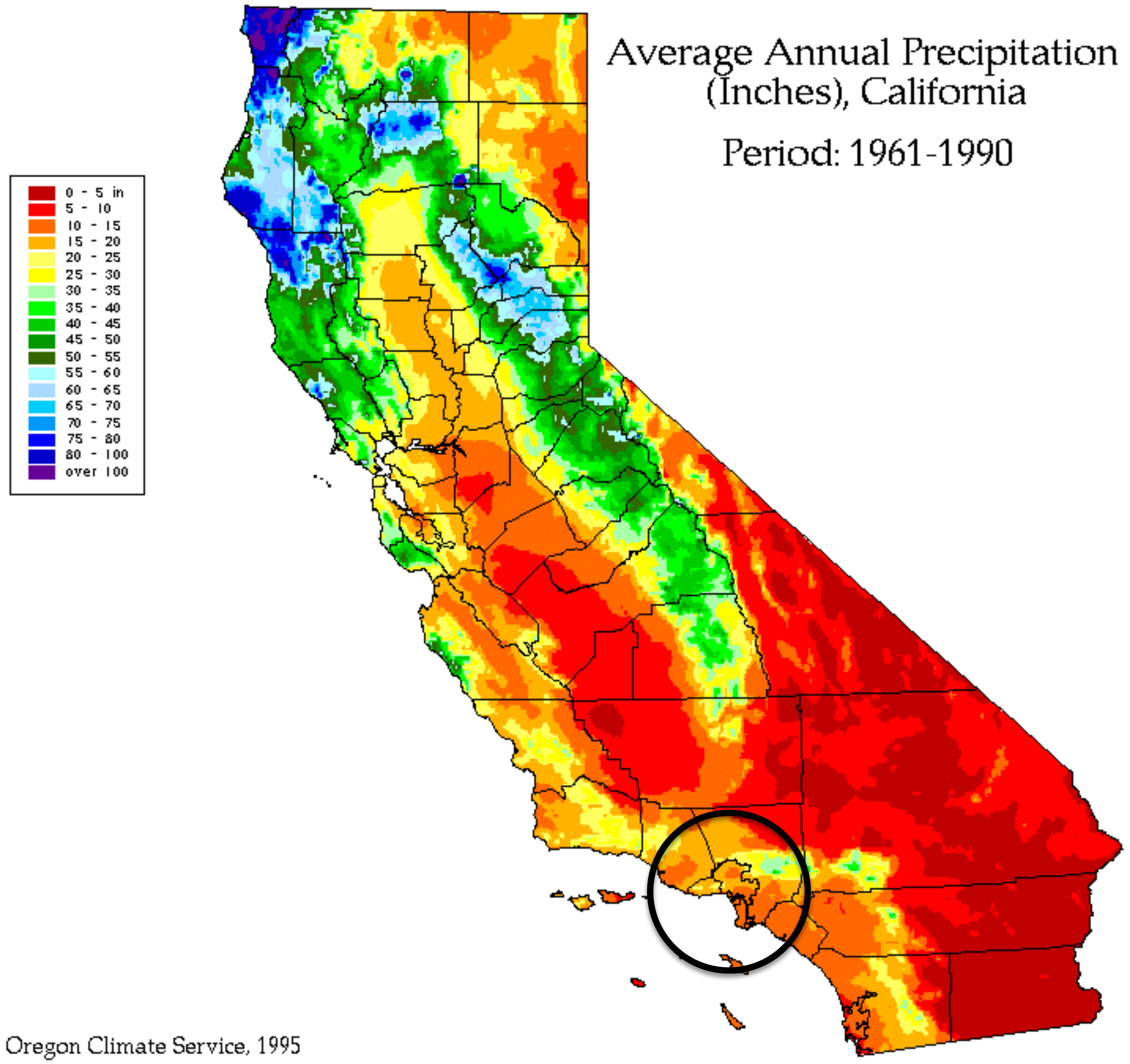
Daily | Weekly | Monthly | Custom

	Max	Avg	Min	Sum
Temperature				
Max Temperature	103 °F	78 °F	56 °F	
Mean Temperature	90 °F	68 °F	49 °F	
Min Temperature	76 °F	59 °F	39 °F	
Degree Days				
Heating Degree Days (base 65)	16	1	0	527
Cooling Degree Days (base 65)	25	5	0	1729
Growing Degree Days (base 50)	40	18	0	6422
Dew Point				
Dew Point	69 °F	51 °F	7 °F	
Precipitation				
Precipitation	2.24 in	0.03 in	0.00 in	9.77 in
Snowdepth	-	-	-	-
Wind				
Wind	17 mph	2 mph	0 mph	
Gust Wind	27 mph	18 mph	16 mph	
Sea Level Pressure				
Sea Level Pressure	30.39 in	29.96 in	29.63 in	

