

Building Simulation Assignment

Mexico City passive design strategy proposal

Team: Xi Yao, Fang Cai

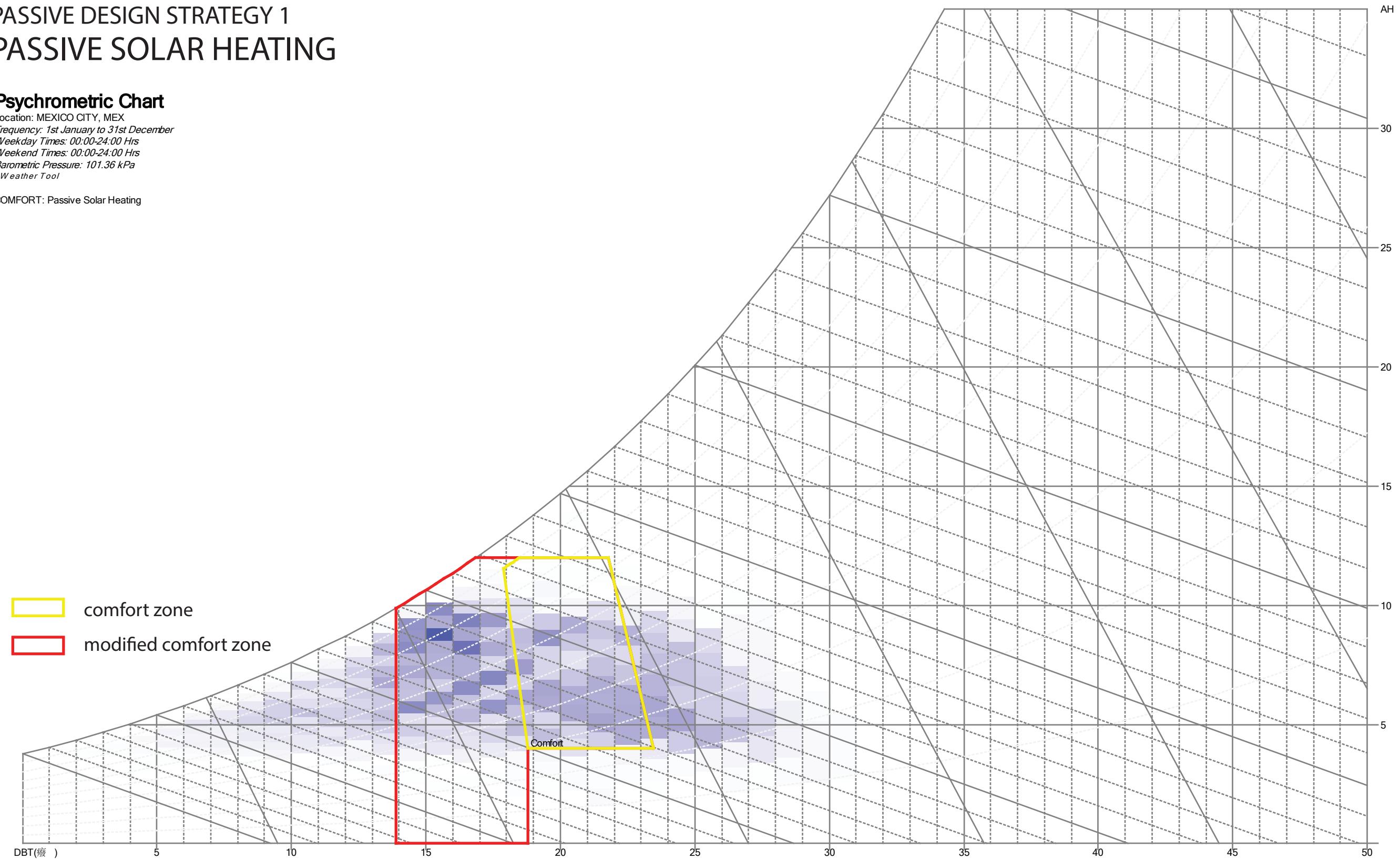
PASSIVE DESIGN STRATEGY 1

PASSIVE SOLAR HEATING

Psychrometric Chart

Location: MEXICO CITY, MEX
Frequency: 1st January to 31st December
Weekday Times: 00:00-24:00 Hrs
Weekend Times: 00:00-24:00 Hrs
Barometric Pressure: 101.36 kPa
?Weather Tool

COMFORT: Passive Solar Heating



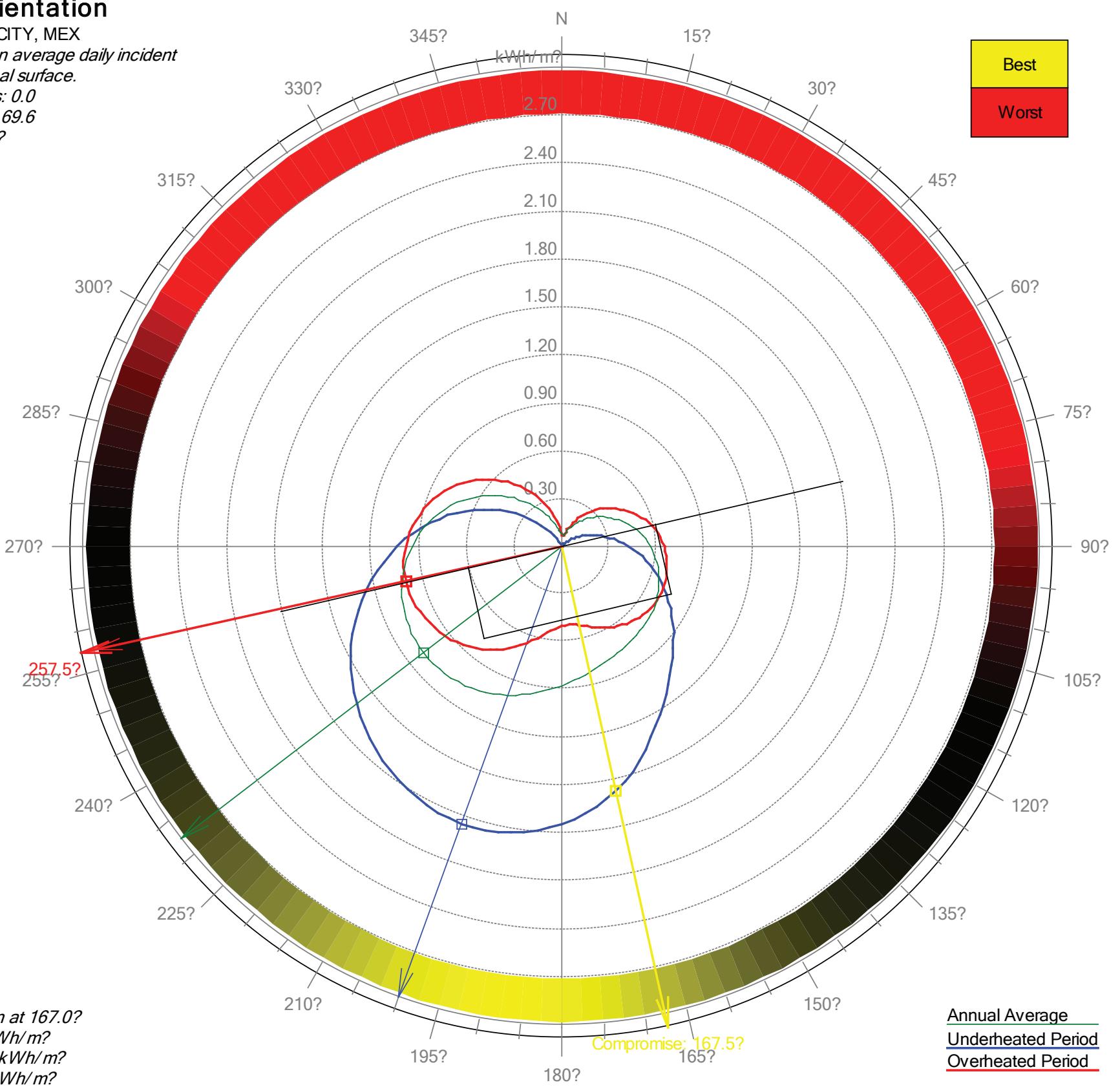
An effective passive solar heating design assumes that the building is orientated to receive as much solar radiation as possible in winter, when heating is required, whilst rejecting as much as possible in summer when it is not.

