

Building Science Series

Sun-path Possibilities

Prepared & Presented by Devang

Agenda

1. Recap

2. Data on Sun-path
3. Shading with Sun-path
4. Shadow Range Study

5. Simulation driven design process
6. Simulation tools overview
7. Other areas to focus on

What did we do last time?

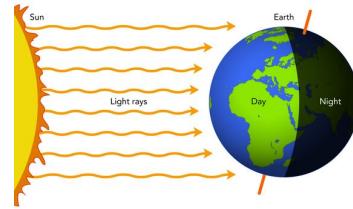


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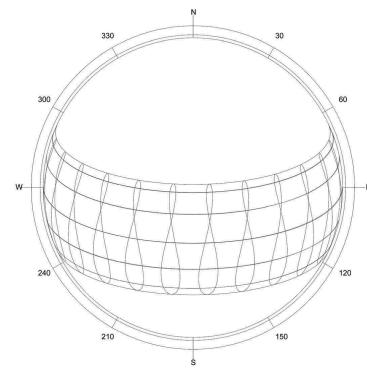
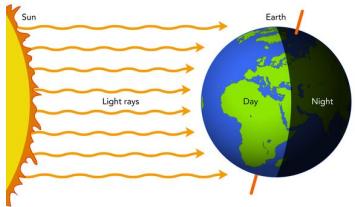
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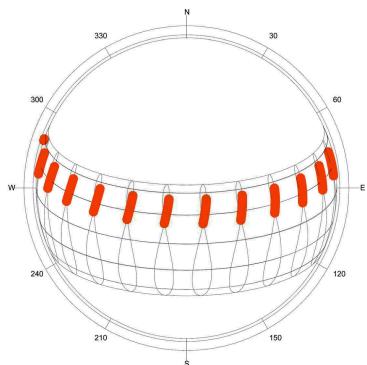
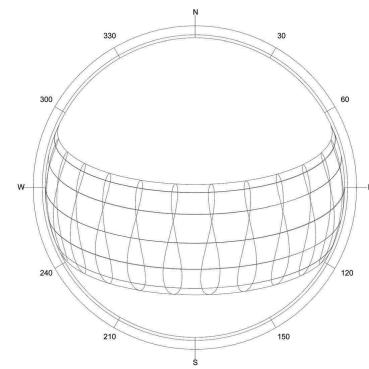
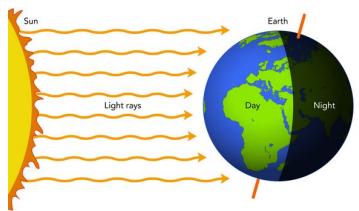
Building Science



Building Science

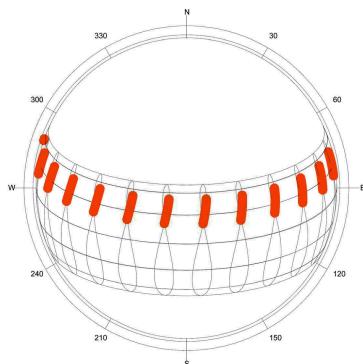
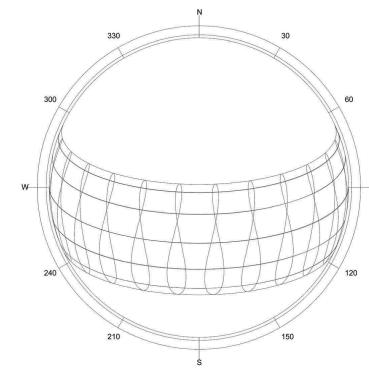
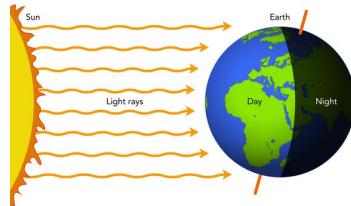


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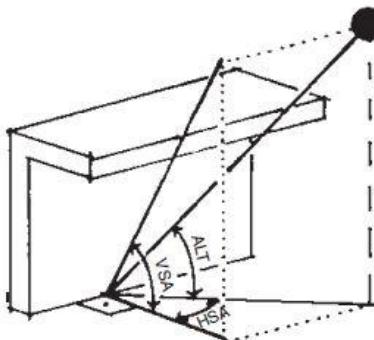


Sun-Path Diagram - Latitude: 22.3072

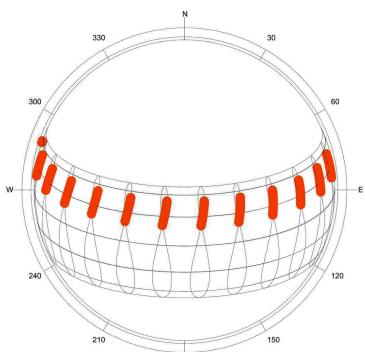
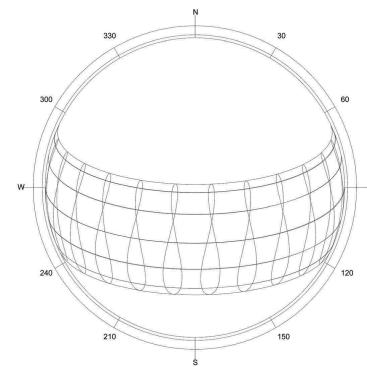
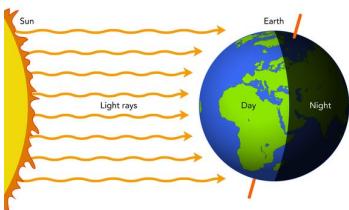
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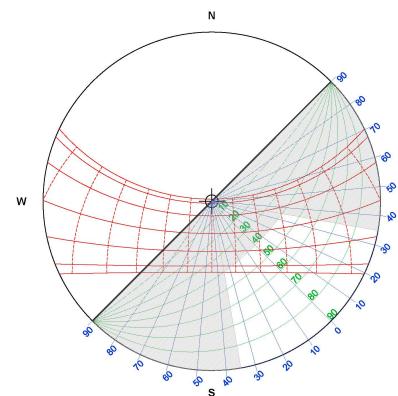
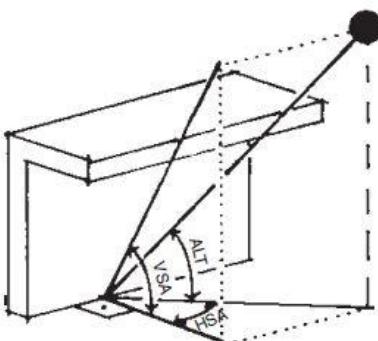
Sun-Path Diagram - Latitude: 22.3072



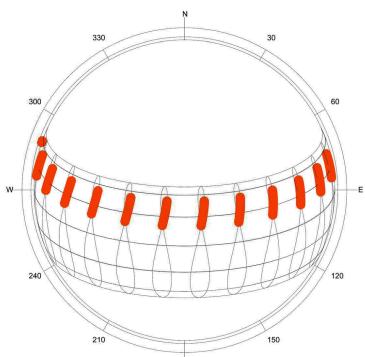
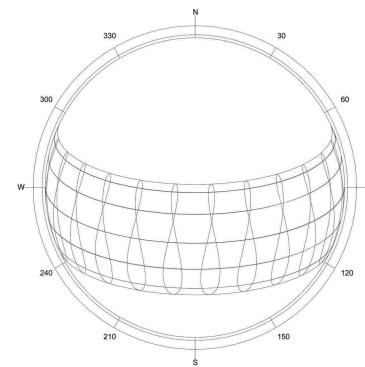
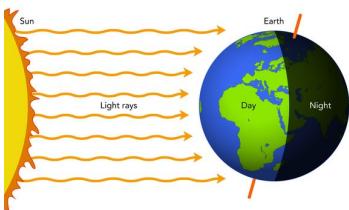
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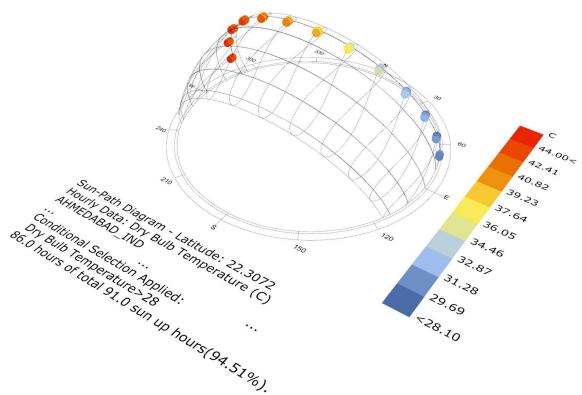
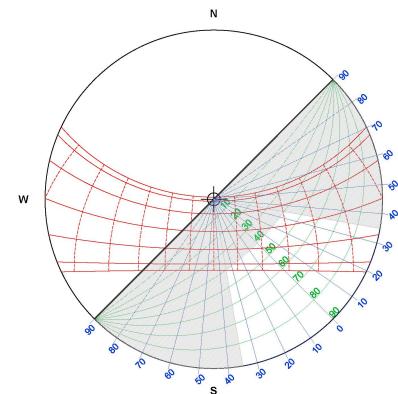
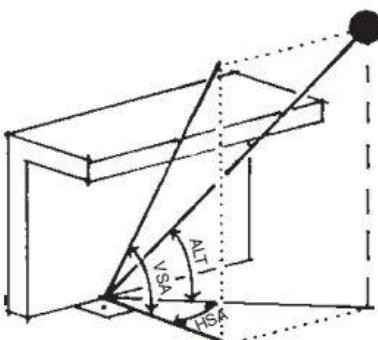
Sun-Path Diagram - Latitude: 22.3072



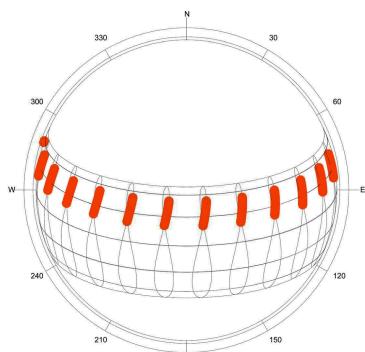
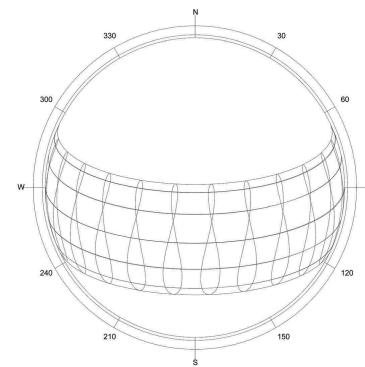
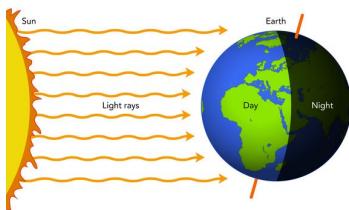
Building Science