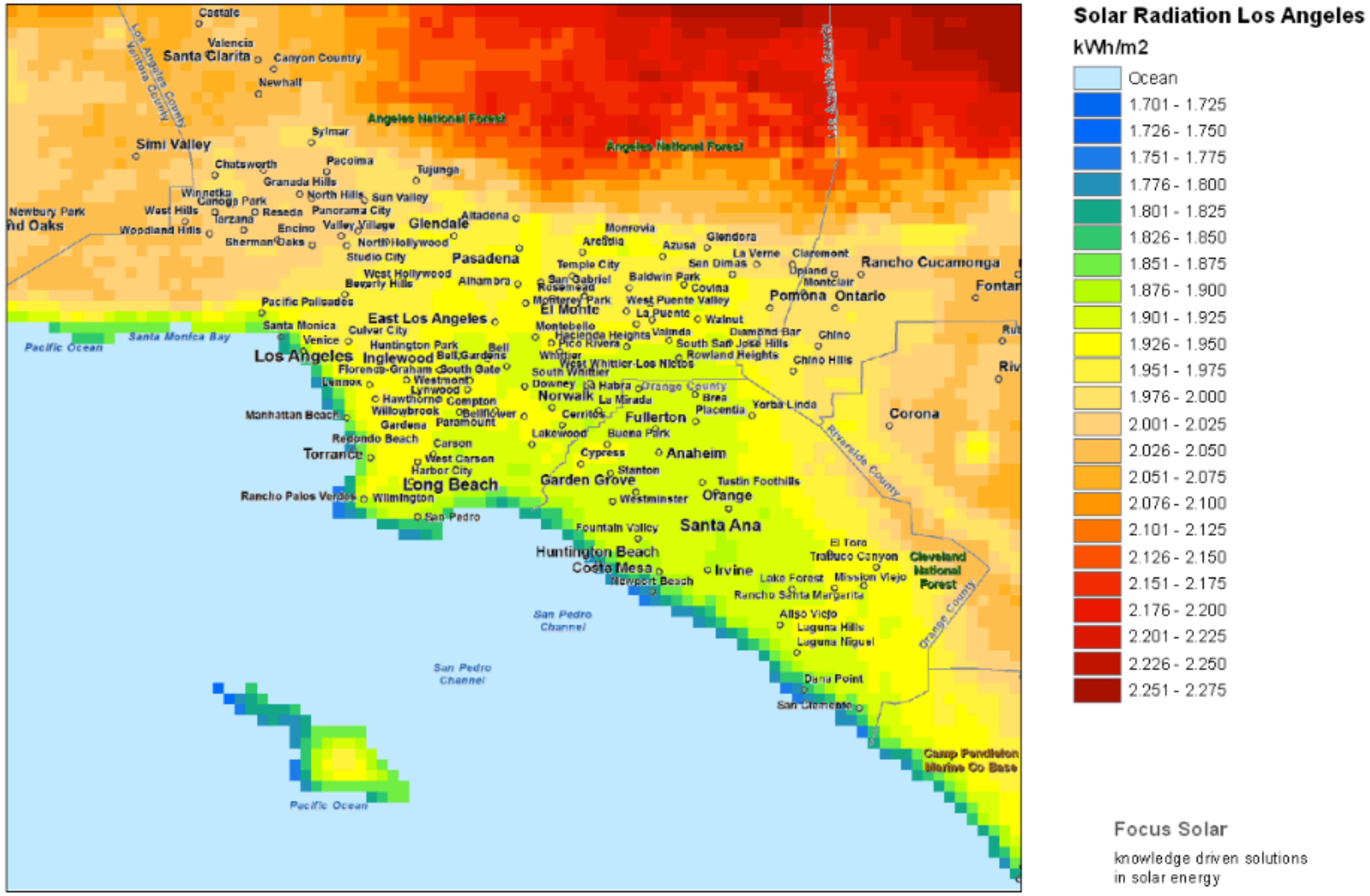
Custom Weather History Graph



California average annual precipitation , and solar radiation in Los Angeles



Oregon Climate Service, 1995



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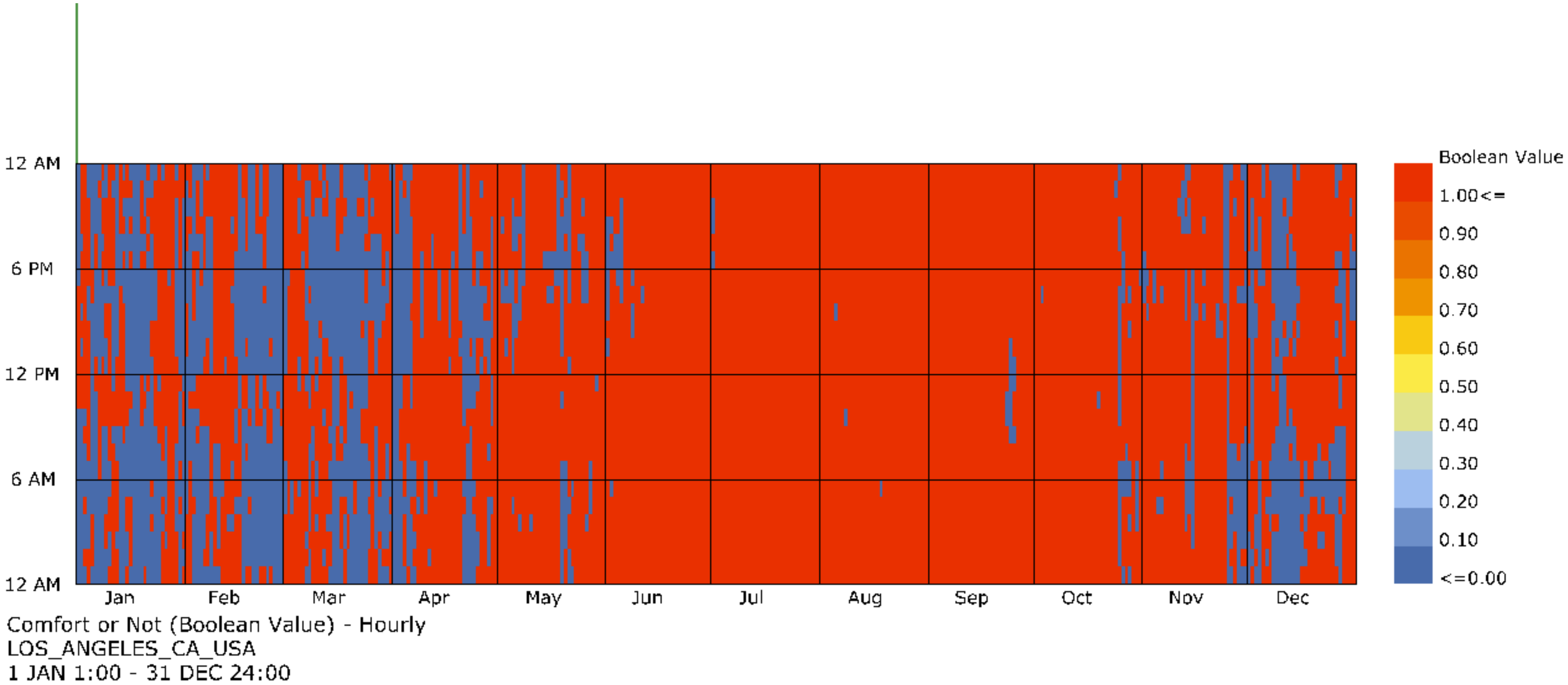
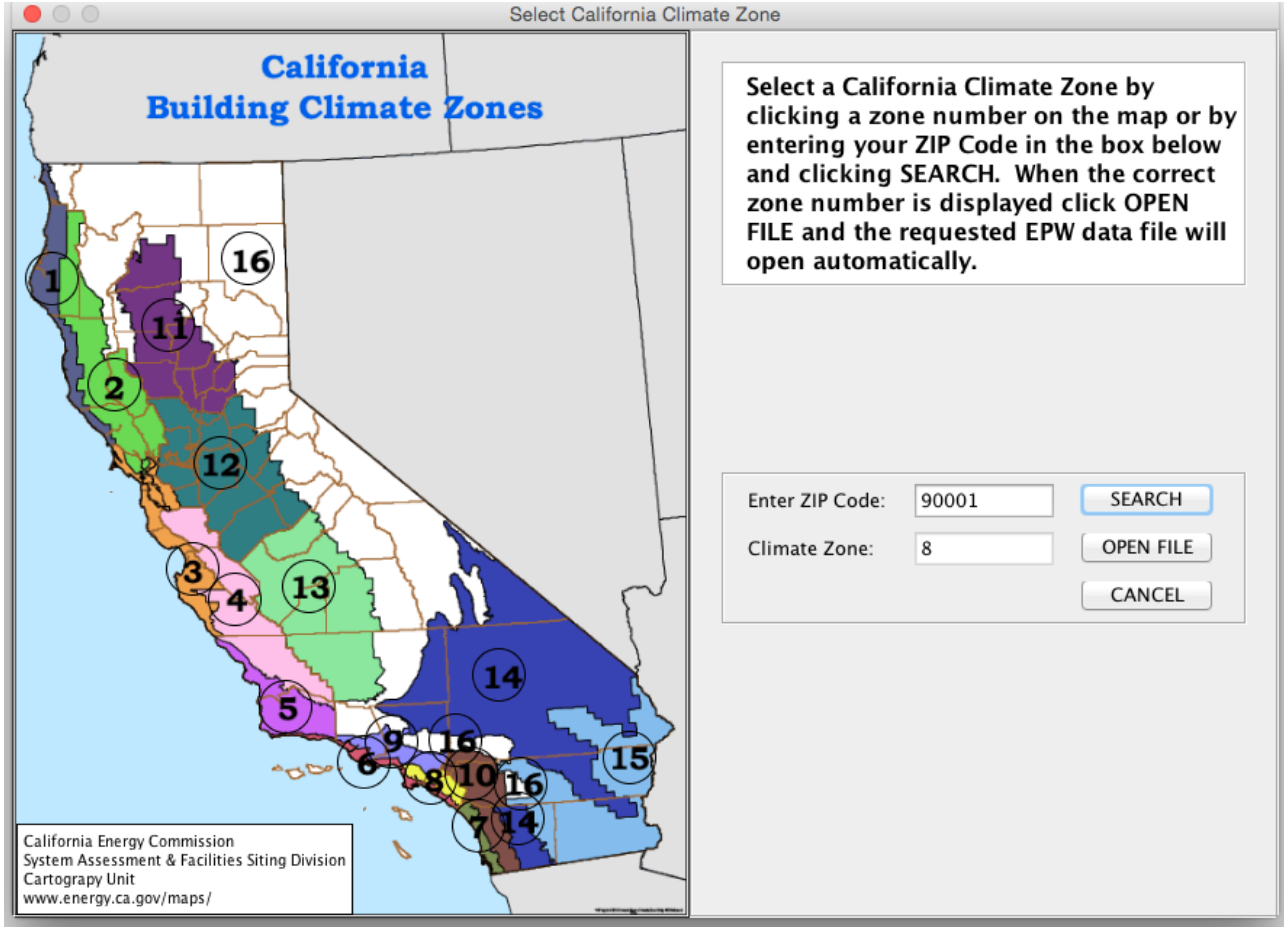
Red dots are comfortable hours, while the blue dots are not comfortable. Los Angeles' climate presents pretty moderate weather conditions throughout all the year.