The most favourable orientations occur where the amount of incident radiation in winter is greater than that incident in summer, where the blue line extends out beyond the red line. So the best orientation for mexico city is direction of yellow arrow.

Optimum Orientation

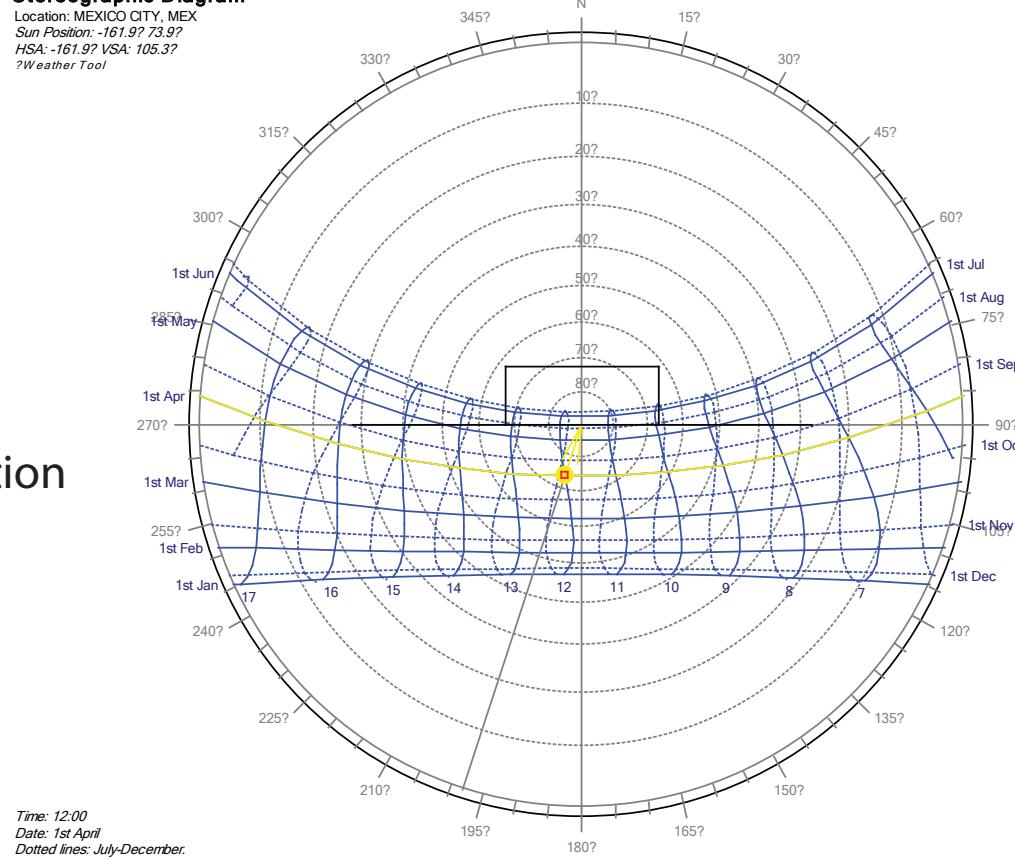
Location: MEXICO CITY, MEX
Orientation based on average daily incident radiation on a vertical surface.
 Underheated Stress: 0.0
 Overheated Stress: 69.6
 Compromise: 167.5?
 ?Weather Tool

Avg. Daily Radiation at 167.0?
 Entire Year: 0.79 kWh/m²
 Underheated: 1.52 kWh/m²
 Overheated: 0.51 kWh/m²



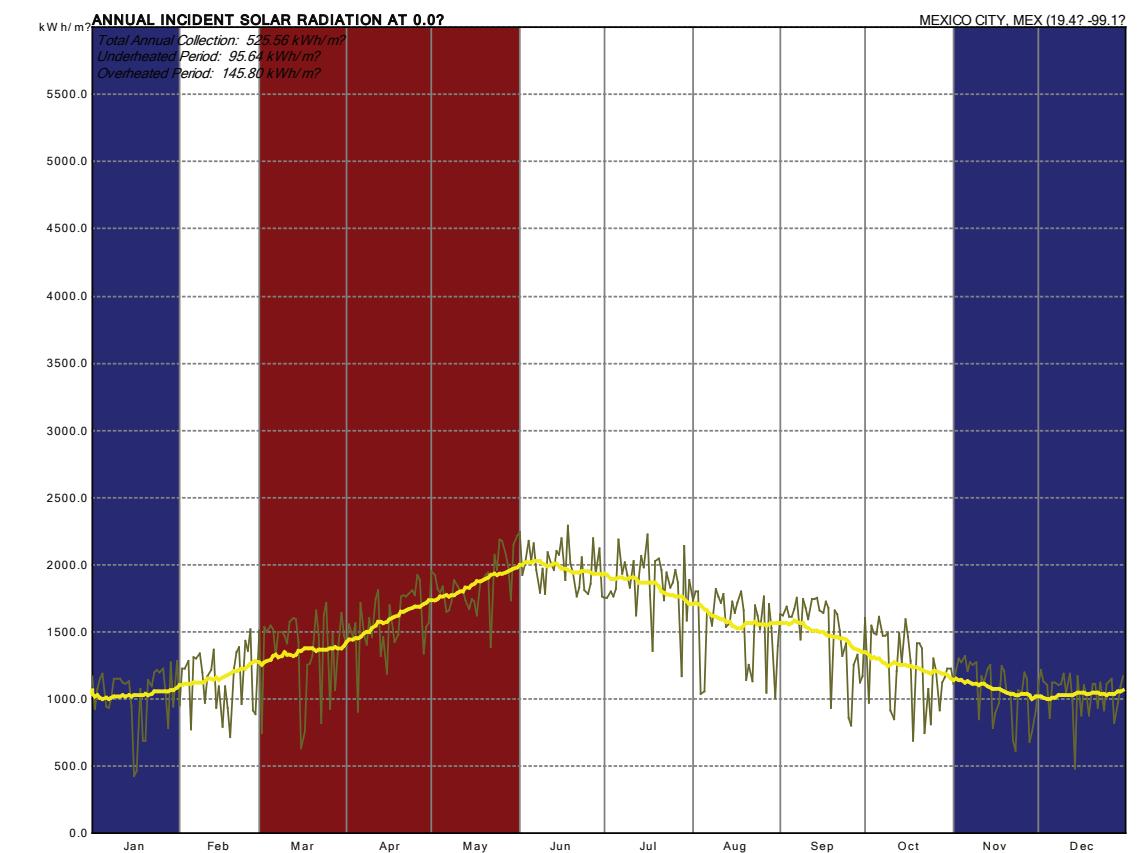
Stereographic Diagram

Location: MEXICO CITY, MEX
Sun Position: -161.97 73.97
HSA: -161.97 VSA: 105.3?
?Weather Tool