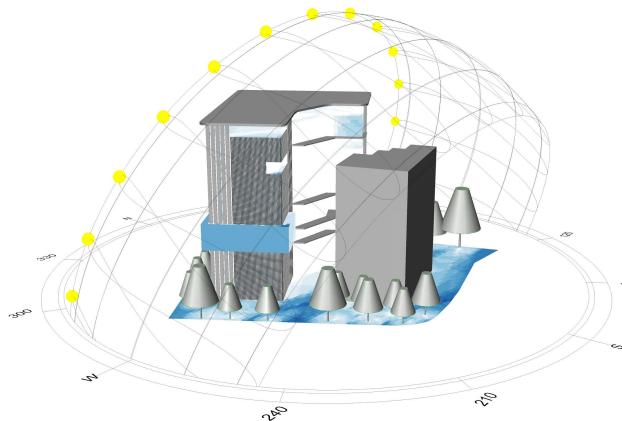
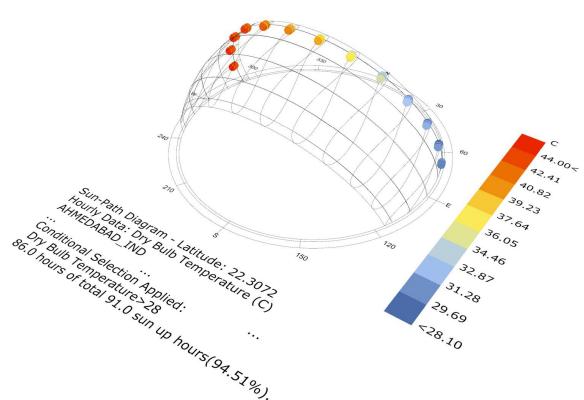
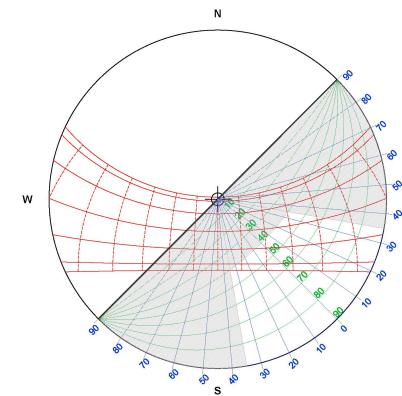
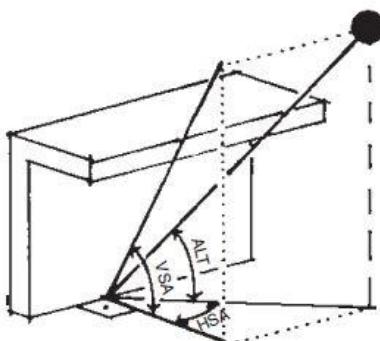
Sun-Path Diagram - Latitude: 22.3072



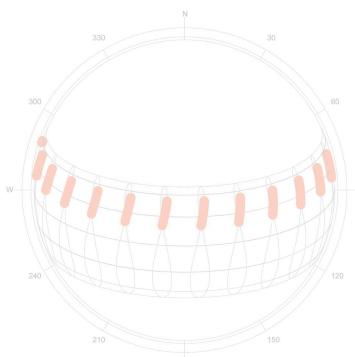
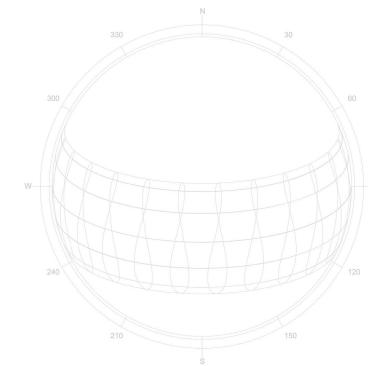
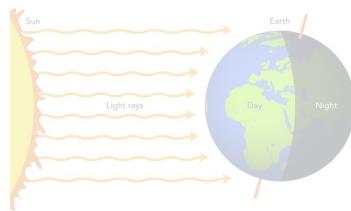
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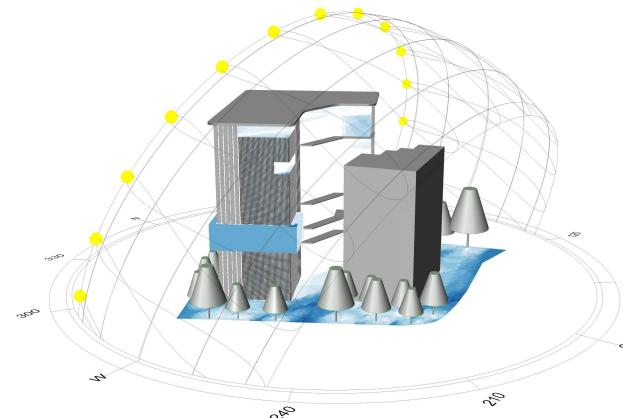
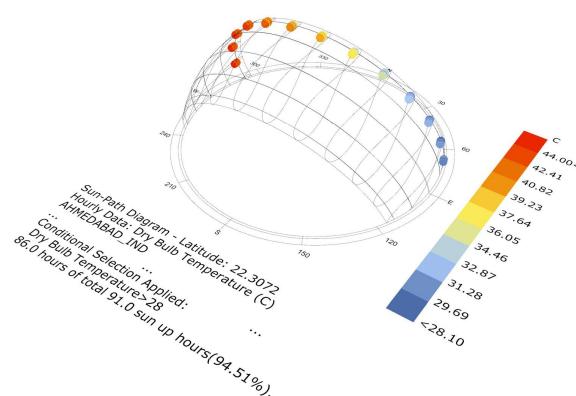
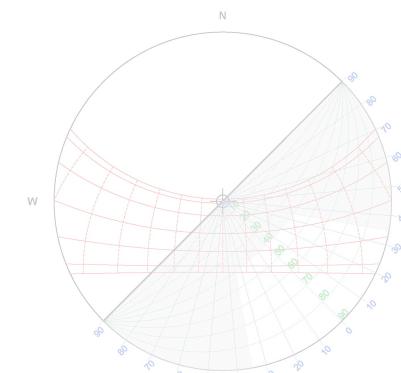
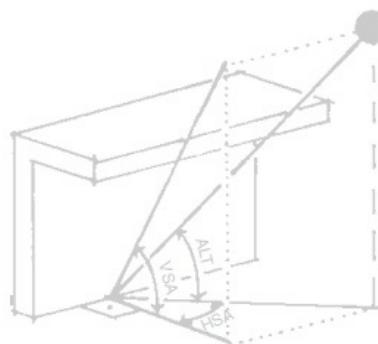
Sun-Path Diagram - Latitude: 22.3072



Building Science



Sun-Path Diagram - Latitude: 22.3072



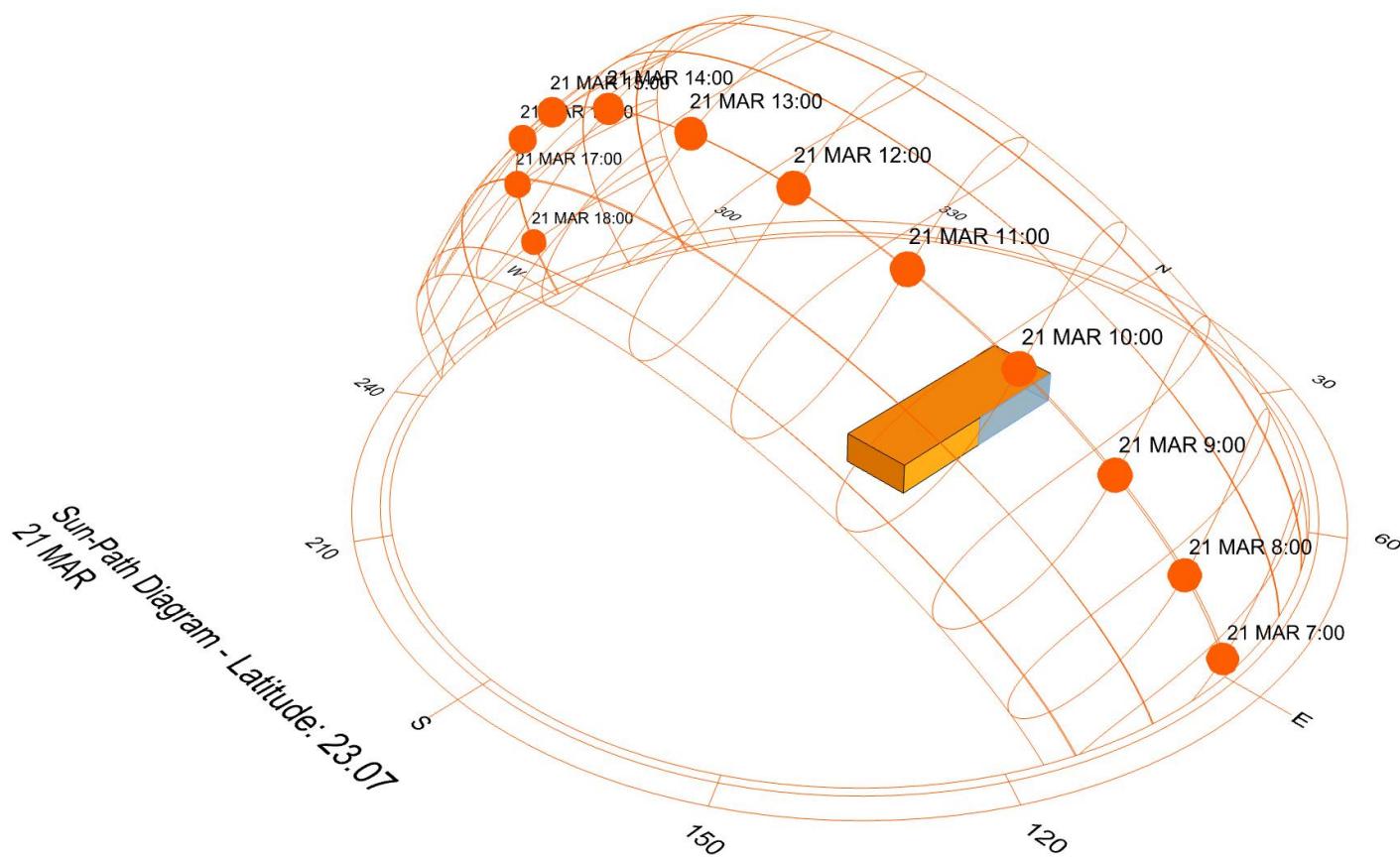


Yeaah!!