Regardless of what type of building, it is critical to analyze the various environmental conditions and the most important factors that can influence the design process.

With the use of **Climate Consultant** it was possible to :

1. Learn and interpret the basic climate data
2. Define which parameters take into consideration that will impact design decisions.
3. Associate passive design strategies with climate conditions.



Climate has big implications for the type of materials and constructions the Design Team shall take into account for the selection of passive design strategies to be implemented in the project.

Topics:

- humidity (tolerable)
- temperature (warm/hot)
- wind (stable / moderate)

Climate Consultant 6.0 BETA (Build 5, May 13, 2015)

WEATHER DATA SUMMARY

LOCATION: **Climate Zone 8, CA, USA**
Latitude/Longitude: 33.6° North, 117.7° West, **Time Zone from Greenwich** -8
Data Source: WYEC2-C-00008 690140 WMO Station Number, **Elevation** 383 ft

MONTHLY MEANS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Global Horiz Radiation (Avg Hourly)	98	114	137	149	153	156	169	162	140	123	101	88	Btu/sq.ft
Direct Normal Radiation (Avg Hourly)	165	158	167	149	132	144	167	159	139	143	145	143	Btu/sq.ft
Diffuse Radiation (Avg Hourly)	30	35	42	52	56	50	45	45	47	43	34	30	Btu/sq.ft
Global Horiz Radiation (Max Hourly)	194	241	275	303	315	315	313	306	287	243	200	171	Btu/sq.ft
Direct Normal Radiation (Max Hourly)	274	282	288	284	279	277	274	271	267	263	261	264	Btu/sq.ft
Diffuse Radiation (Max Hourly)	89	95	142	149	152	155	139	138	137	122	94	90	Btu/sq.ft
Global Horiz Radiation (Avg Daily Total)	993	1232	1626	1922	2113	2224	2368	2143	1719	1374	1039	872	Btu/sq.ft
Direct Normal Radiation (Avg Daily Total)	1663	1701	1978	1916	1828	2049	2337	2102	1710	1592	1486	1405	Btu/sq.ft
Diffuse Radiation (Avg Daily Total)	305	379	500	678	777	719	636	597	581	478	353	301	Btu/sq.ft
Global Horiz Illumination (Avg Hourly)													footcandles
Direct Normal Illumination (Avg Hourly)													footcandles
Dry Bulb Temperature (Avg Monthly)	54	56	57	60	63	67	70	70	70	65	59	55	degrees F
Dew Point Temperature (Avg Monthly)	37	43	46	43	52	59	59	60	52	56	46	36	degrees F
Relative Humidity (Avg Monthly)	55	68	69	58	70	76	70	73	58	75	67	51	percent
Wind Direction (Monthly Mode)	90	90	270	50	270	270	270	290	270	290	270	50	degrees
Wind Speed (Avg Monthly)	3	5	4	6	5	6	5	5	4	4	5	6	mph
Ground Temperature (Avg Monthly of 3 Depths)	57	57	59	60	64	66	67	67	65	63	60	58	degrees F