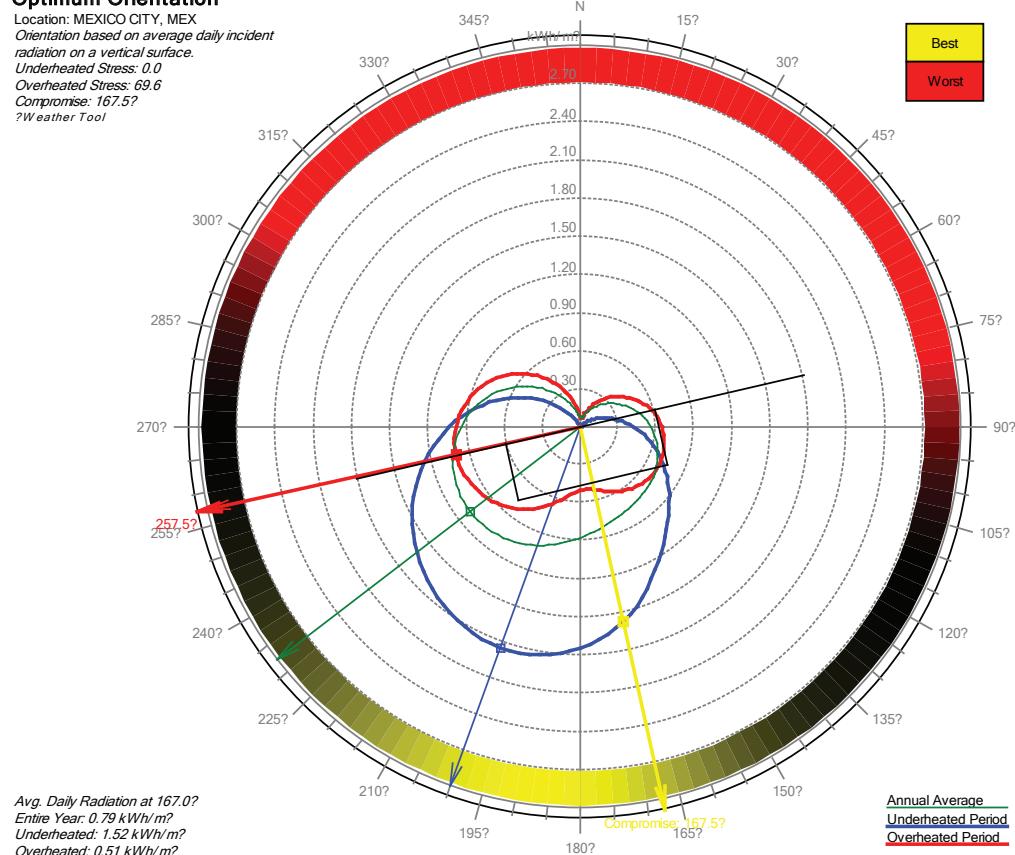
Random Orientation

Radiation map

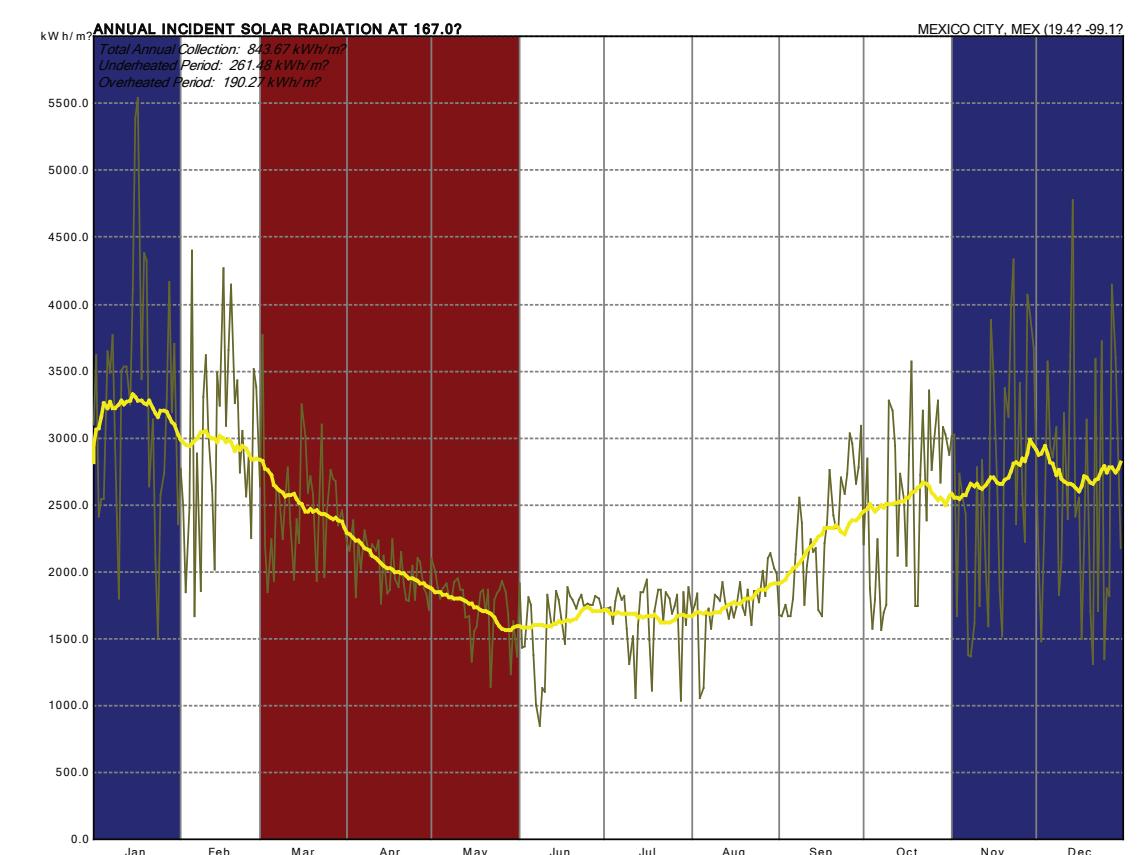


Optimum Orientation

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Orientation based on average daily incident radiation on a vertical surface.
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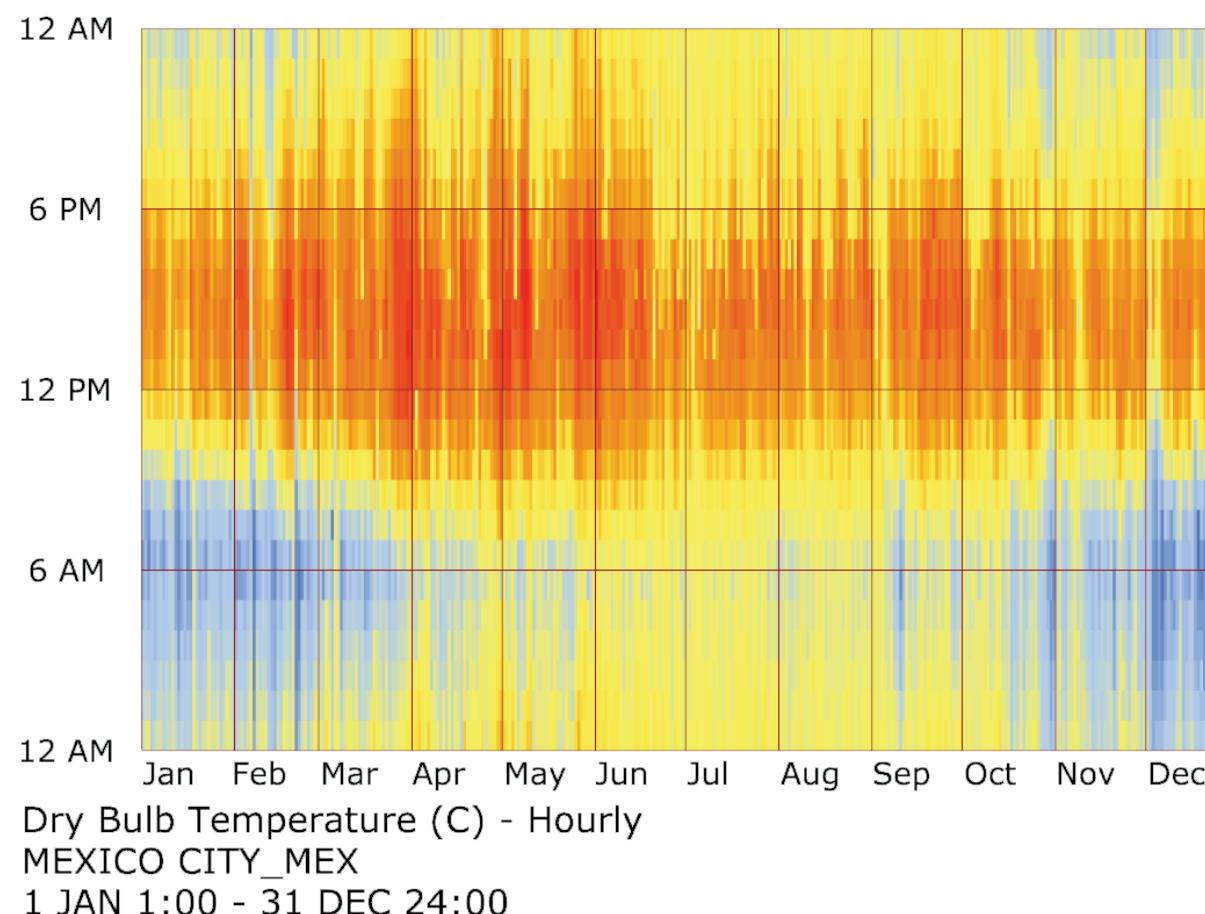
Best Orientation