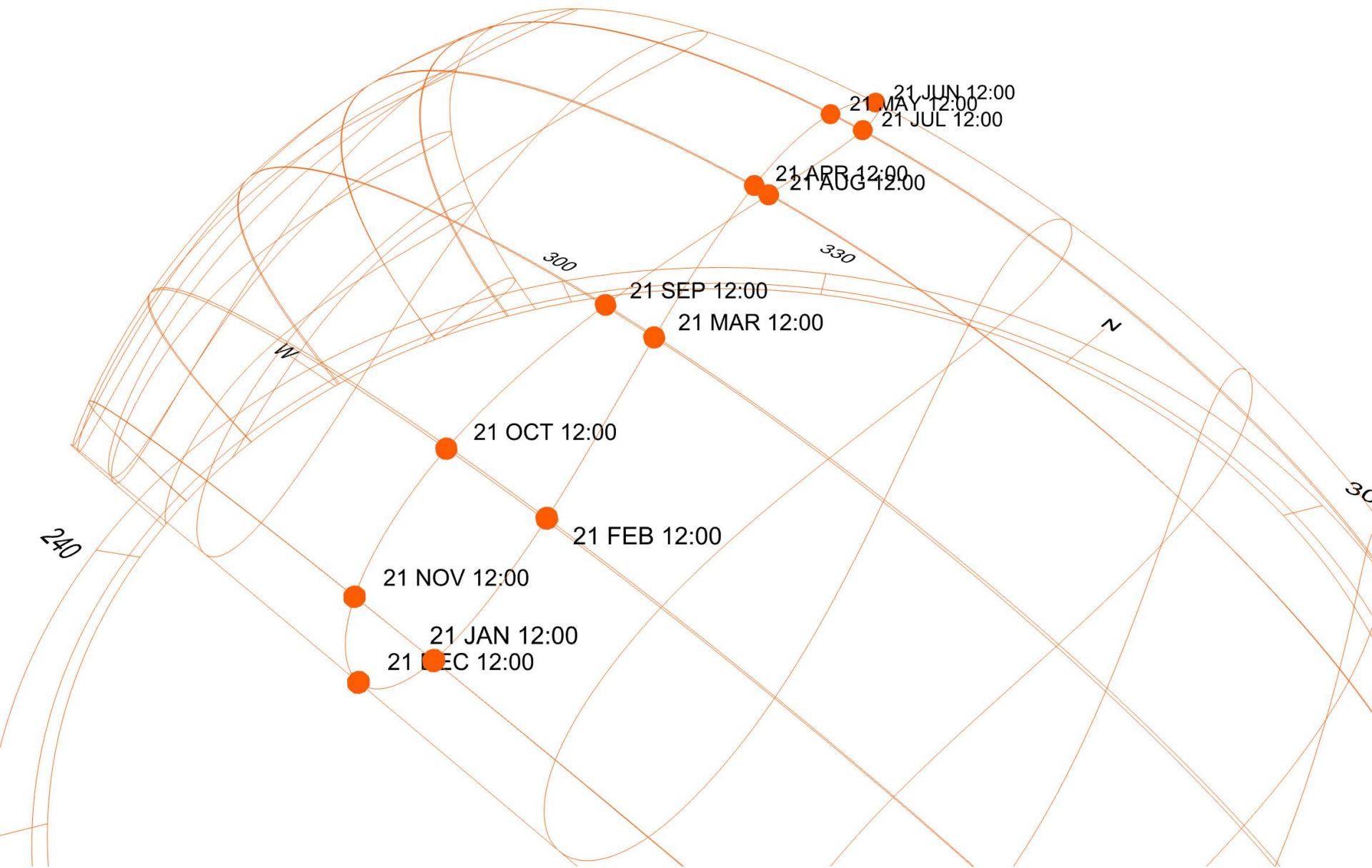
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Data on Sunpath