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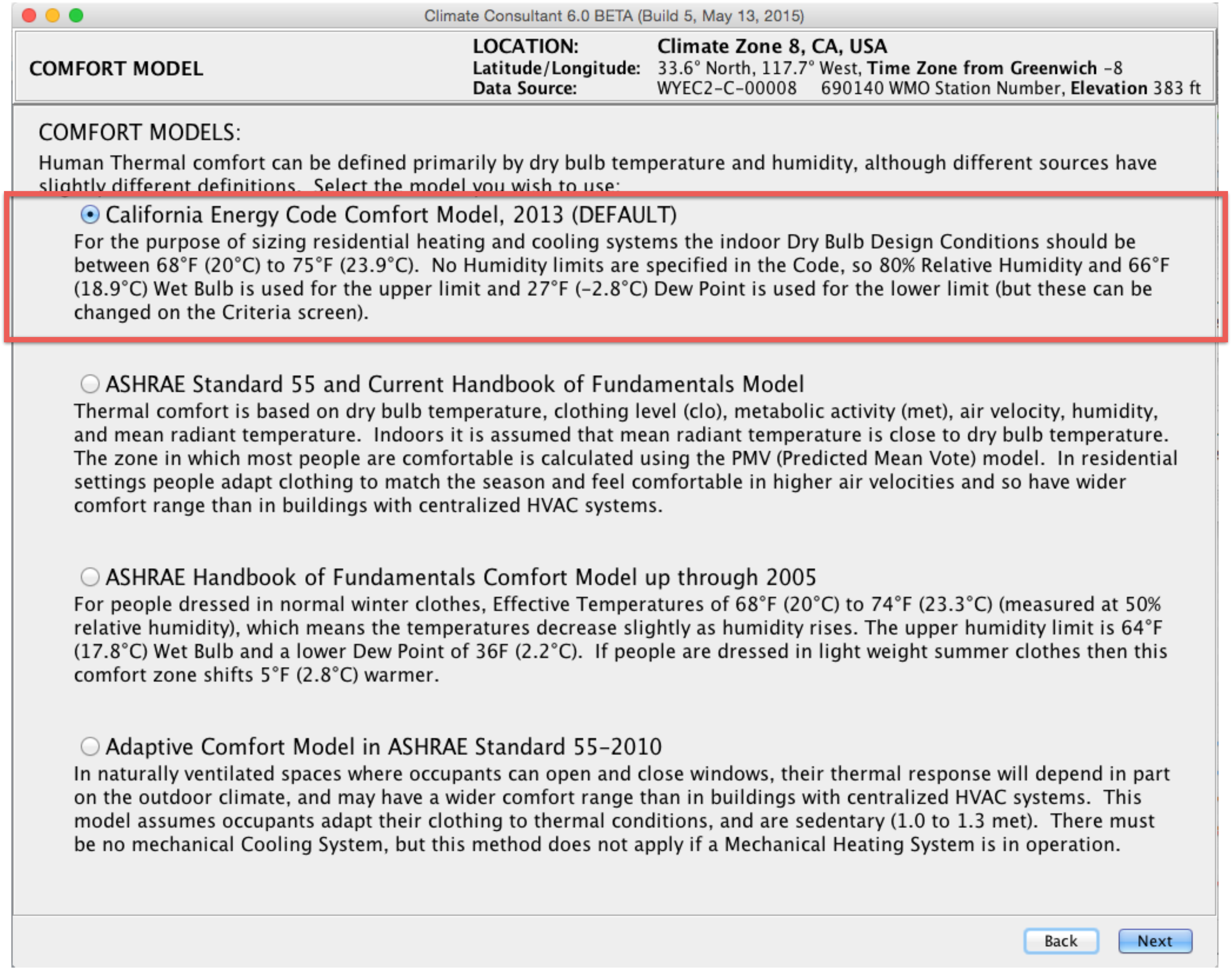
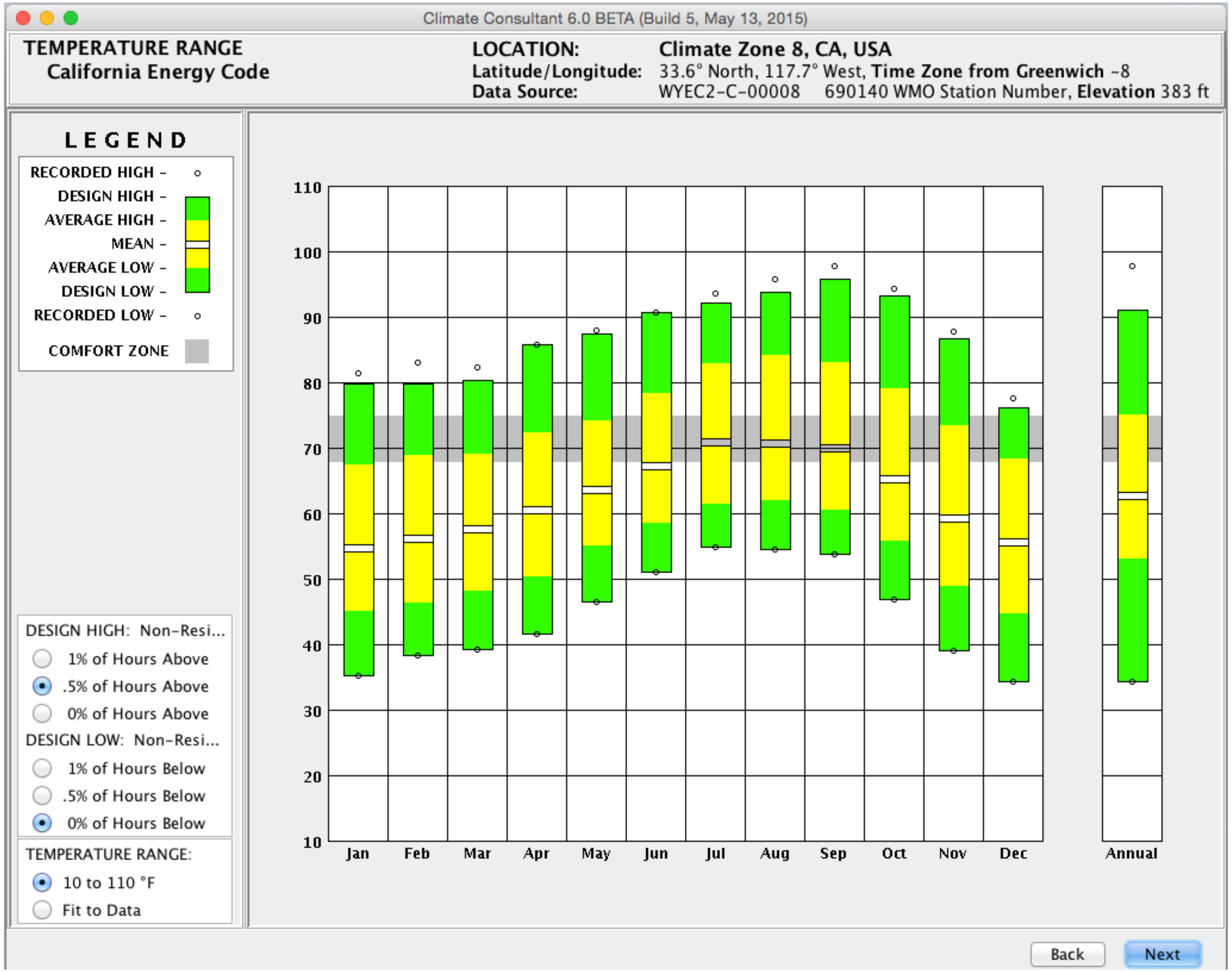
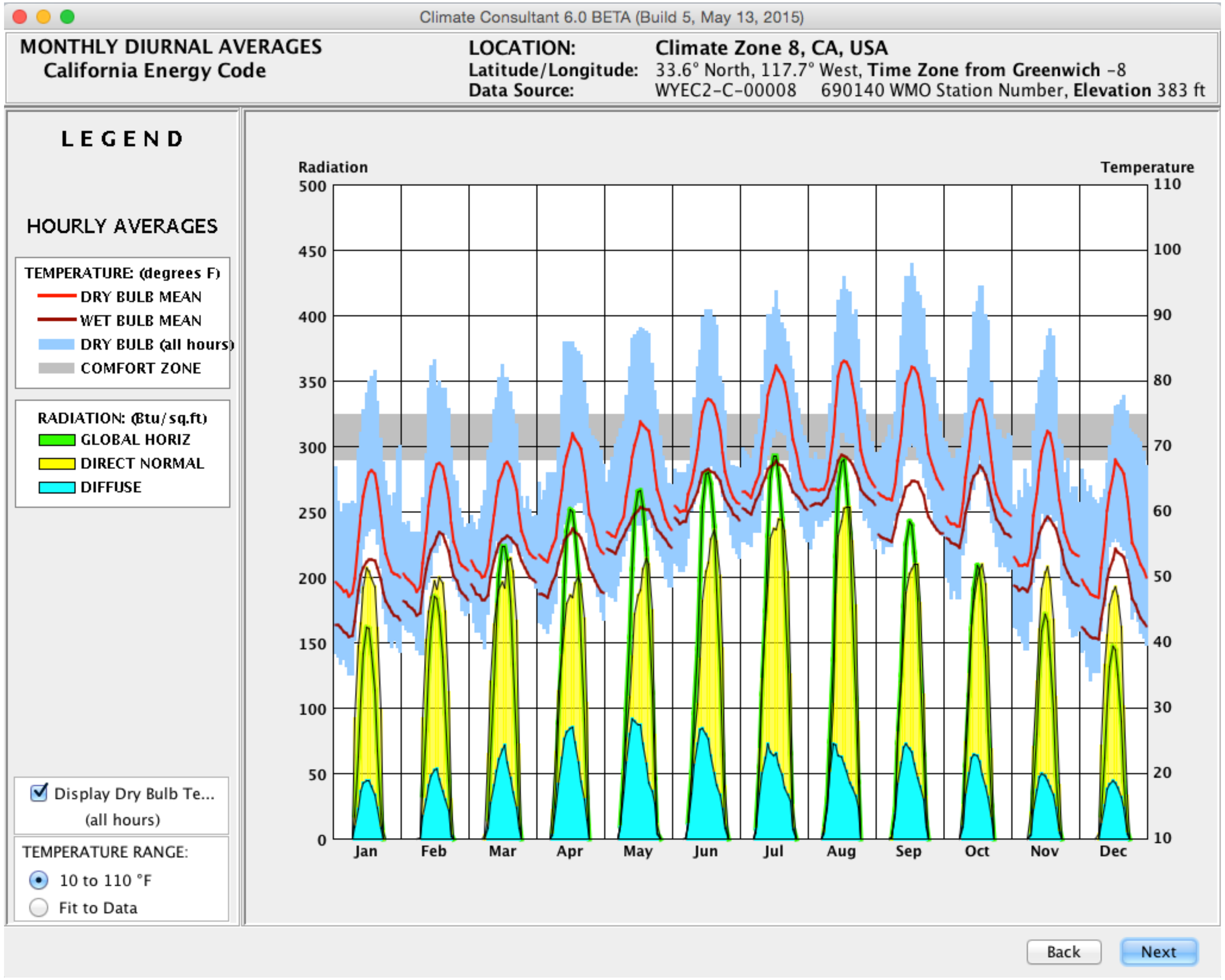
Since the project is located in California, I used the default data provided by the **California Energy Code** Comfort Model, 2008 for the assignment.