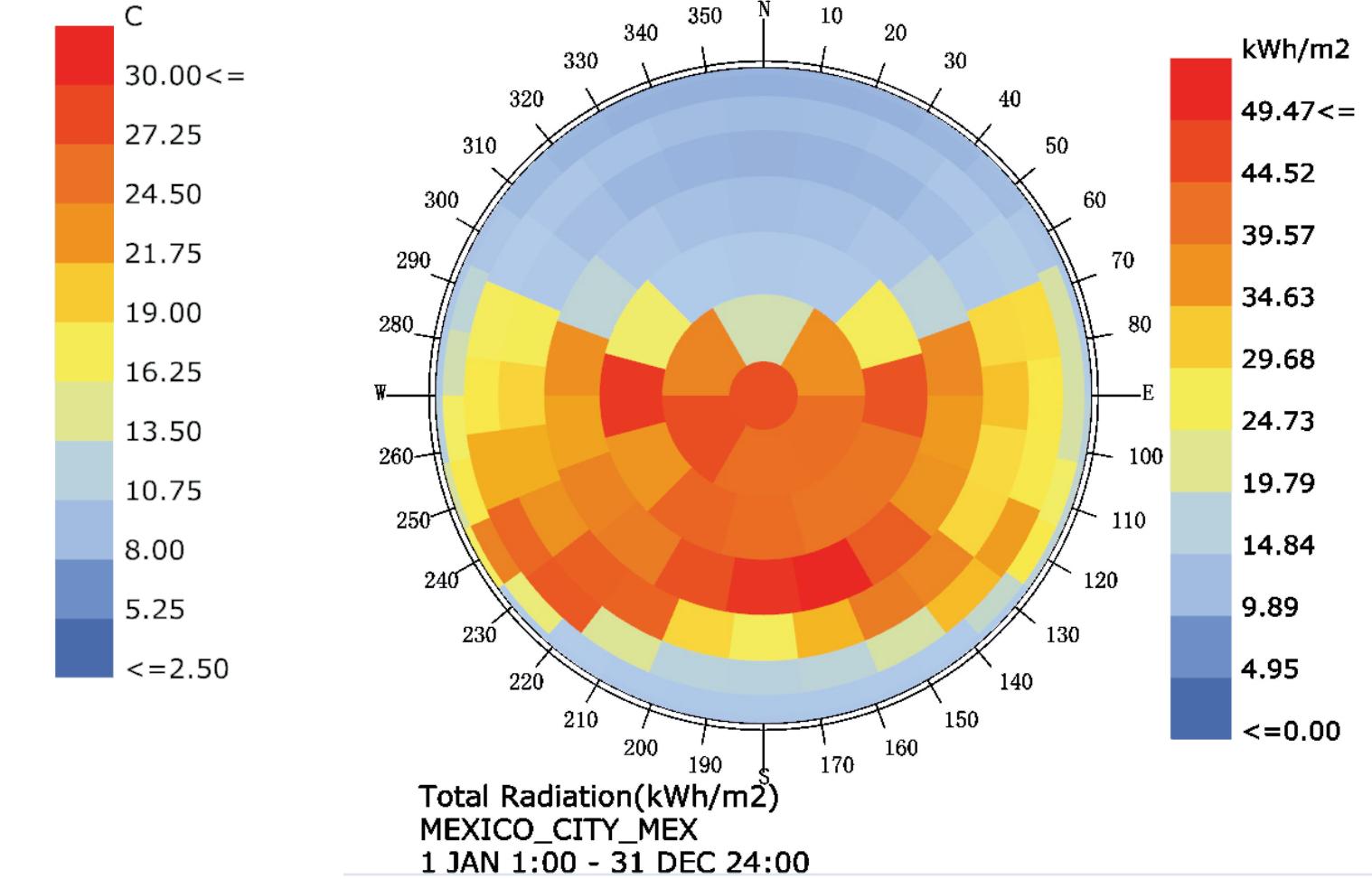
PASSIVE DESIGN STRATEGY 2 INTERNAL HEAT GAIN

To take the “energy conservation first” approach, one of the most basic idea is to radically minimize heat loss through effective heat retention, and maximize passive solar and internal heat gains. In our local climate, the sun can be used to provide a lot of the energy needed to heat a Passive House. Meanwhile, internal heat gains could provide an additional.