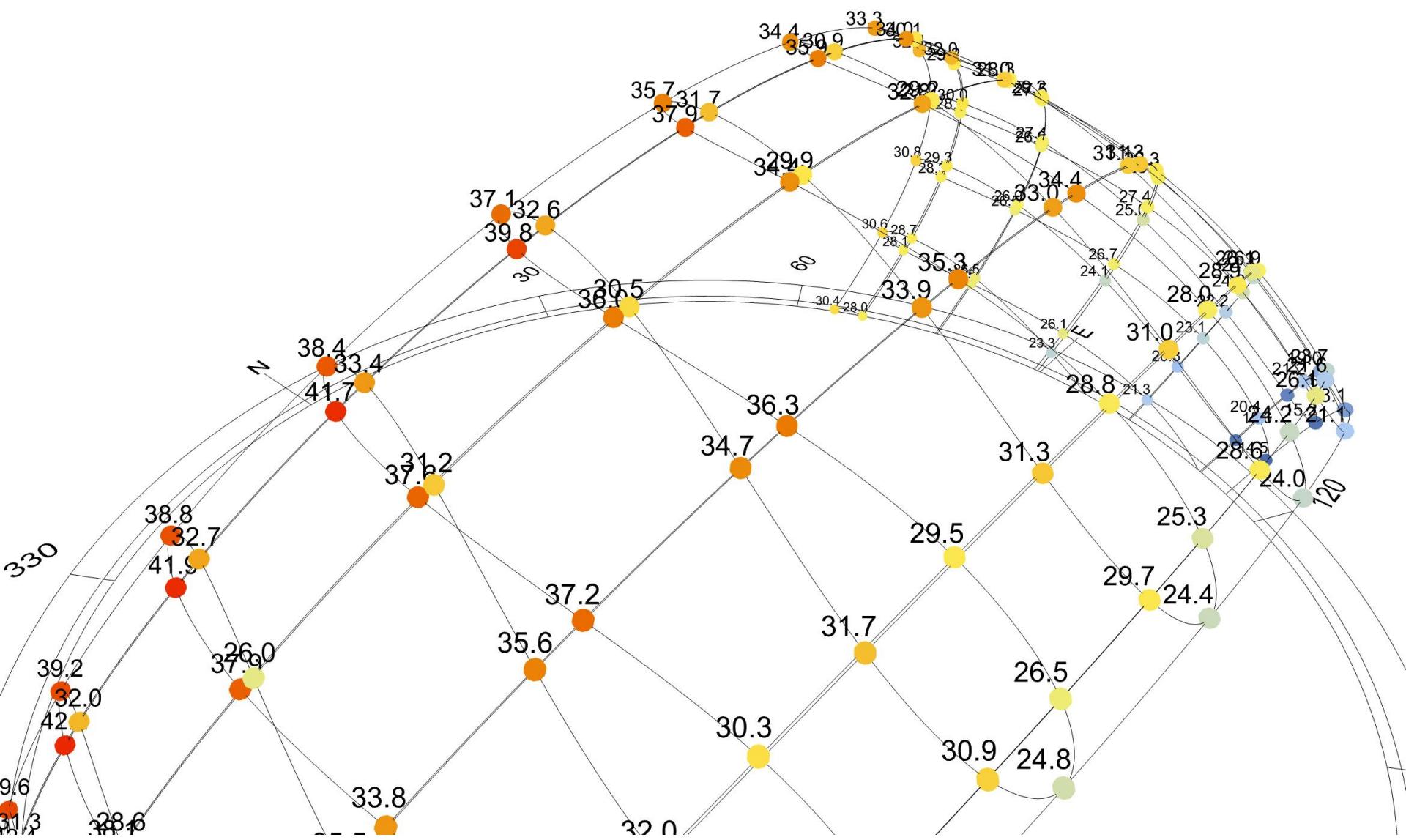
Date & Time Display on Sun-Path



Date & Time Display on Sun-Path

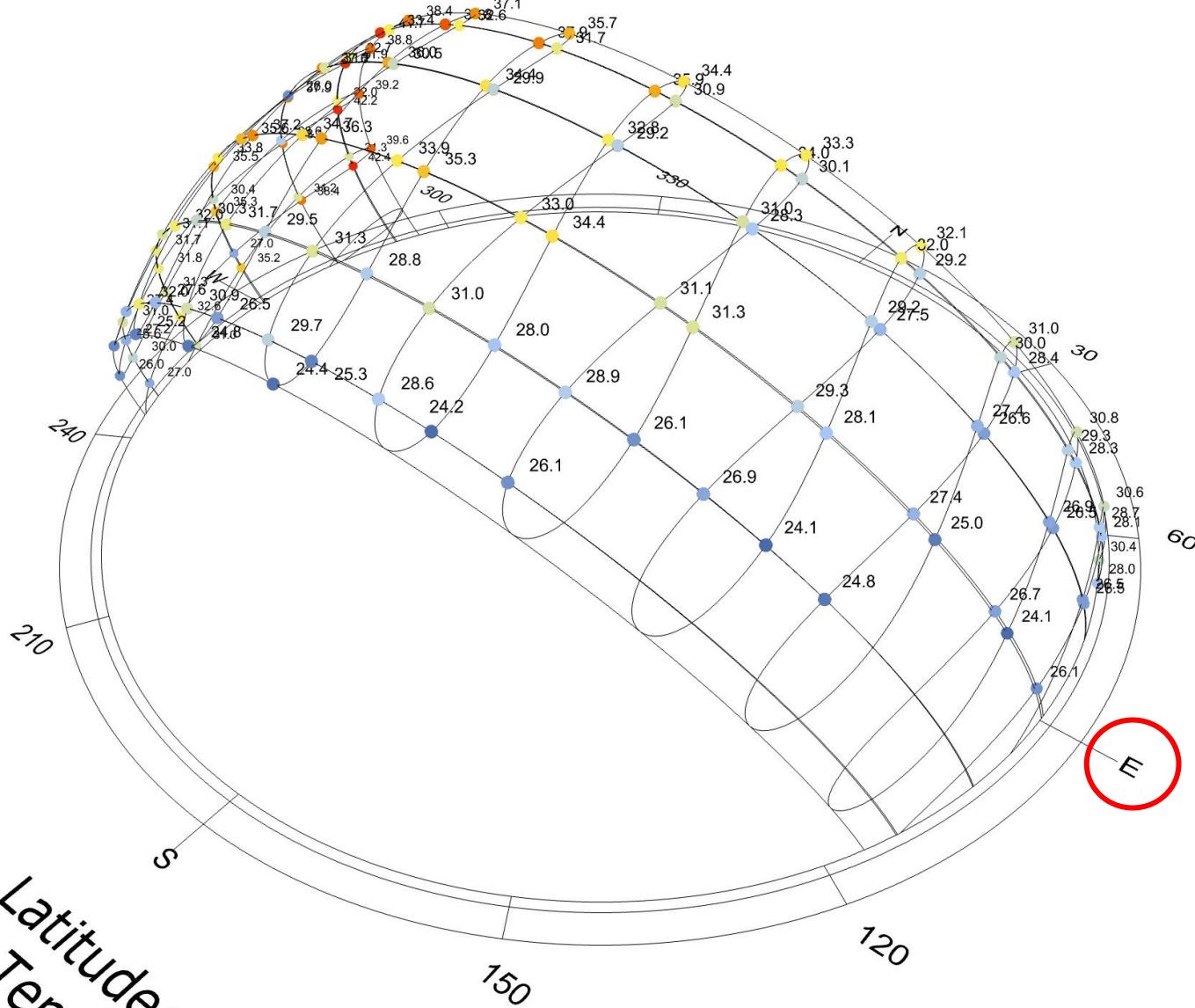


Outside Air Dry-bulb Temperature on Sun-path

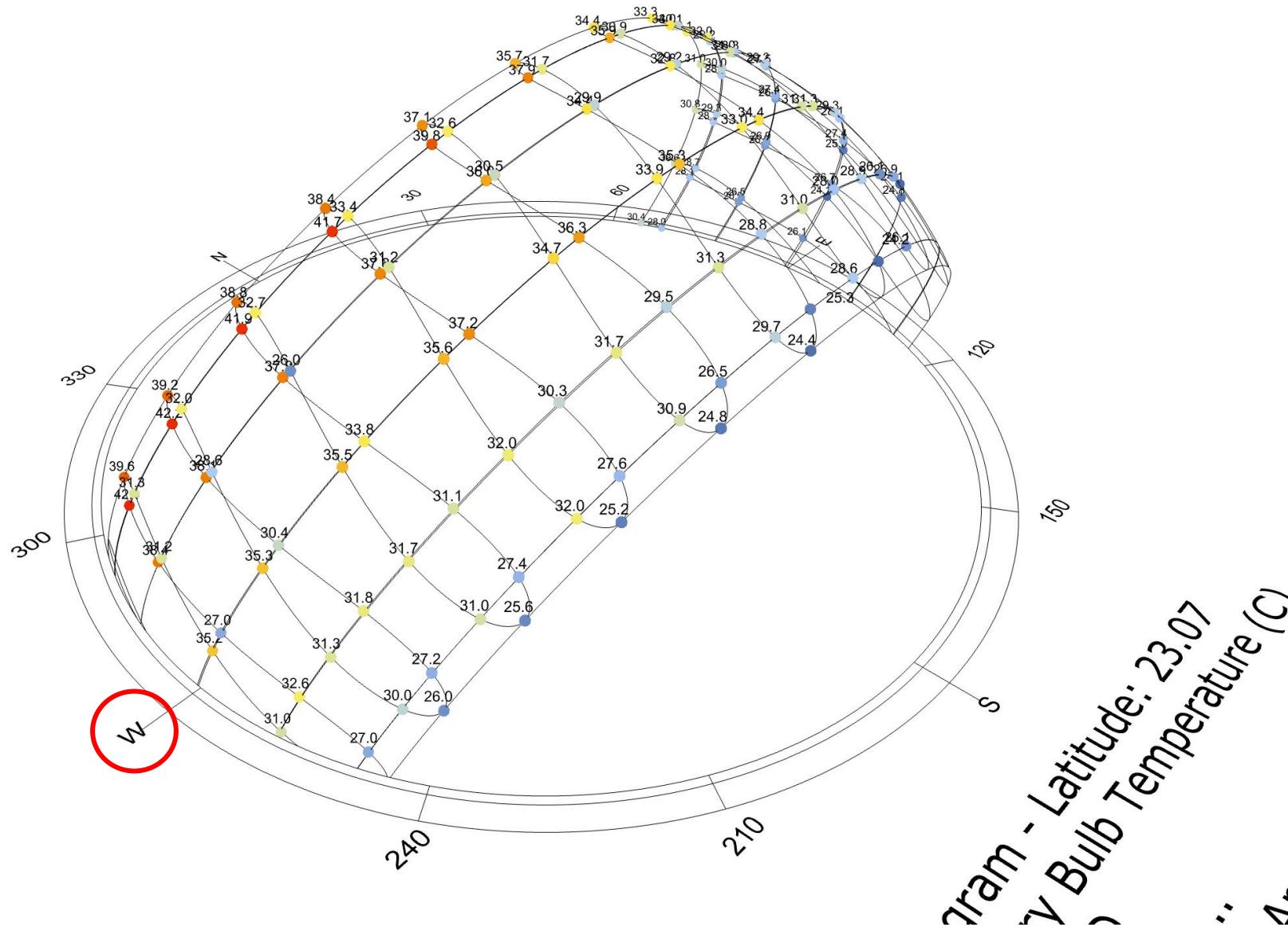


Outside Air Dry-bulb Temperature on Sun-path

Sun-path Diagram - Latitude
Data: Dry Bulb Temp
1D_IND



Outside Air Dry-bulb Temperature on Sun-path



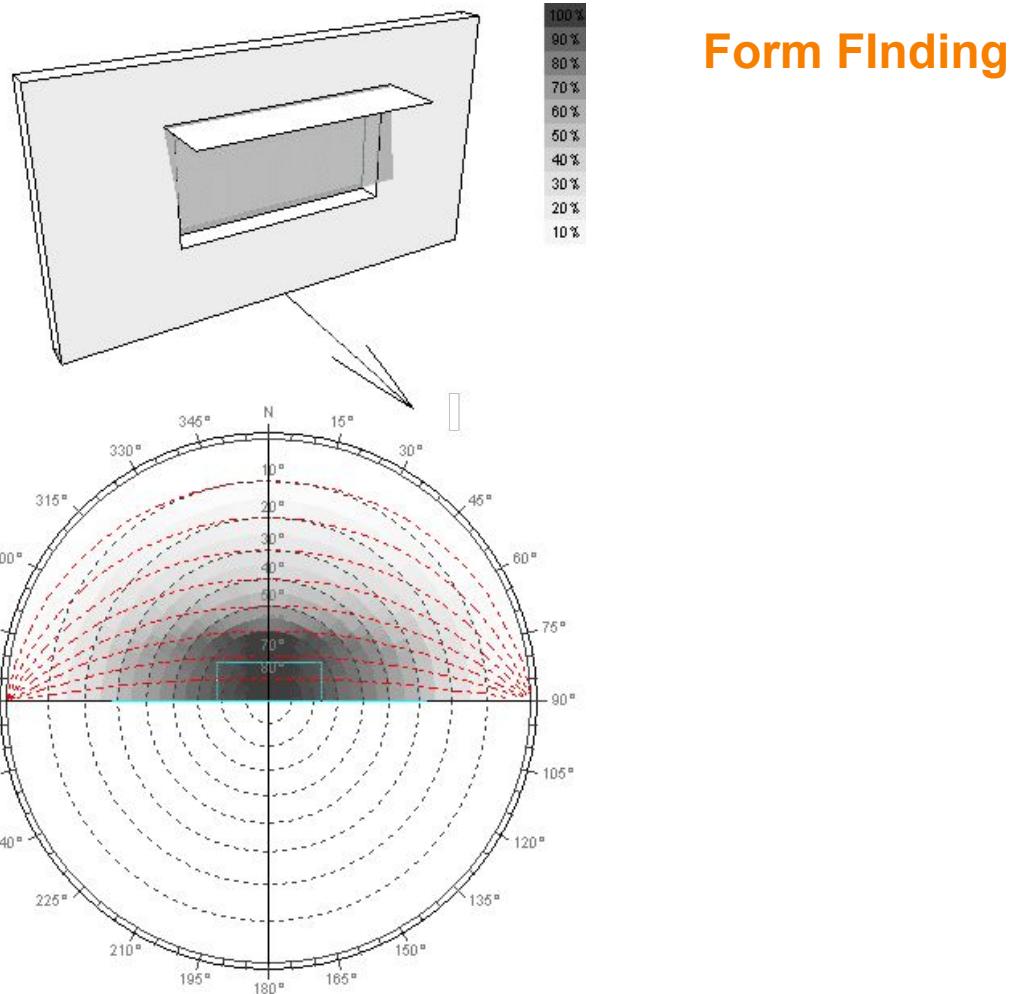
Shading with Sun-path



Static Shading Design