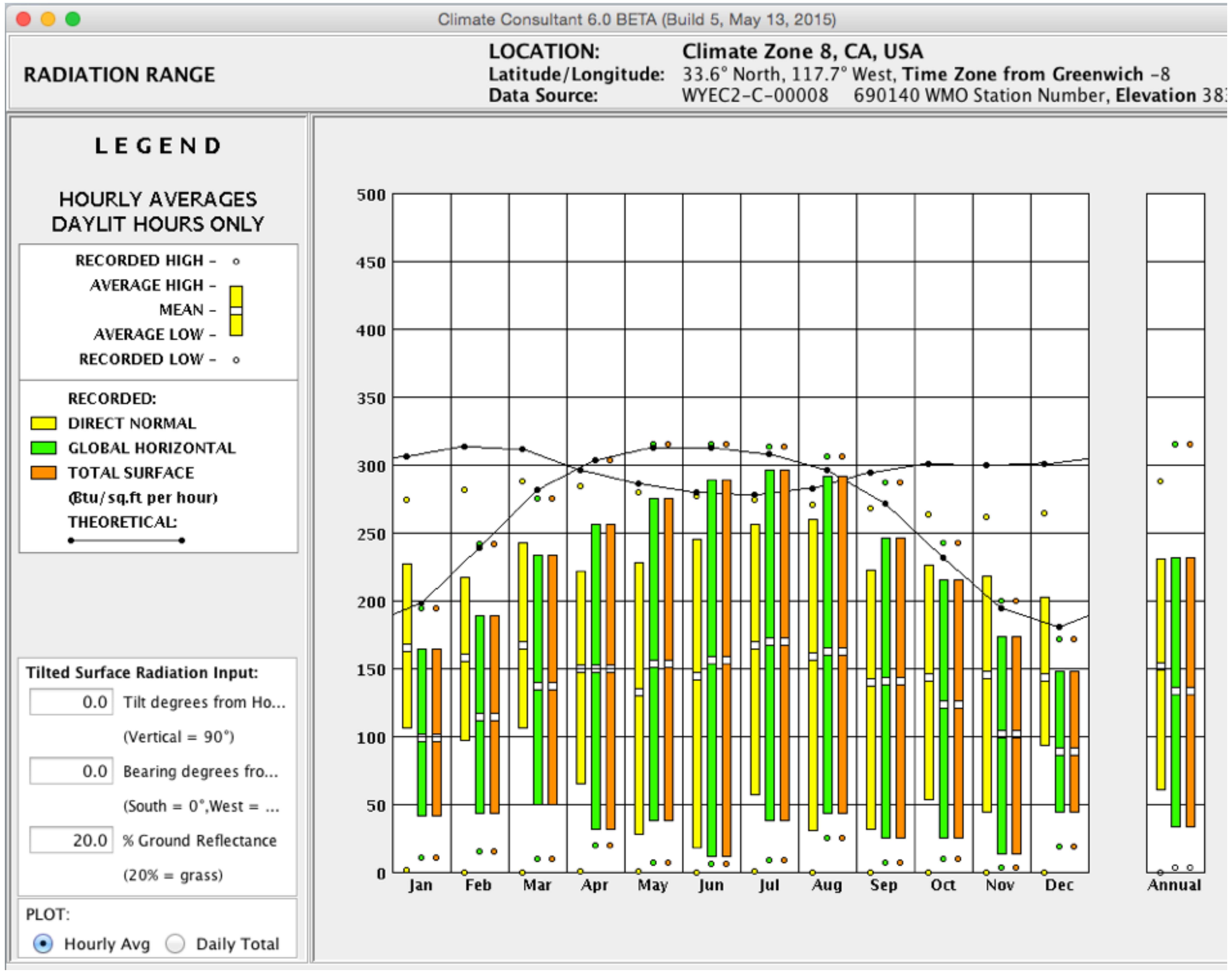
Yearly temperature range. The grey bar shows the expected comfort zone. From Jul to Sep the comfort zone includes the mean temperature, while the mean remains well below for the rest of the year.



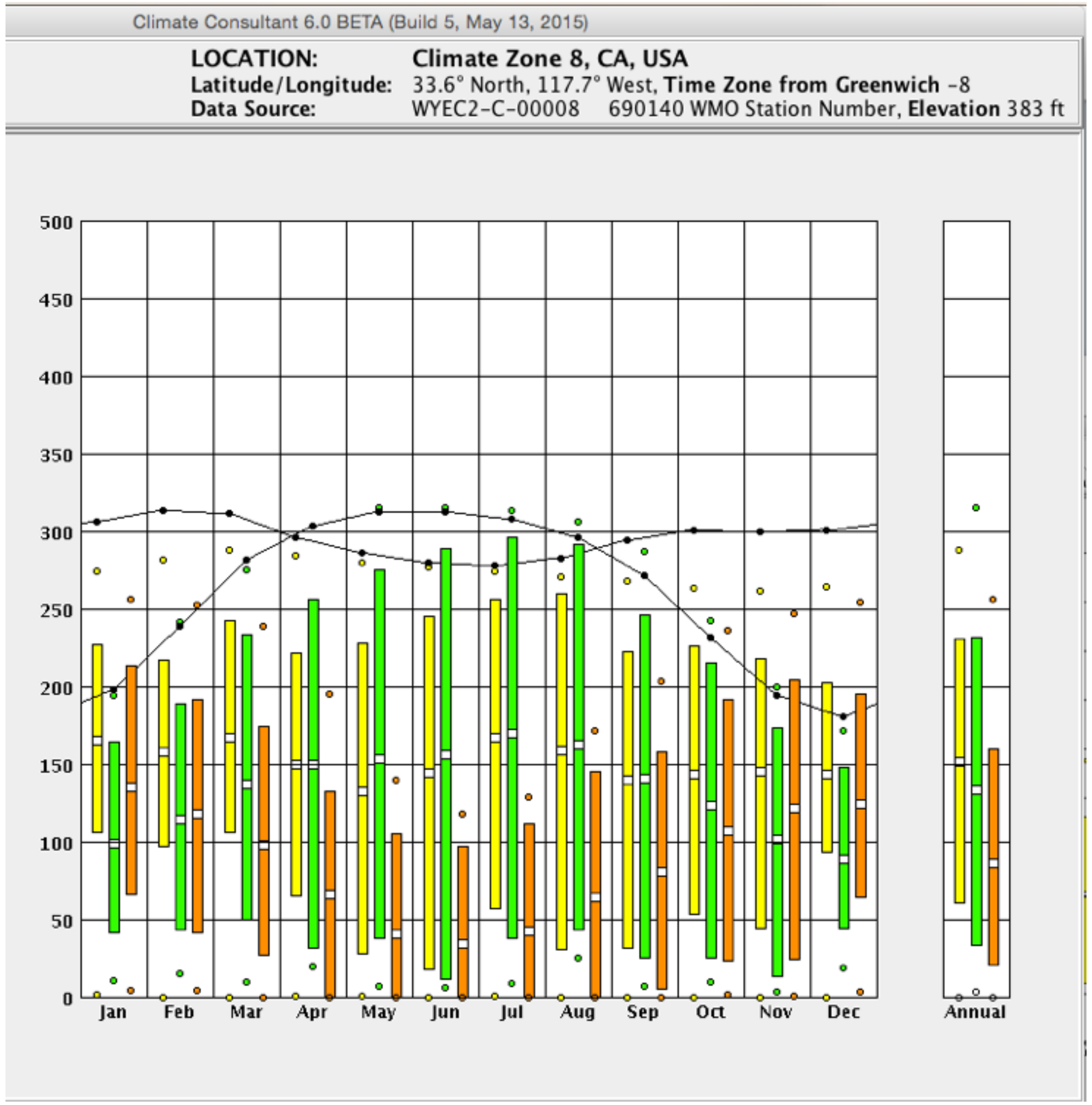
The monthly diurnal averages shows the amount of available sunlight on an average day in any month, and the temperature swings.