Temperature

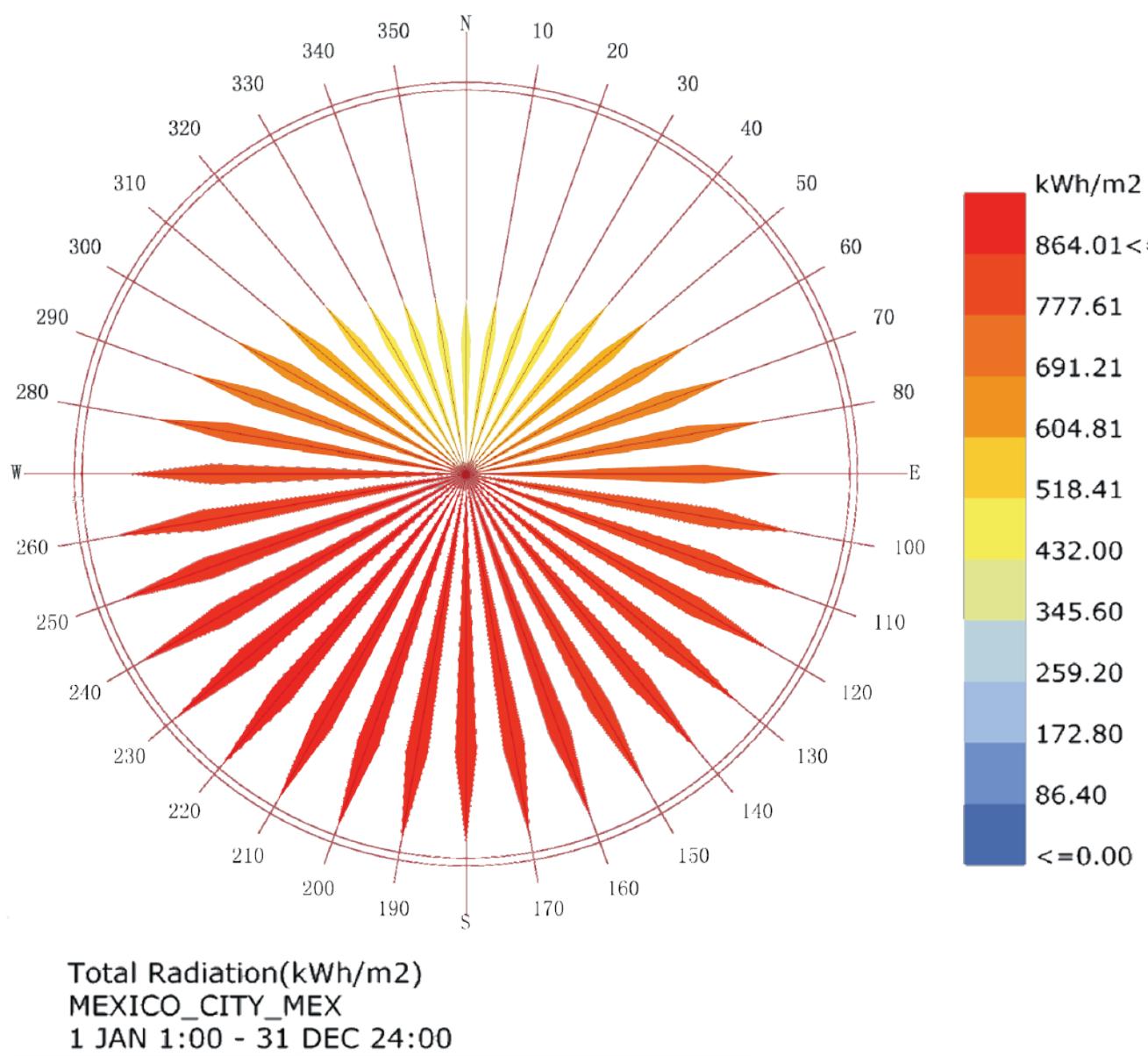


Total Radiation

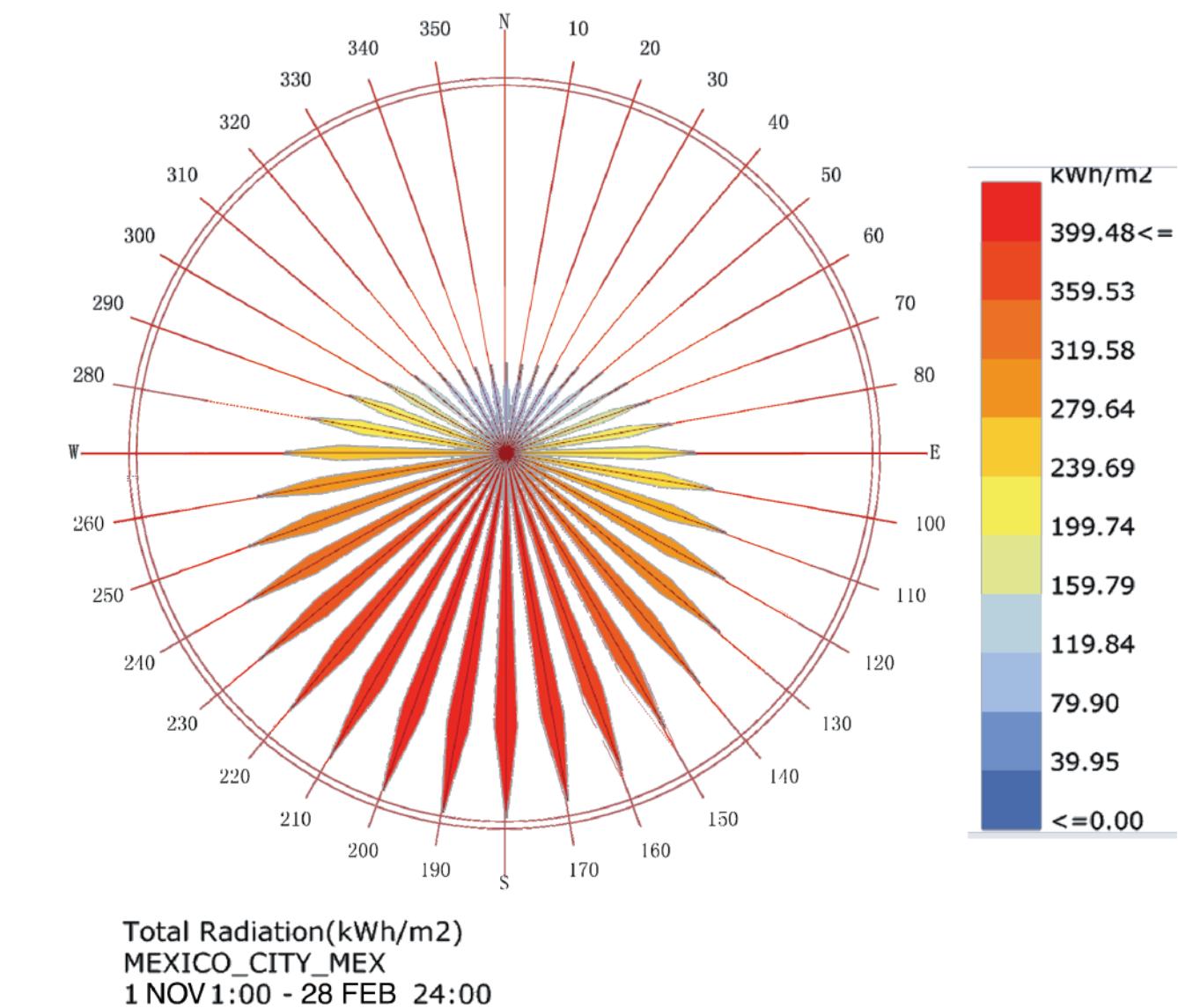


Energy from radiation can move into a window in the day time, and out of the same window at night. Solar heat gain can be significant even on cold clear days. Choices like low-E glasses and triple-pane windows enable the house to maintain a constant, comfortable temperature.