Shading Period

1. Cut-off dates
2. CDD & HDD
3. Energy Modelling

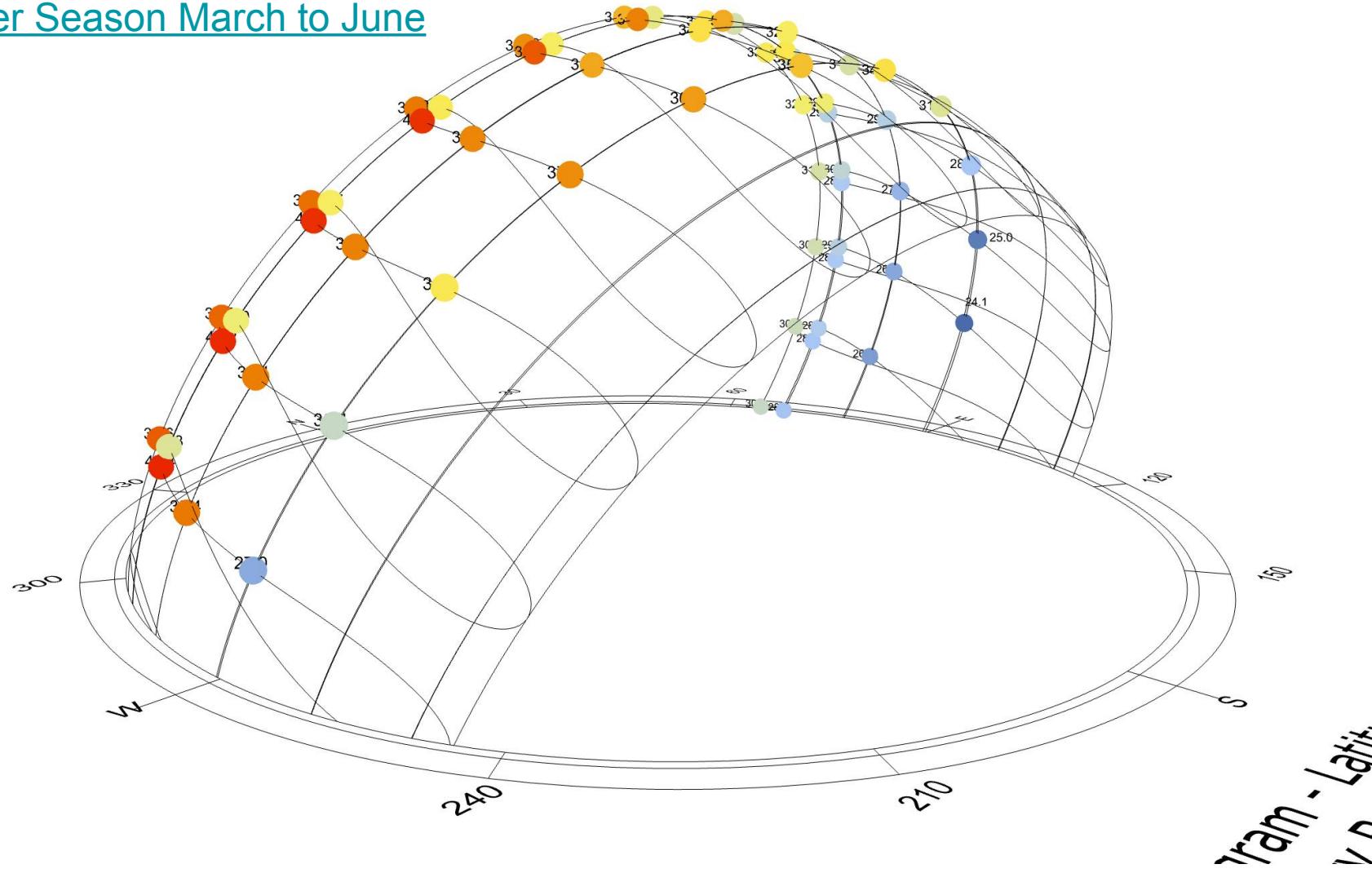


Form Finding

<http://wiki.naturalfrequency.com/files/wiki/shading/shade-horz-medm.gif>

Cut-off Date Selection

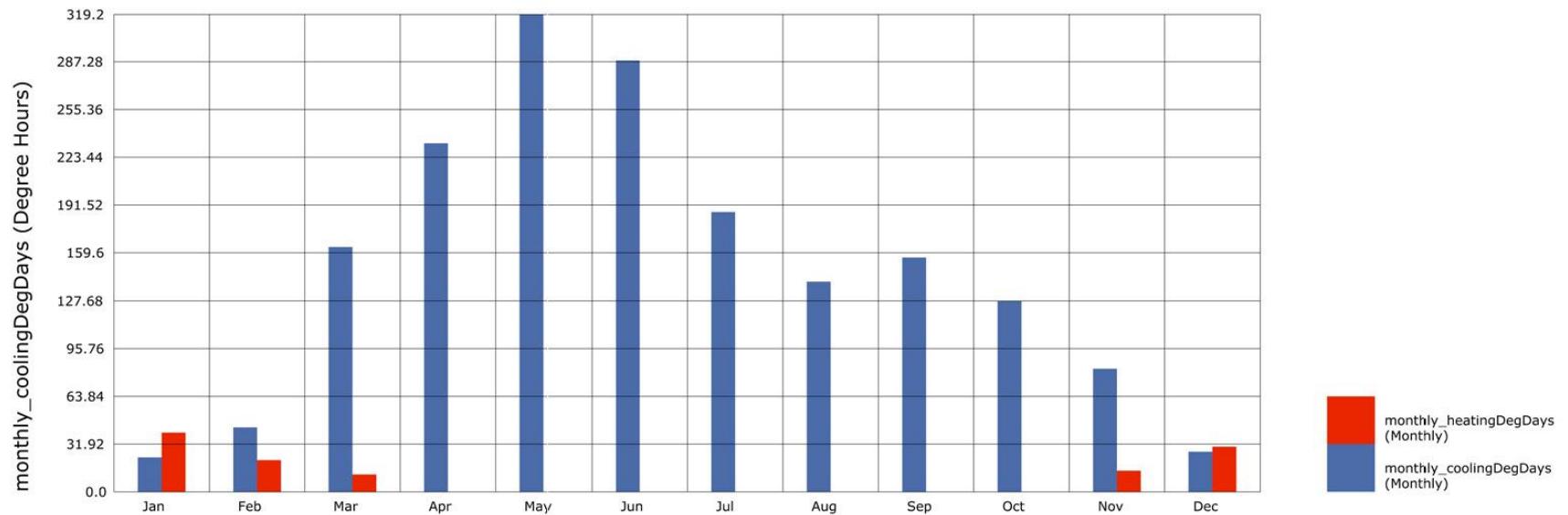
Summer Season March to June



Degree Day Selection

Cooling Degree Days : The difference between the ambient (outside) temperature and balance (inside) temperature if the former is higher than the latter.

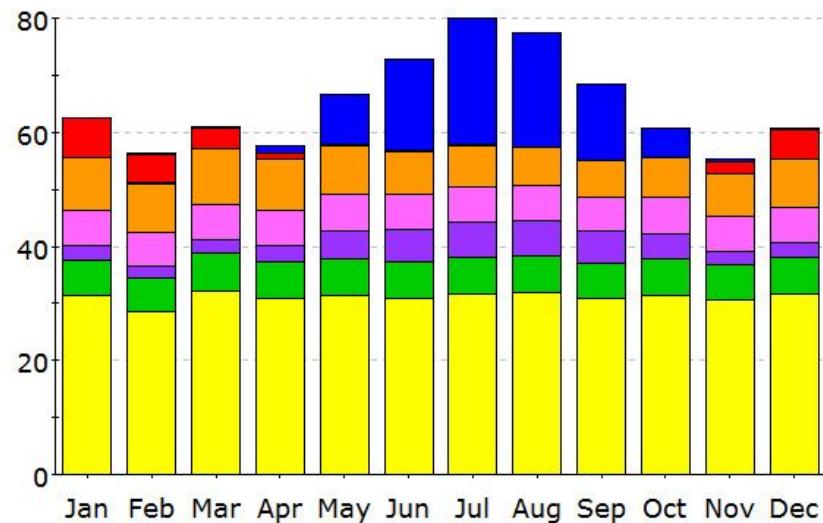