The radiation range graph shows how much solar radiation is available on an horizontal surface (default). If we change the input number to ninety degrees we can consider a vertical surface. The chart shows that insolation values are highest in summer, but quite always high on average.

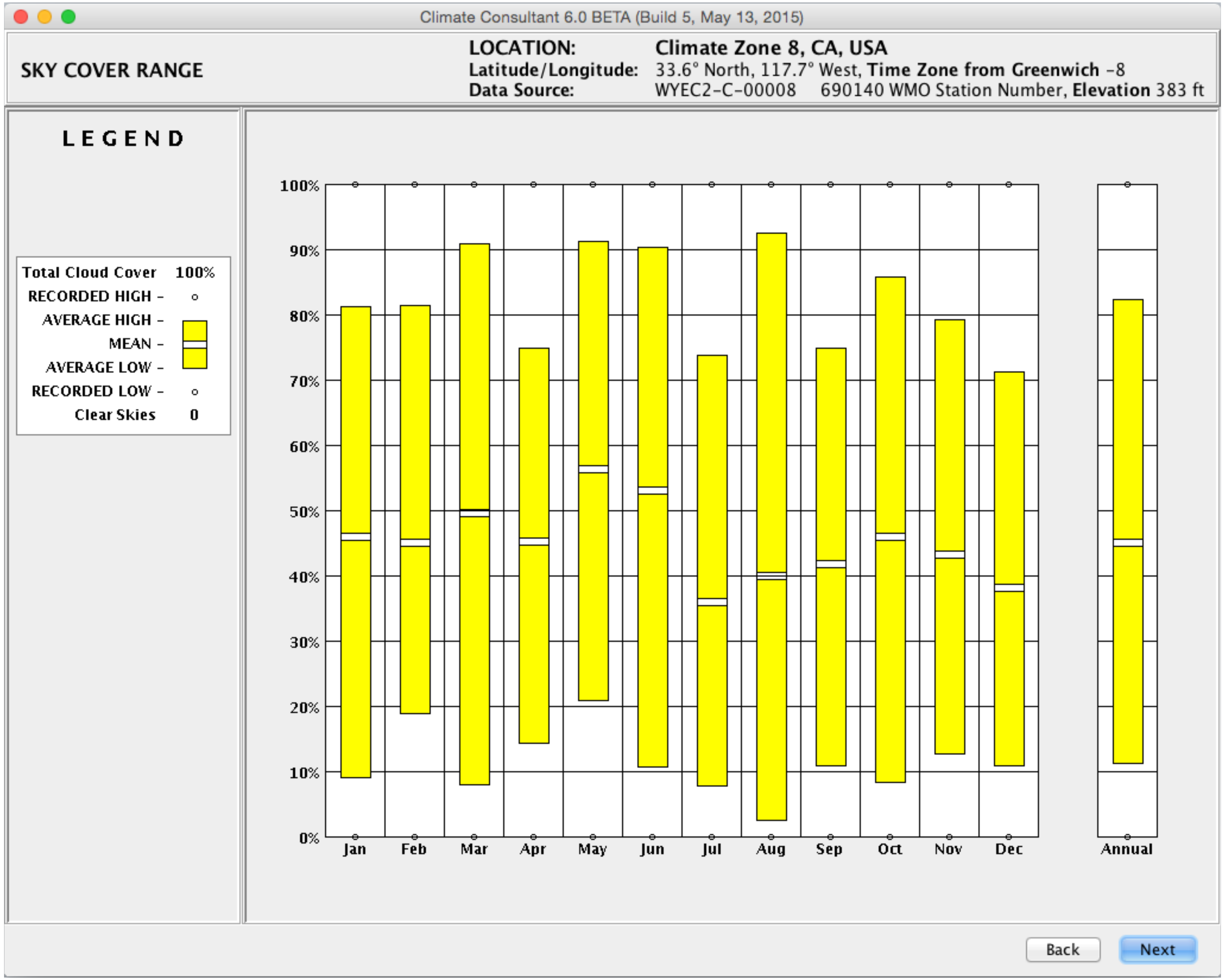


horizontal surface



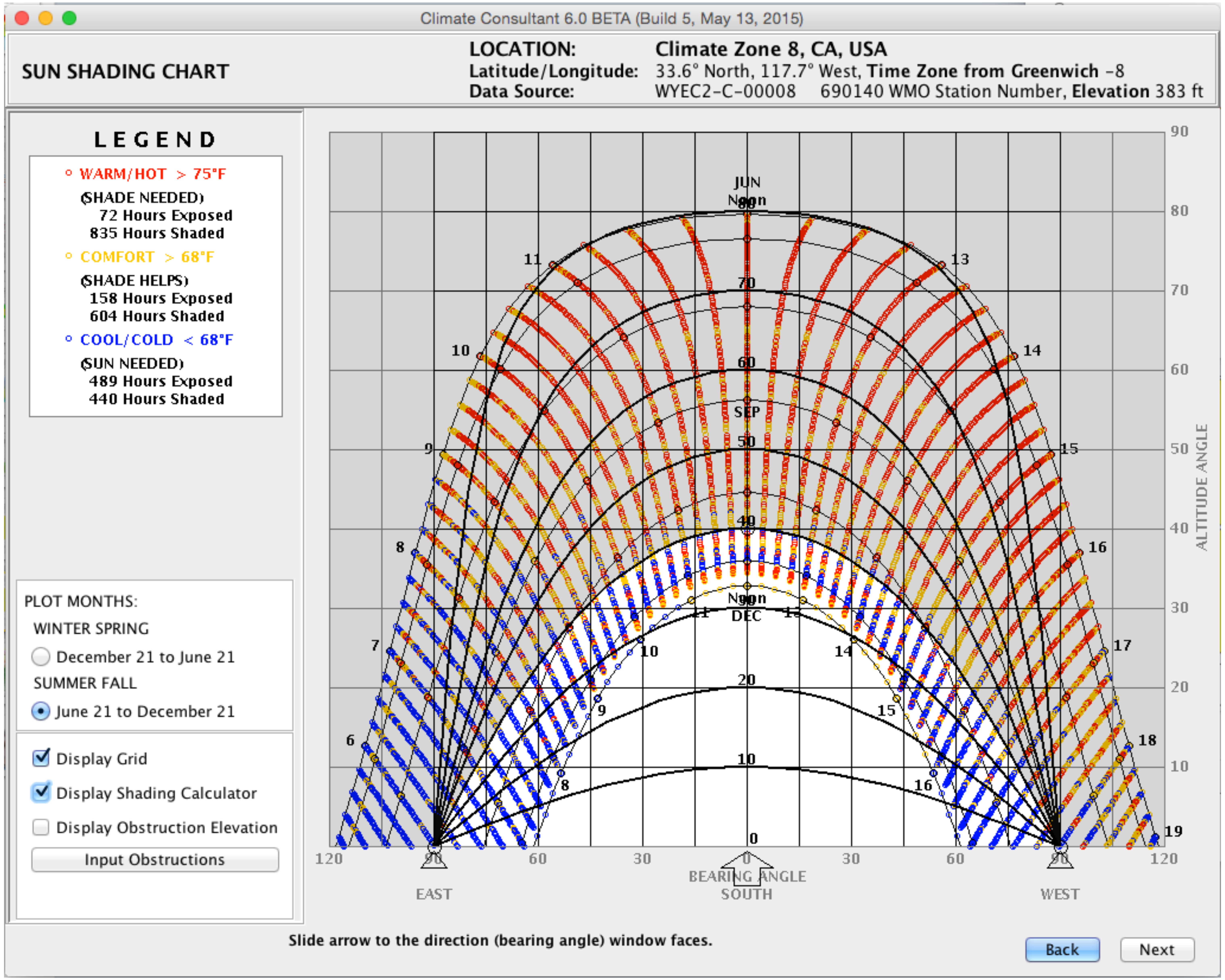
vertical surface

According to the previous slide, California's climate provides a great amount of solar radiation that can be used for the photovoltaic design. On the other hand, sky cloudiness has to be taken into account: the chart shows a range from 0 (clear sky) to 100 (total cloud cover), and the mean is around a 40-45%, meaning that throughout the year approximately half of the sky is cloudy.