Year Round Radiation



Winter Radiation

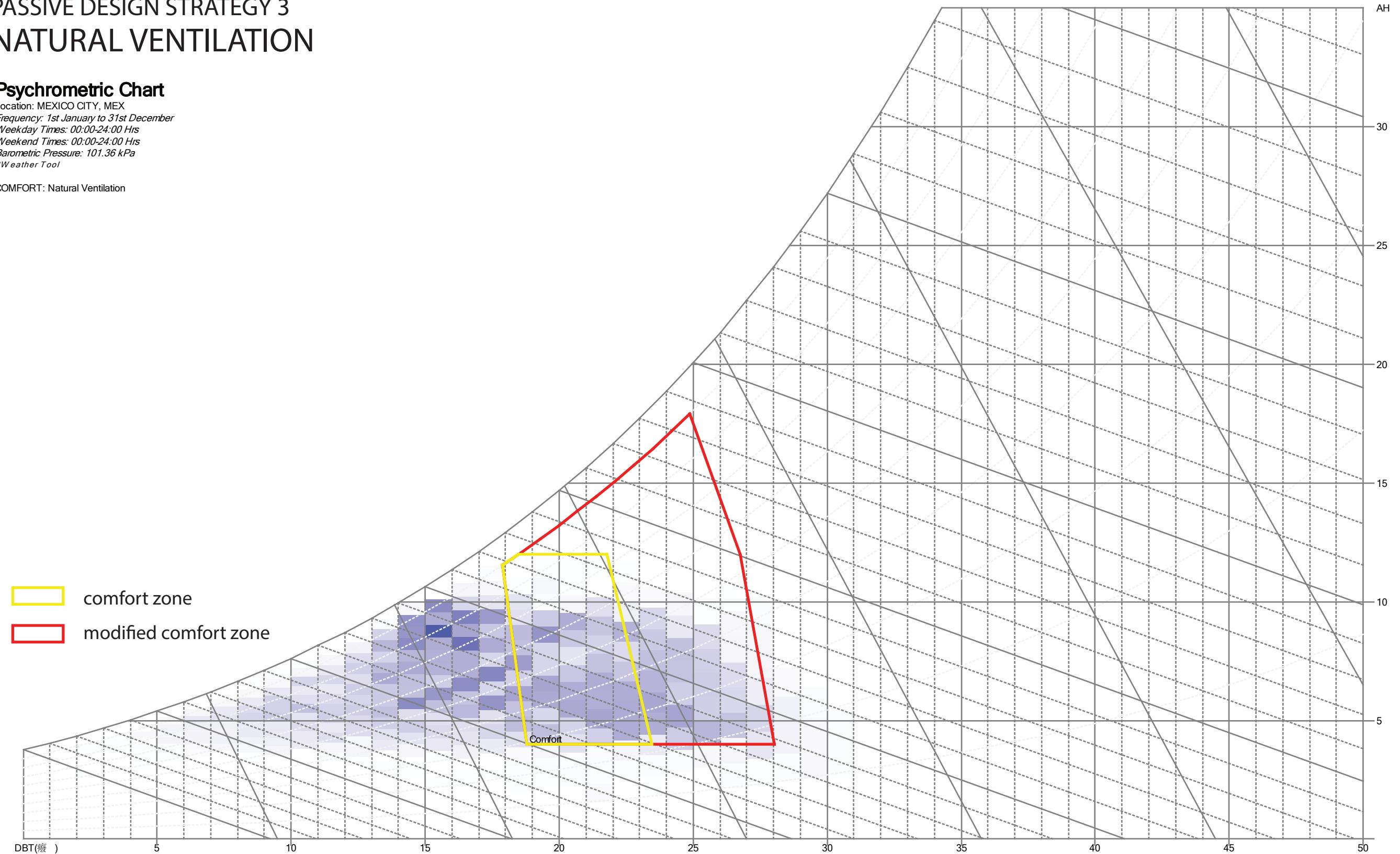


PASSIVE DESIGN STRATEGY 3 NATURAL VENTILATION

Psychrometric Chart

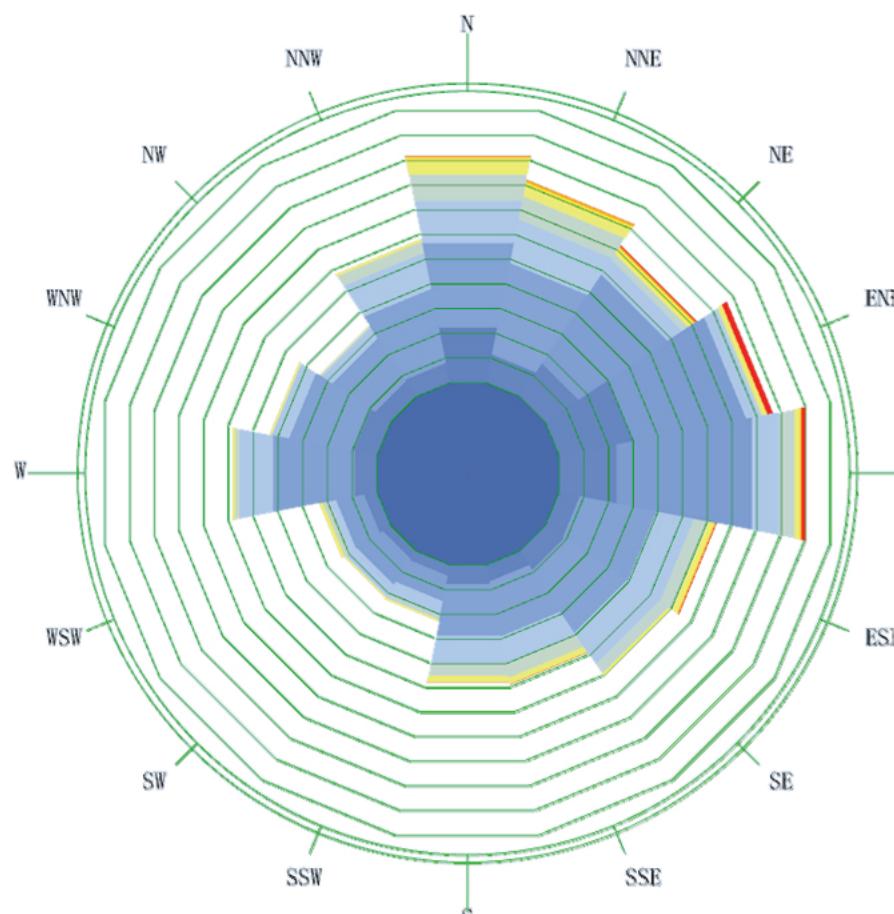
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COMFORT: Natural Ventilation



Natural ventilation uses natural outside air movement and pressure differences to both passively cool and ventilate a building. It can provide and move fresh air without fans. For warm and hot climates, it can help meet a building's cooling loads without using mechanical air conditioning systems. This can be a large fraction of a building's total energy use. In Mexico City, the preferable wind that could be used for natural ventilation mainly comes from northeast to north.