For example, if at 12:00 noon, ambient temperature is 34°C and balance temperature is 24°C, then degree hours for that hour are 10.



Thermal Selection

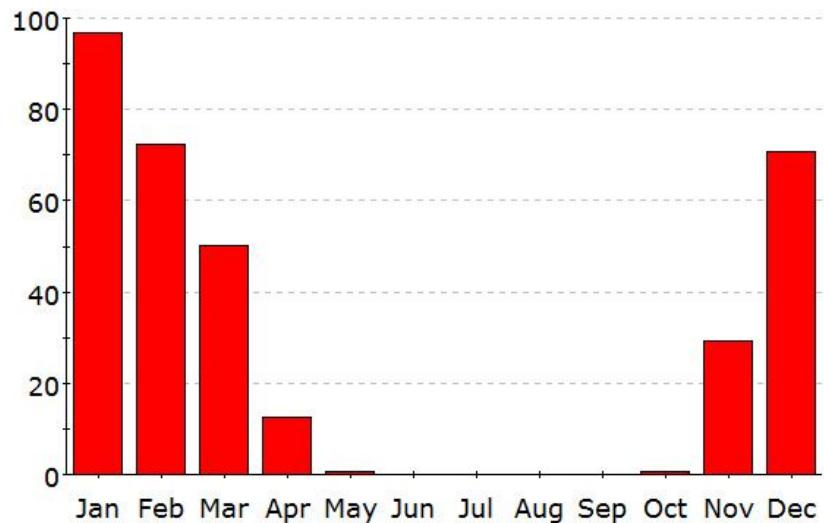
(x000)

Electric Consumption (kWh)



(x000,000)

Gas Consumption (Btu)

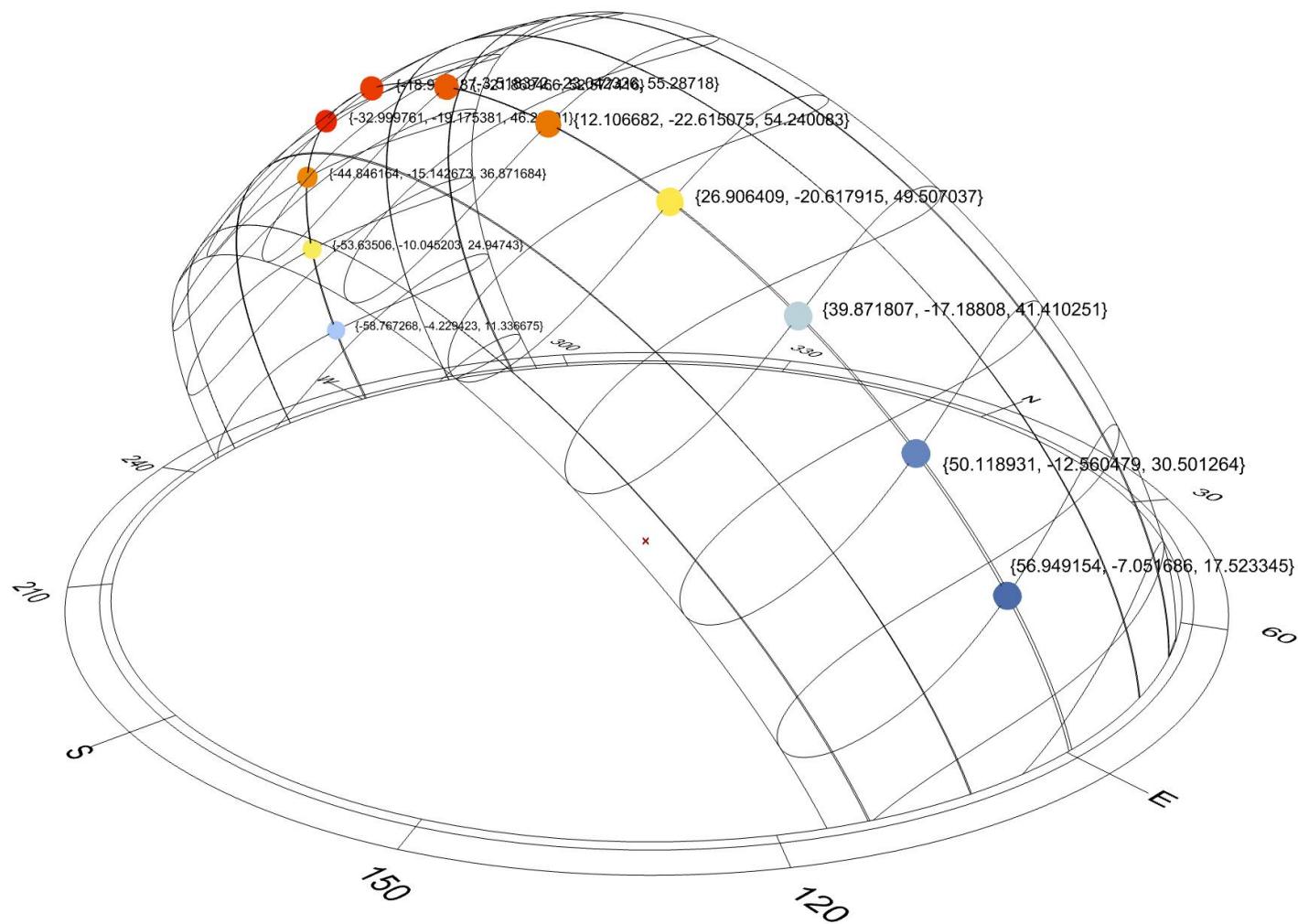


[Legend]
Area Lighting
Task Lighting
Misc. Equipment
Exterior Usage

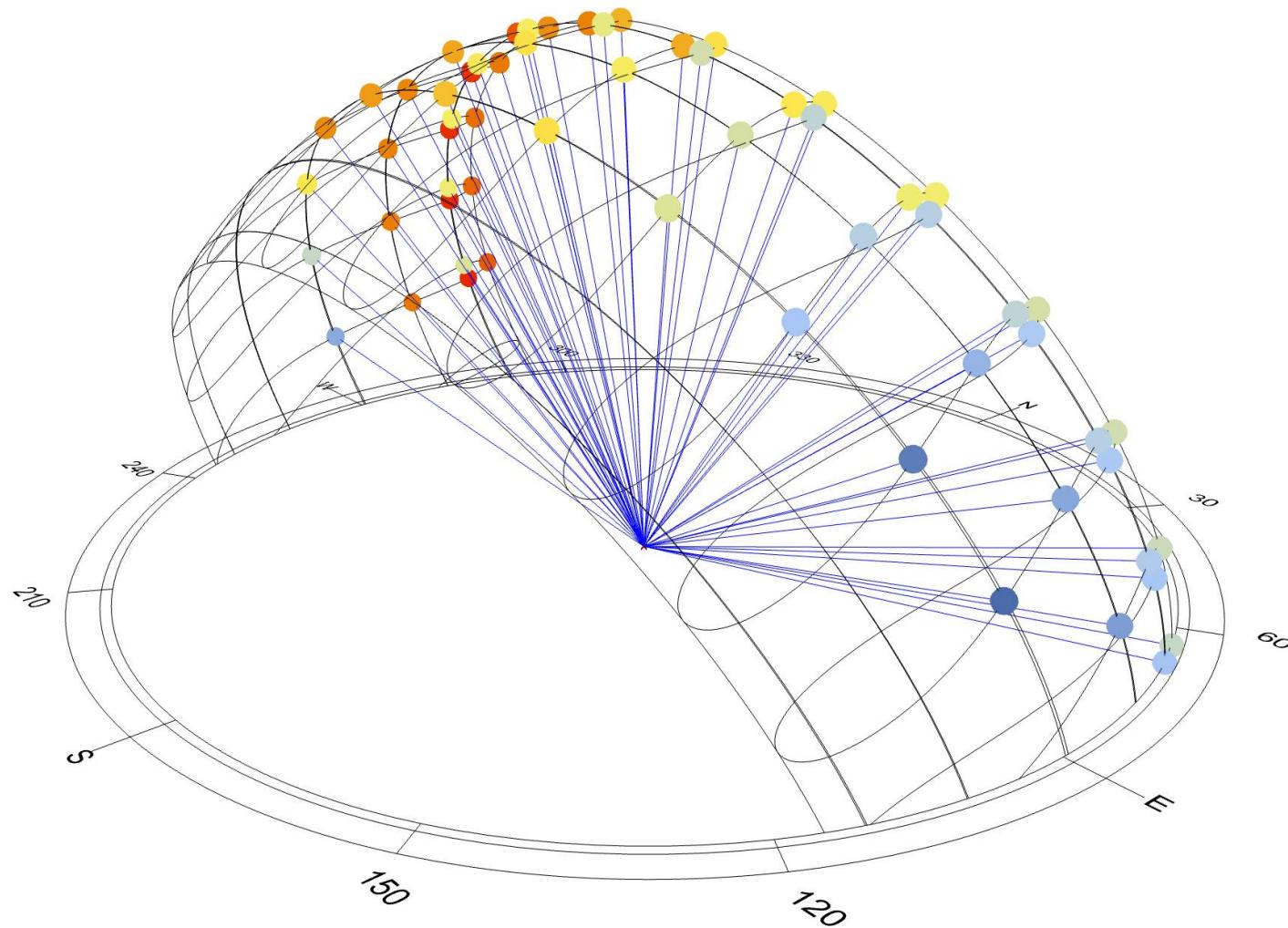
[Legend]
Pumps & Aux.
Ventilation Fans
Water Heating