In this chart are shown hourly date for temperature, at different time of the day and the year, currently from June to December. The red dots show temp above the comfort zone, while blue ones are below. It is possible to use this chart to calculate shading angle. The grey area is the effected shaded area by the shading device (angle 40%).

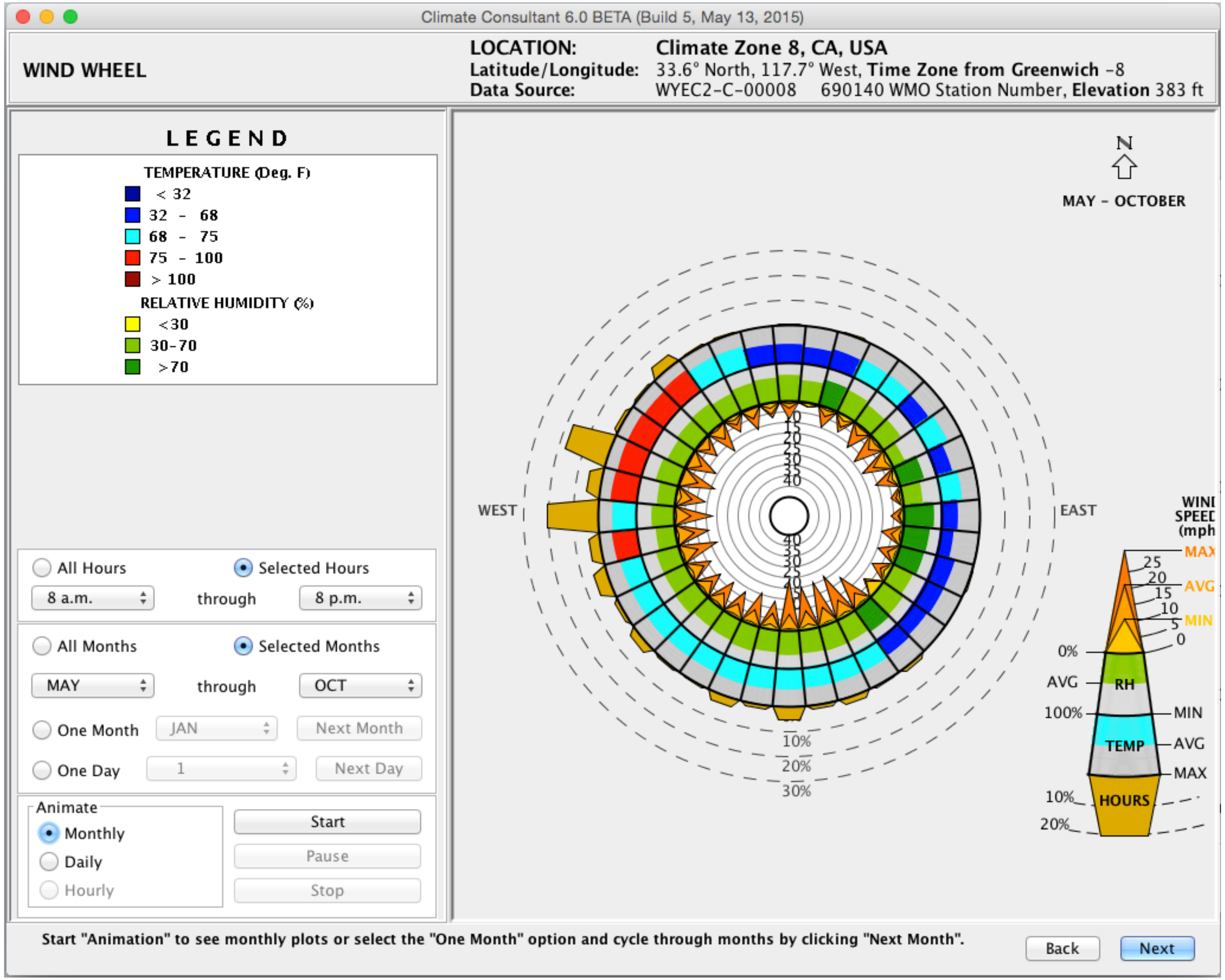
The chart is now considering true south (but it is possible to shift the mask for other sides).



For natural ventilation it is important to address wind speed, direction, temperature and relative humidity.