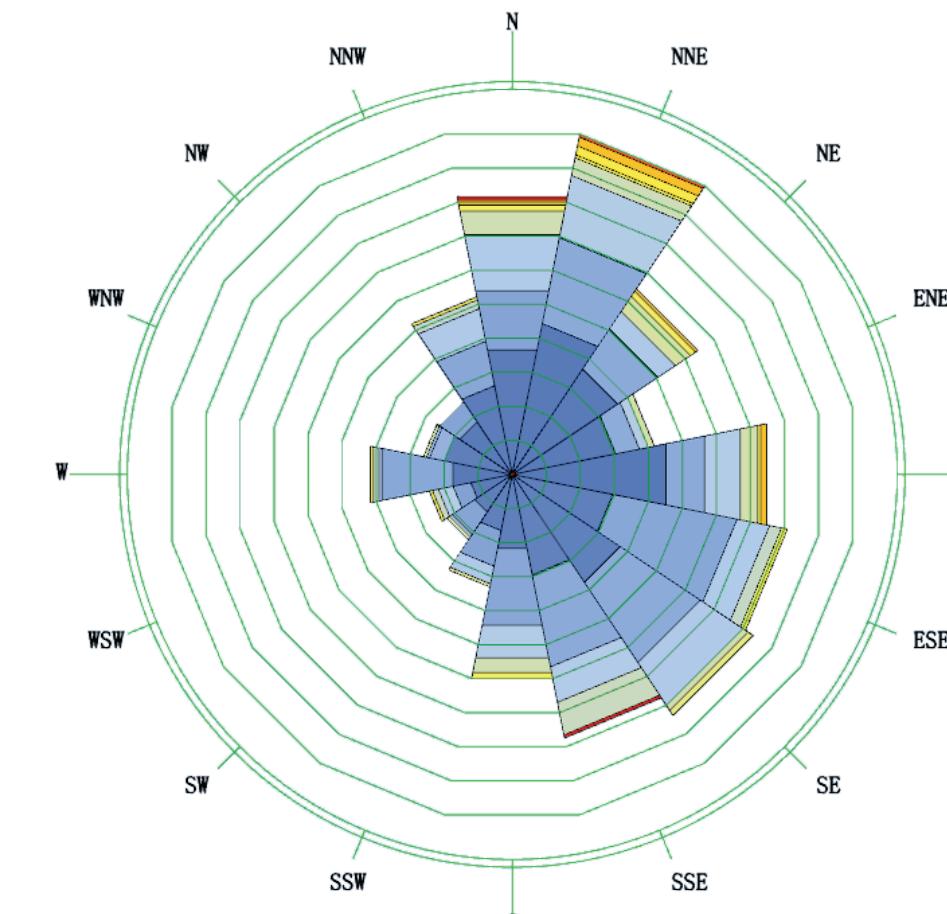
Year Round Wind Rose



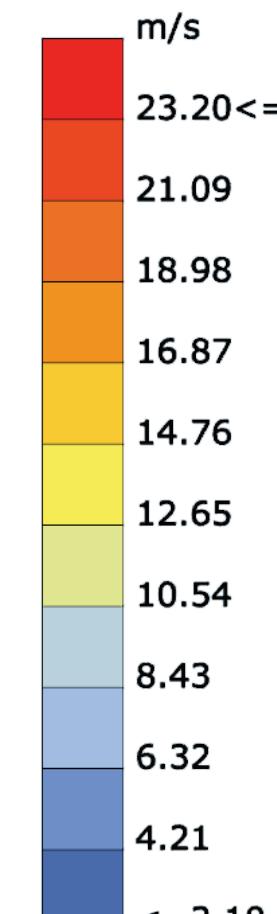
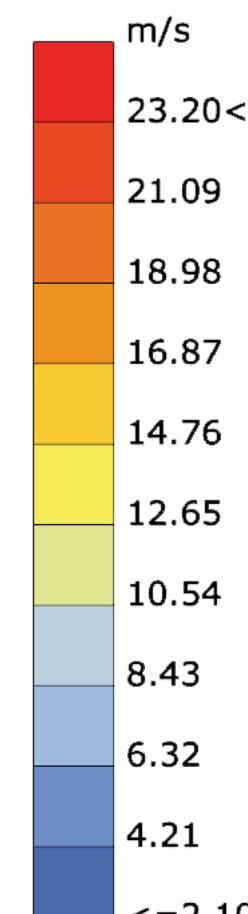
Wind-Rose
MEXICO CITY_MEX
1 JAN 1:00 - 31 DEC 24:00

Preferable Wind Direction

Temp 18-22
Humidity<80
Speed<2



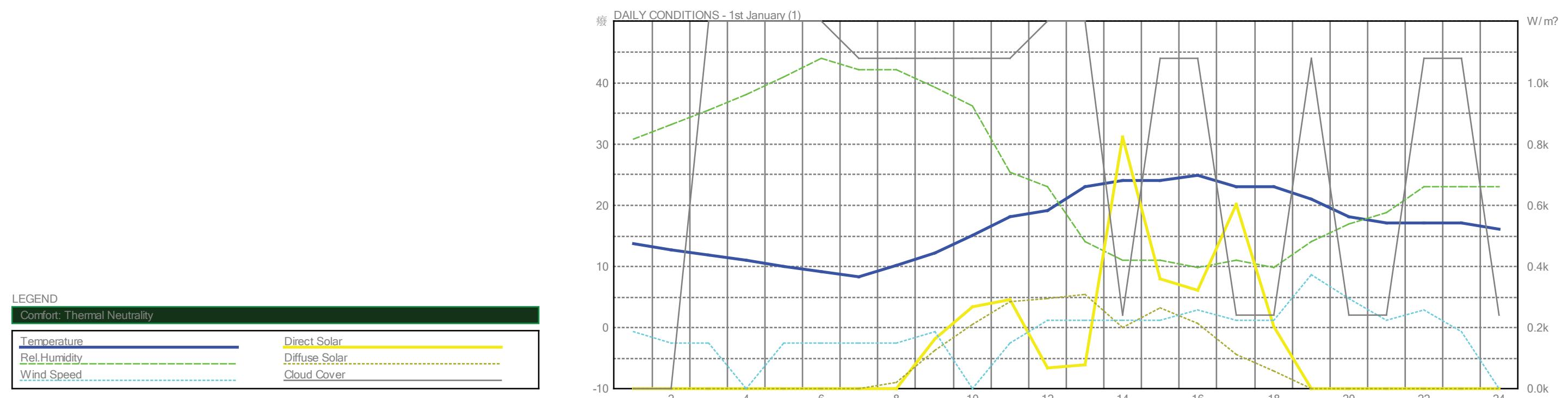
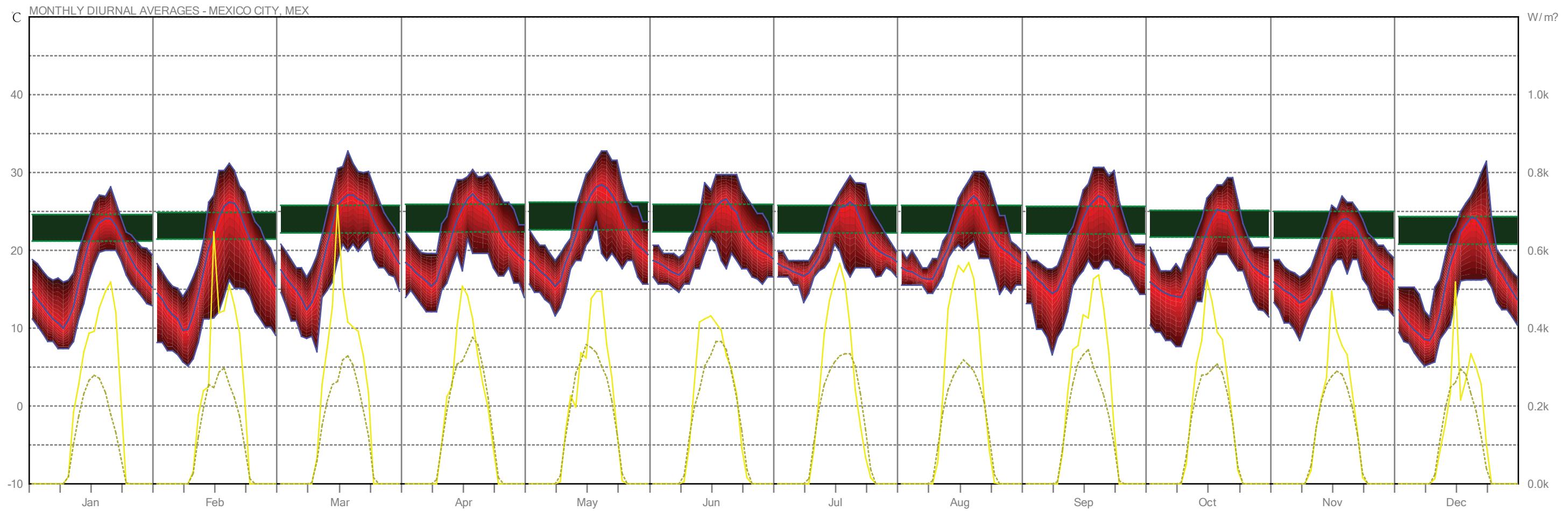
Wind-Rose
MEXICO CITY_MEX
1 JAN 1:00 - 31 DEC 24:00