[Legend]
Space Heating
Refrigeration
Heat Rejection
Space Cooling

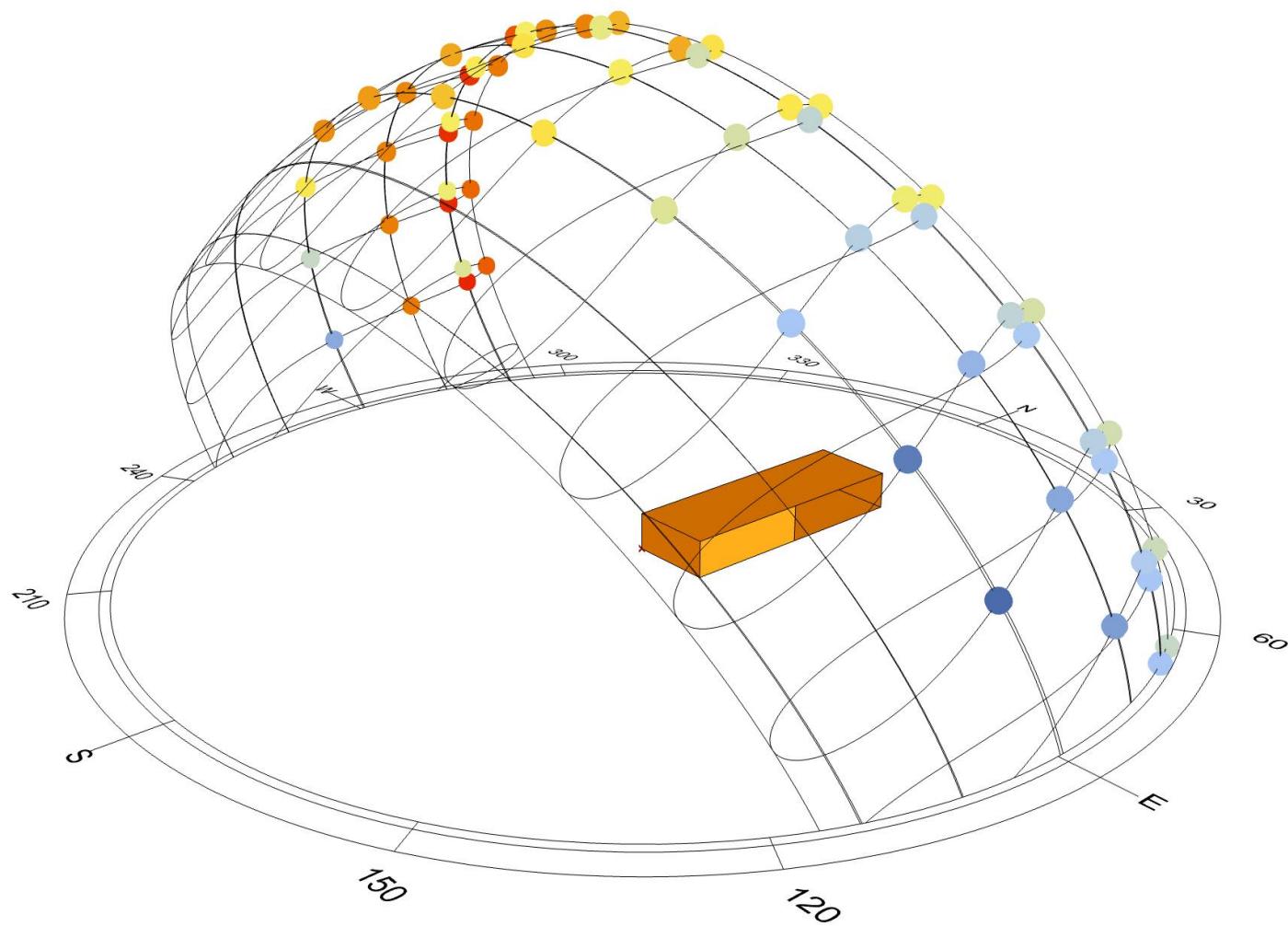
Form Finding - Vectors



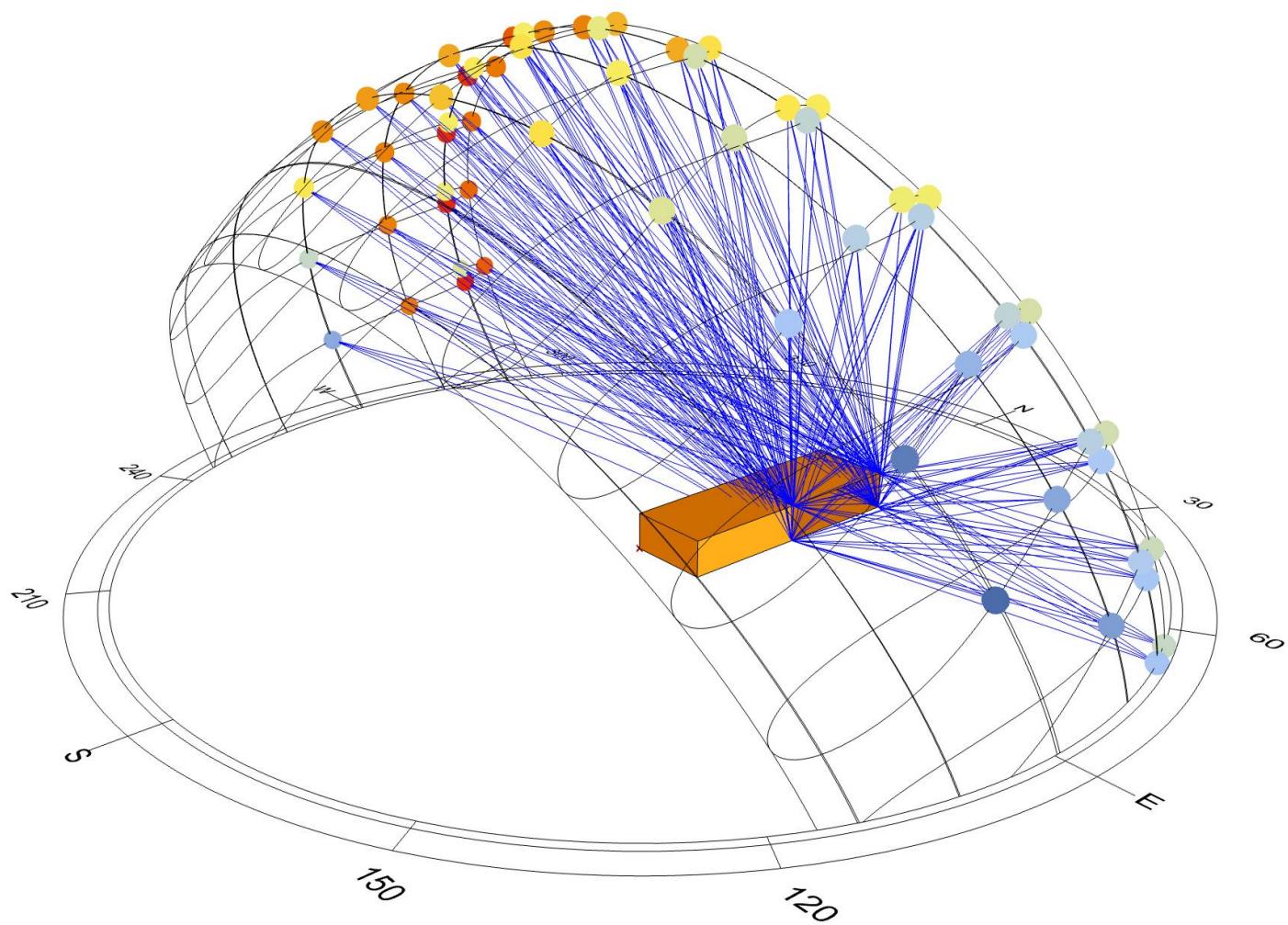
Form Finding - Origin to Sun-Positions



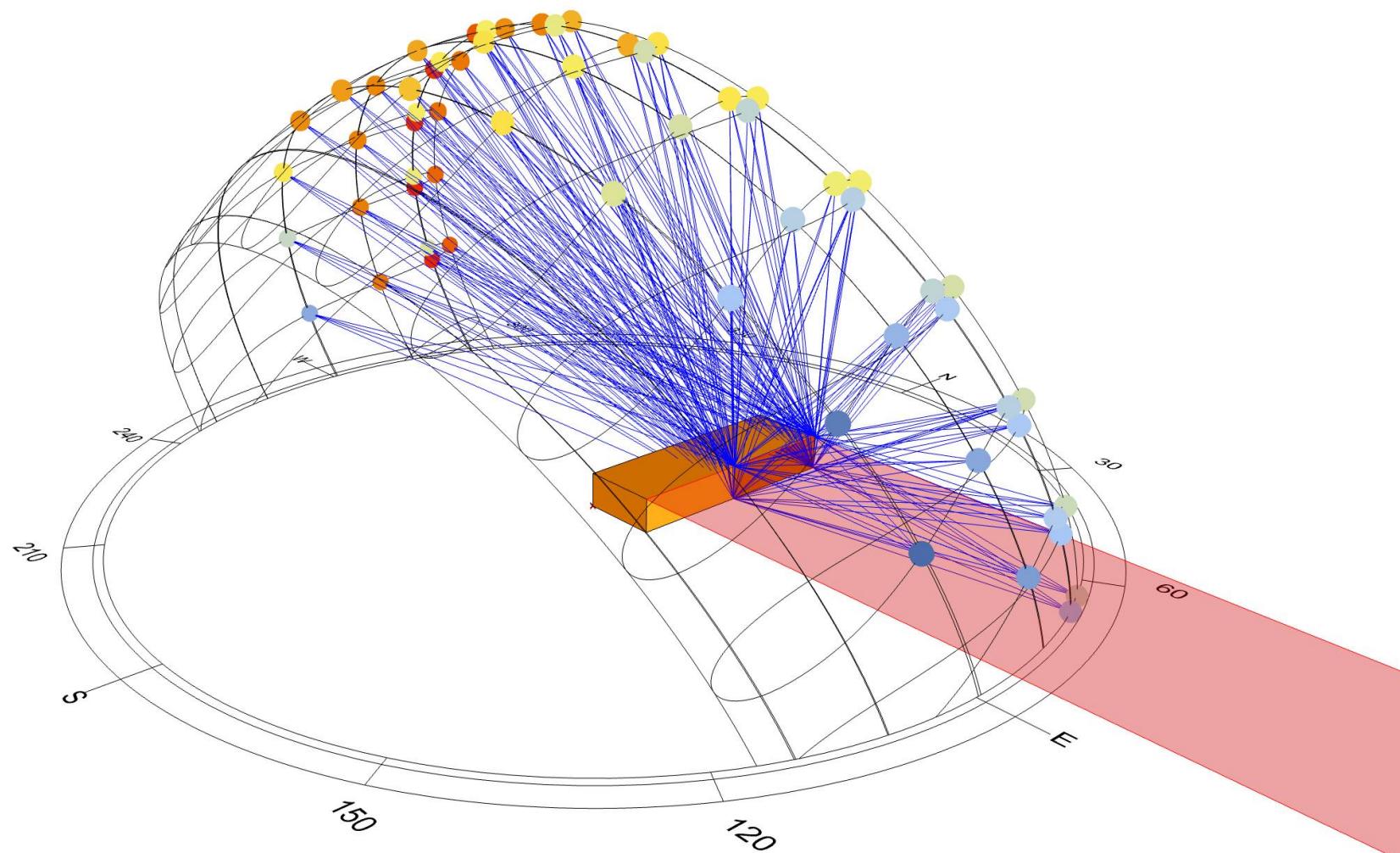
Form Finding - Building



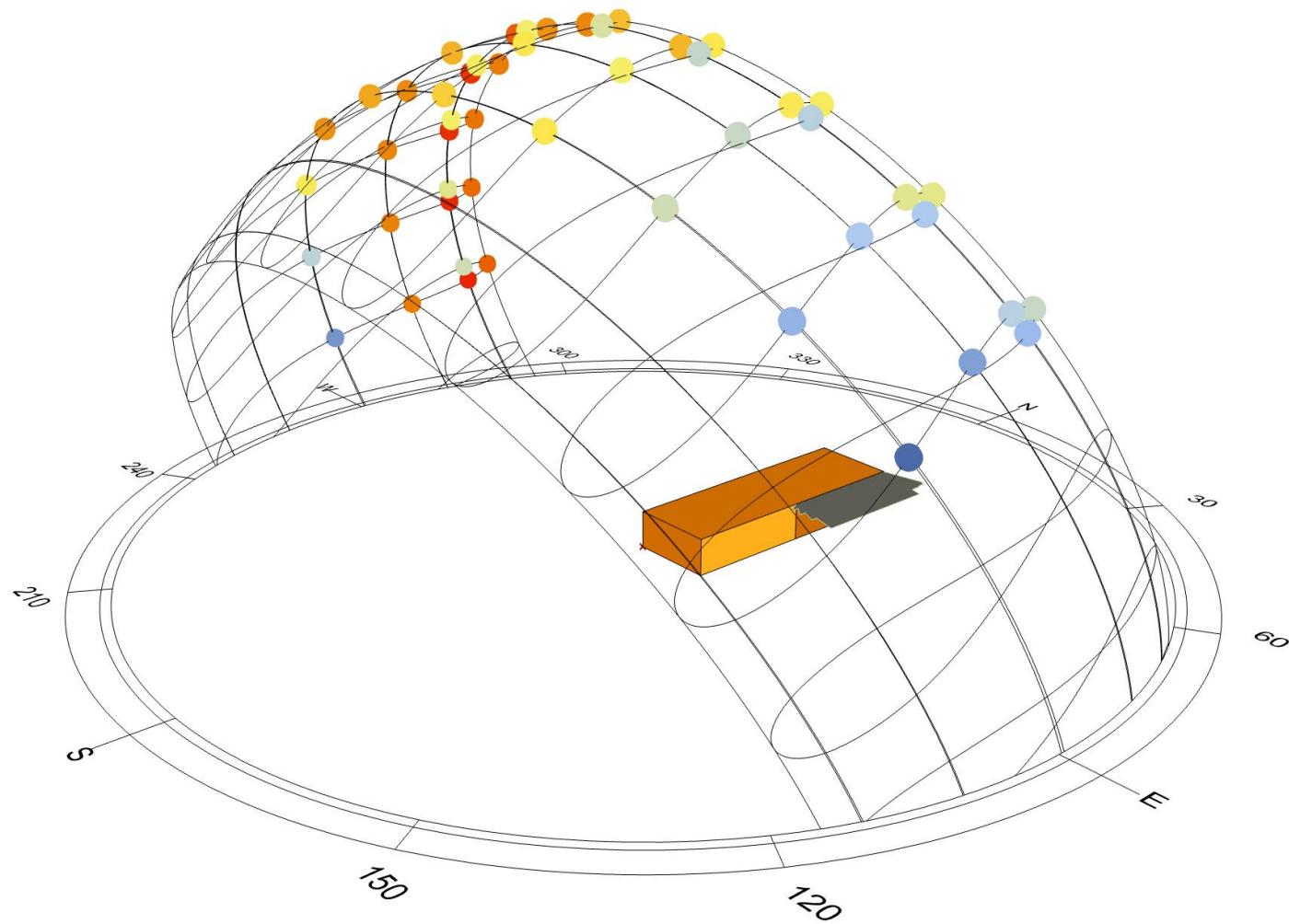
Form Finding - Opening Vectors



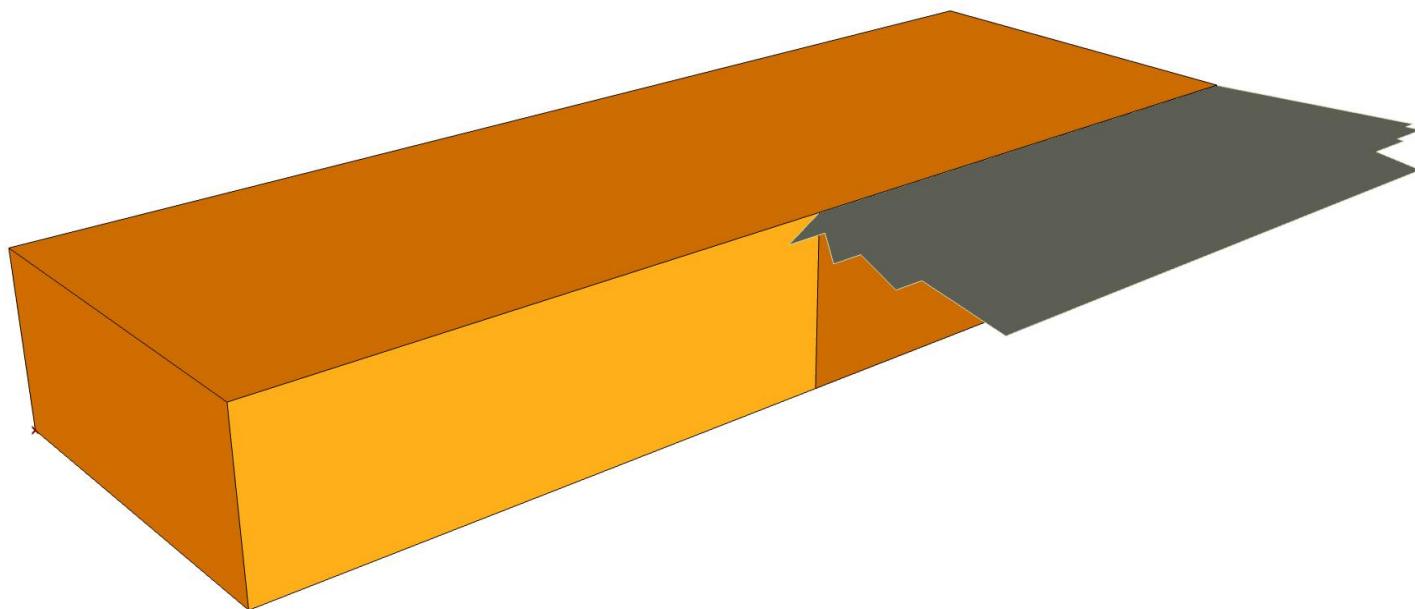