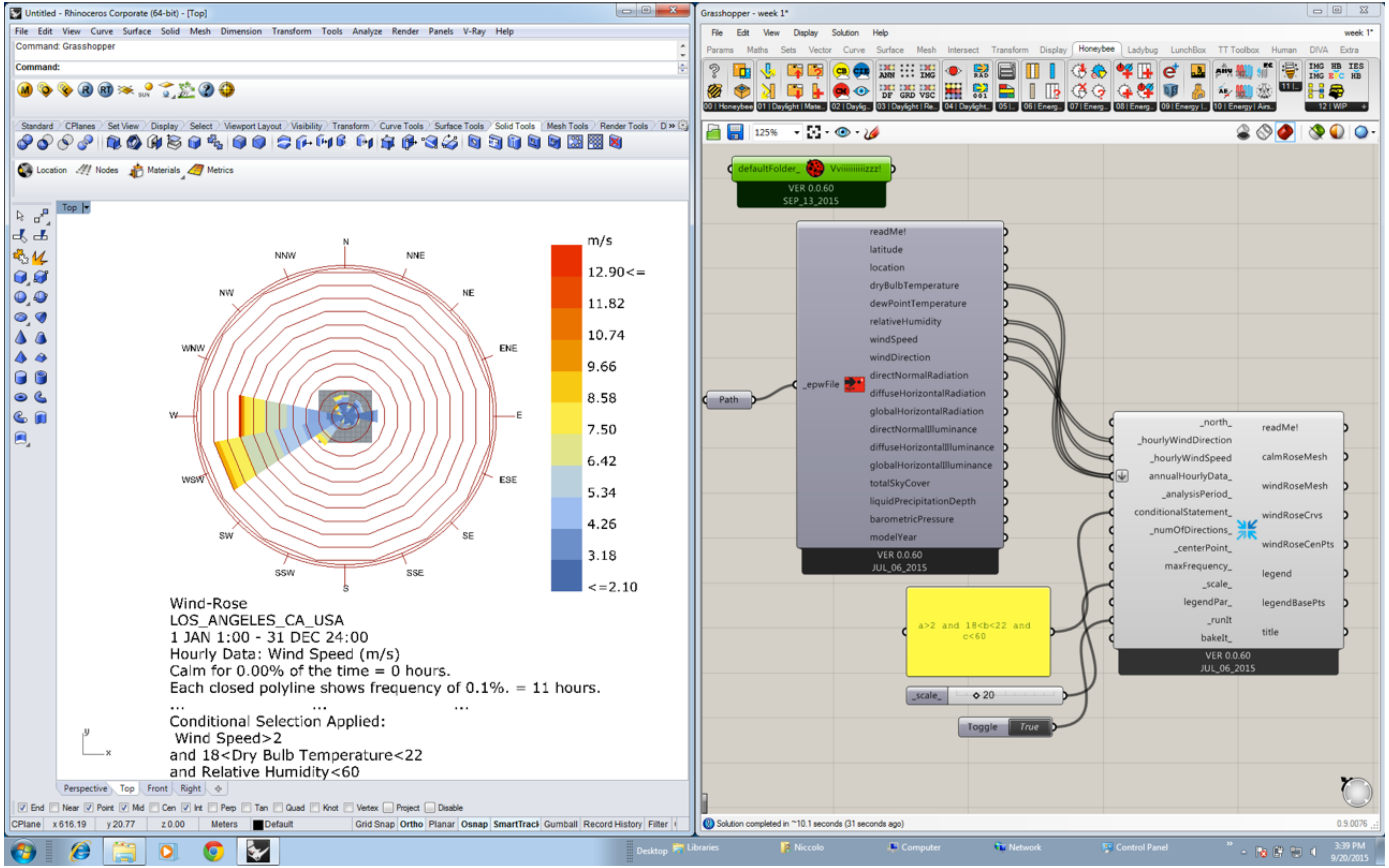
The wind wheel allows to discover if there is any prevailing wind and to high-line seasonal correlations between wind and temperature.

In the selected hours range, from 8am to 8pm between May and Oct, the prevailing wind direction from West would provide feasible temperature and RH.



The simulation completed with Ladybug confirms the preponderance of the western wind stream.

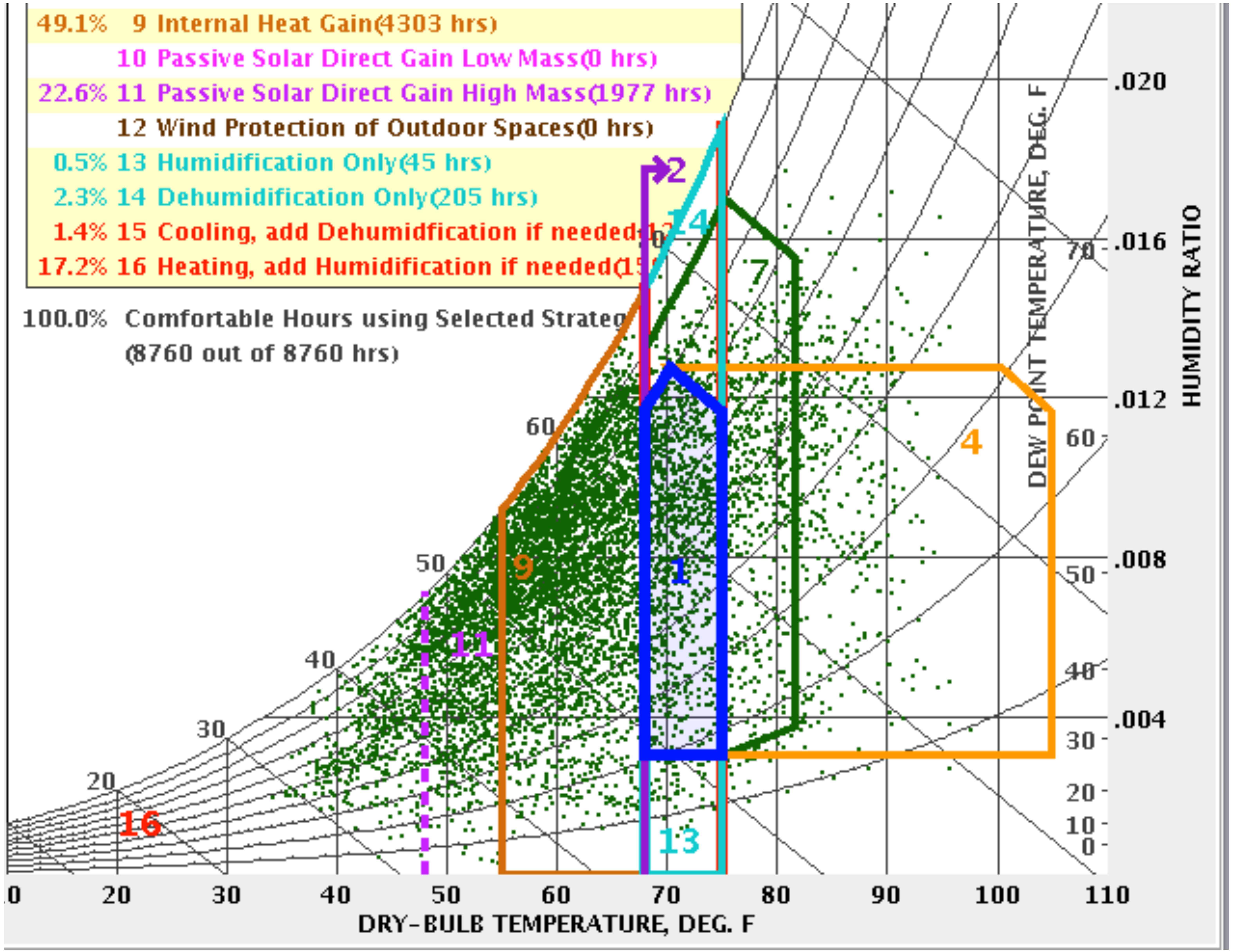
The chart shows wind direction when wind speed is lower then 2m/s, dry bulb temp is below 22°C and above18°C, and relative humidity is below 60%.



The psychometric charts demonstrates that in terms of yearly hours, the most effective passive strategies are:

- **Internal heat gain**
- **Sun shading of windows**
- **Passive solar direct gain high mass**

In warm climates, like the kind of Los Angeles climate, it is possible to downsize heating, ventilating and air conditioning system by emphasize the use of shading devices, high performance glazing, and daylighting.



1. What is the orientation of the building ?
2. Which is the kind of occupancy expected (weekdays, hours, monthly schedule) ?
3. Comfort levels (Min. and Max. Dry Bulb Temperature, RH)
4. Required building performance ? Which kind of system will be installed ?

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