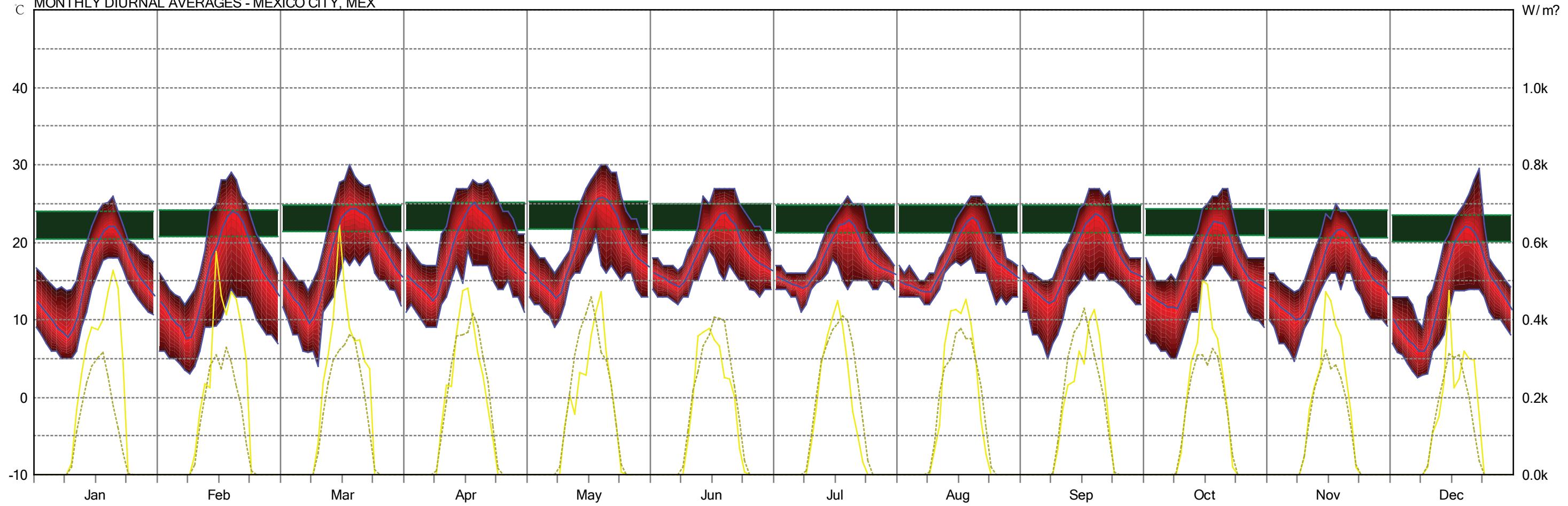
FURTHER DATA REQUIRED

- 1 Site Specific weather data
- 2 Mixed-use building designed internal load
- 3 Active using time during a day.
- 4 Building mass geometry
- 5 Building construction material

CLIMATE CHANGE IN 2050



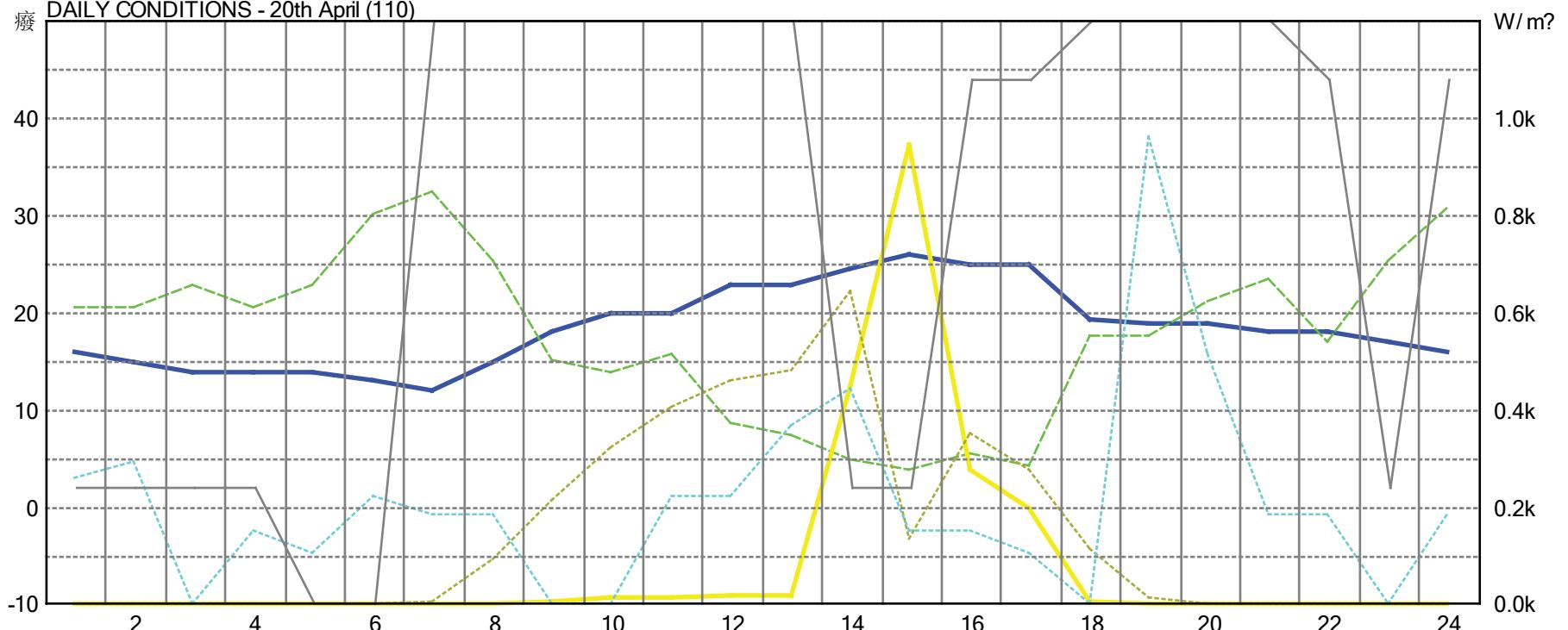
MONTHLY DIURNAL AVERAGES - MEXICO CITY, MEX

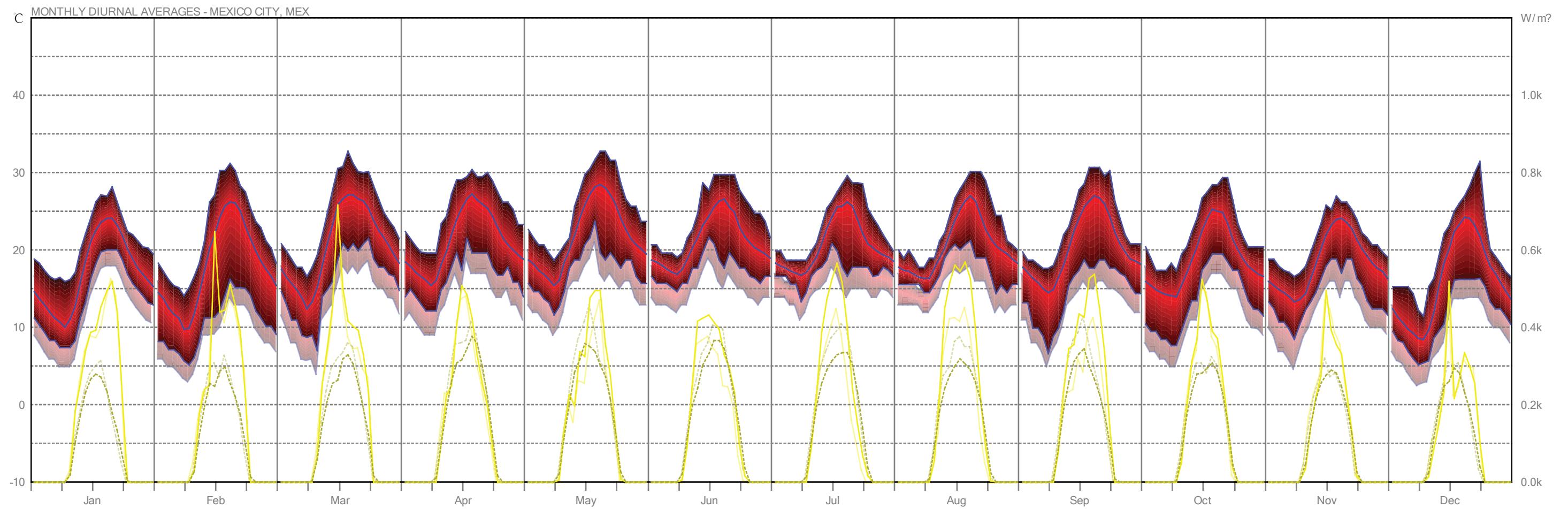


LEGEND

Comfort: Thermal Neutrality	
Temperature	Direct Solar
Rel.Humidity	Diffuse Solar
Wind Speed	Cloud Cover

DAILY CONDITIONS - 20th April (110)





LEGEND

Comfort: Thermal Neutrality	
Temperature	Direct Solar
Rel.Humidity	Diffuse Solar
Wind Speed	Cloud Cover