Form Finding - Infinite Overhang



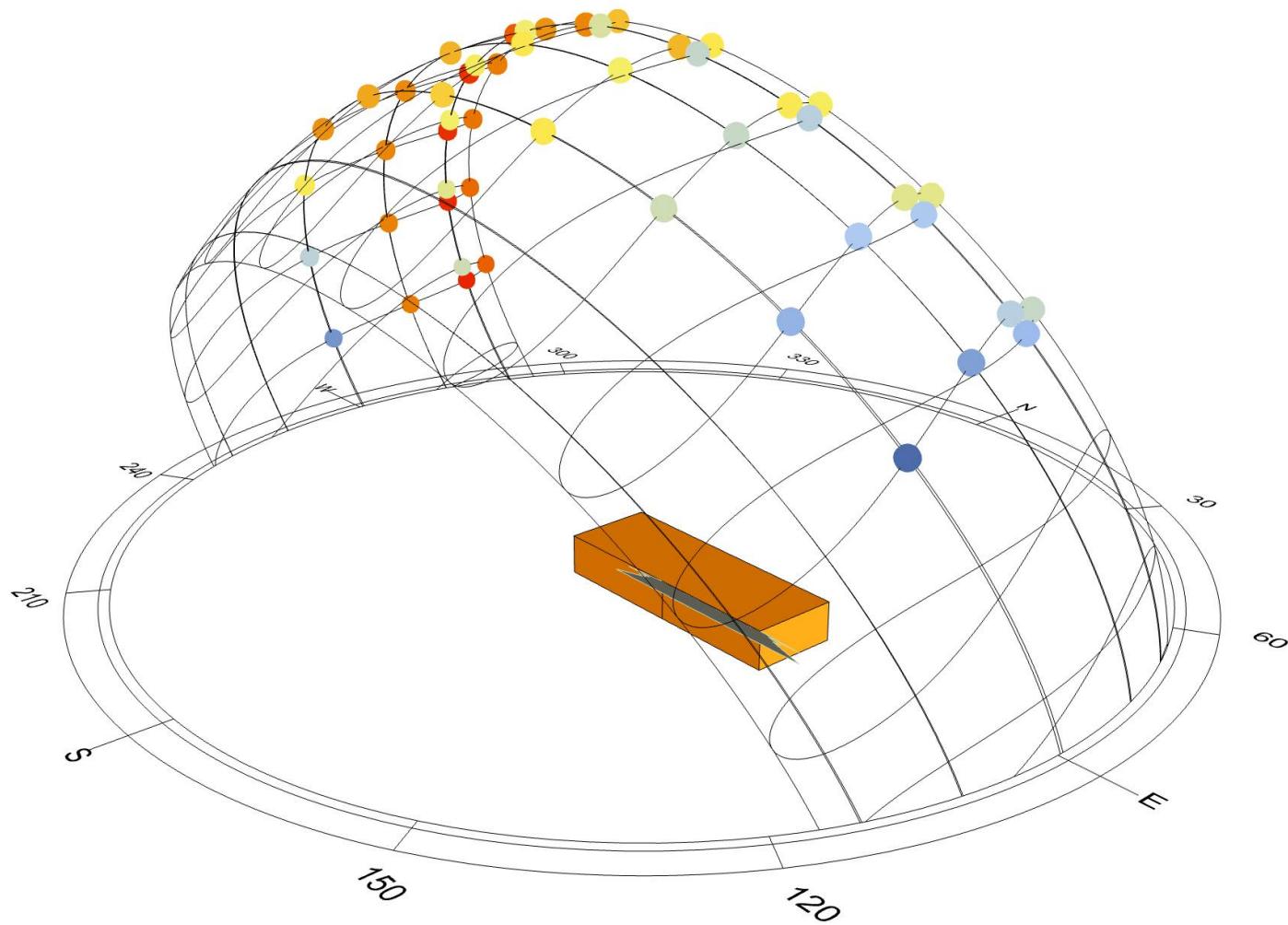
Form Finding - Shade Intersected



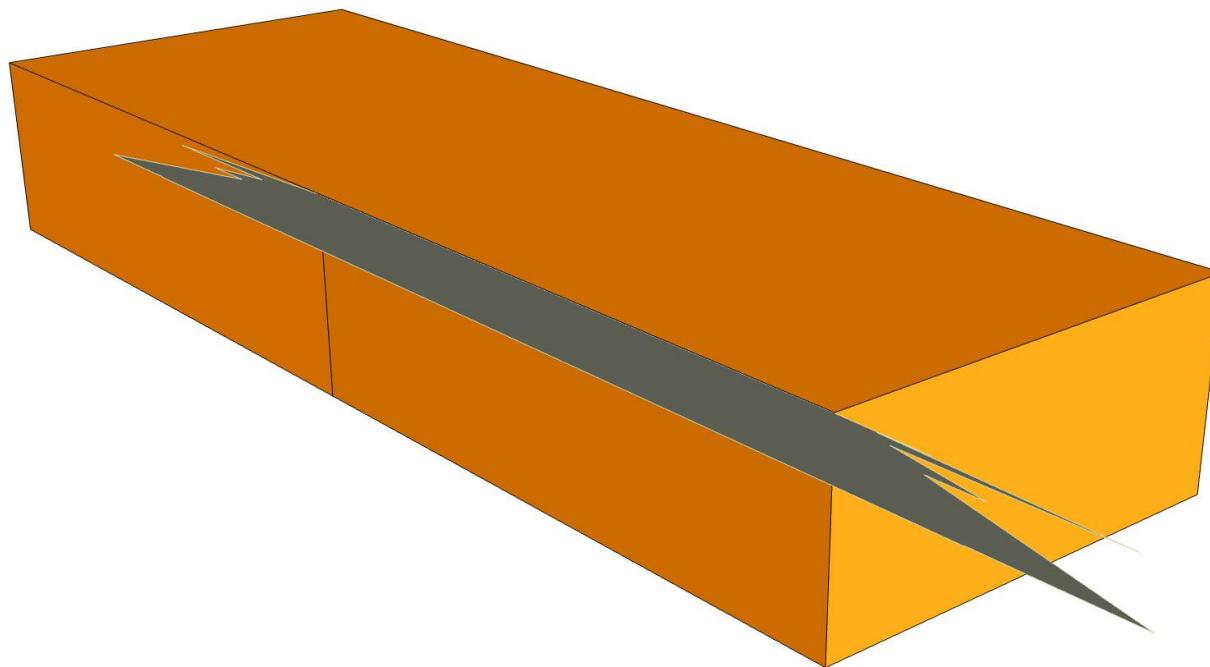
Form Finding - East Facing Shade (**8m** Overhang)



Form Finding - Shade Intersected



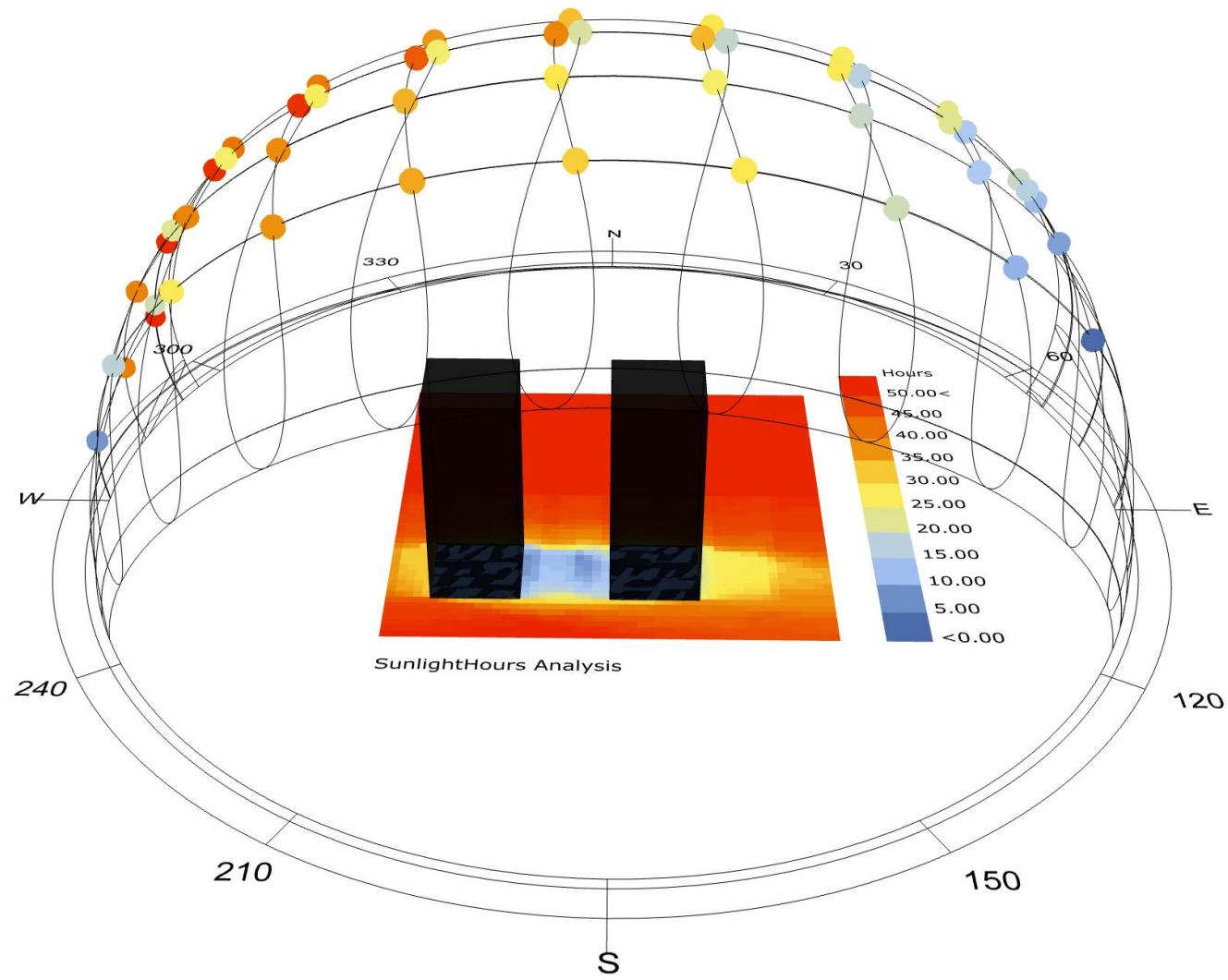
Form Finding - South Facing Shade (**2m** Overhang)



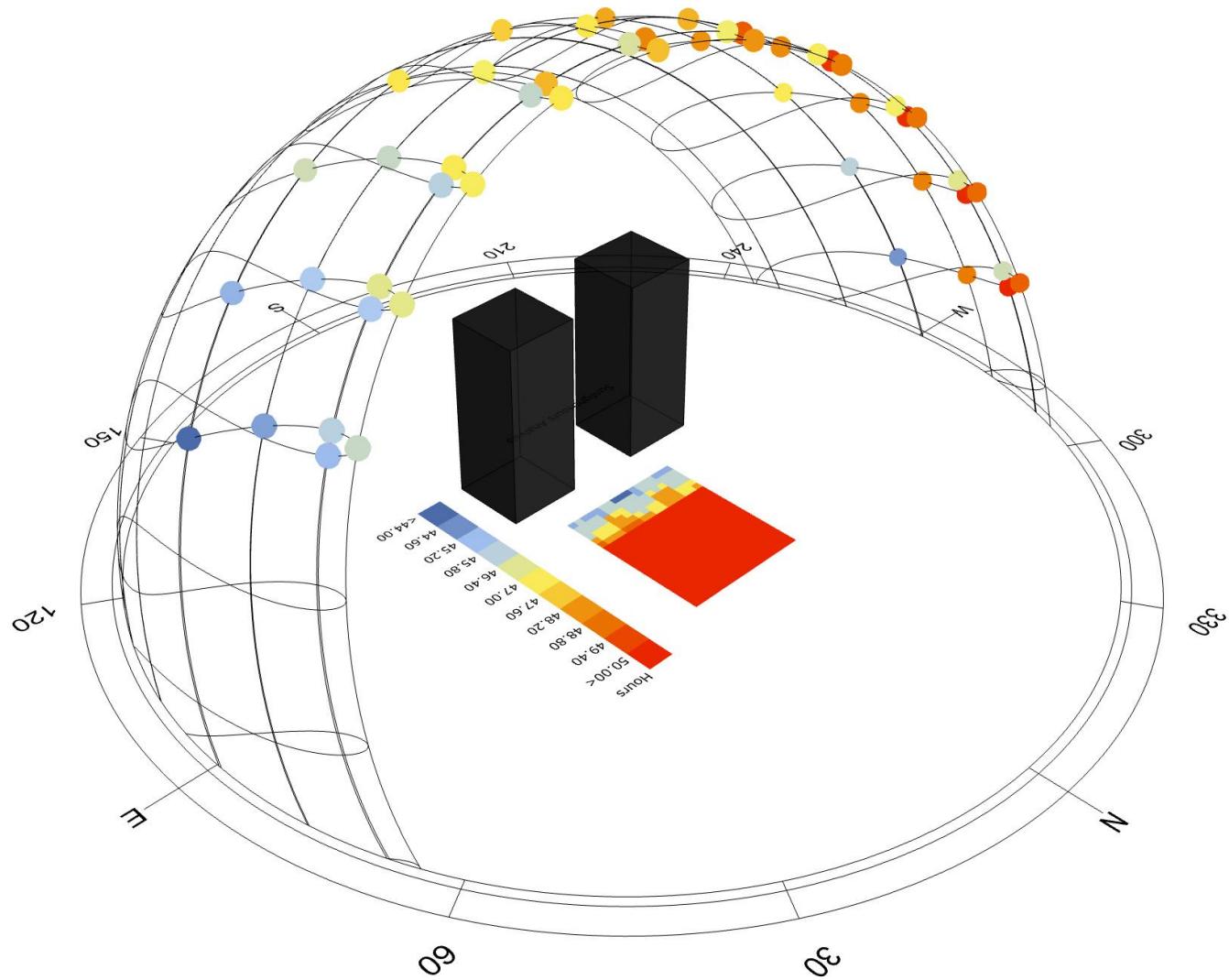


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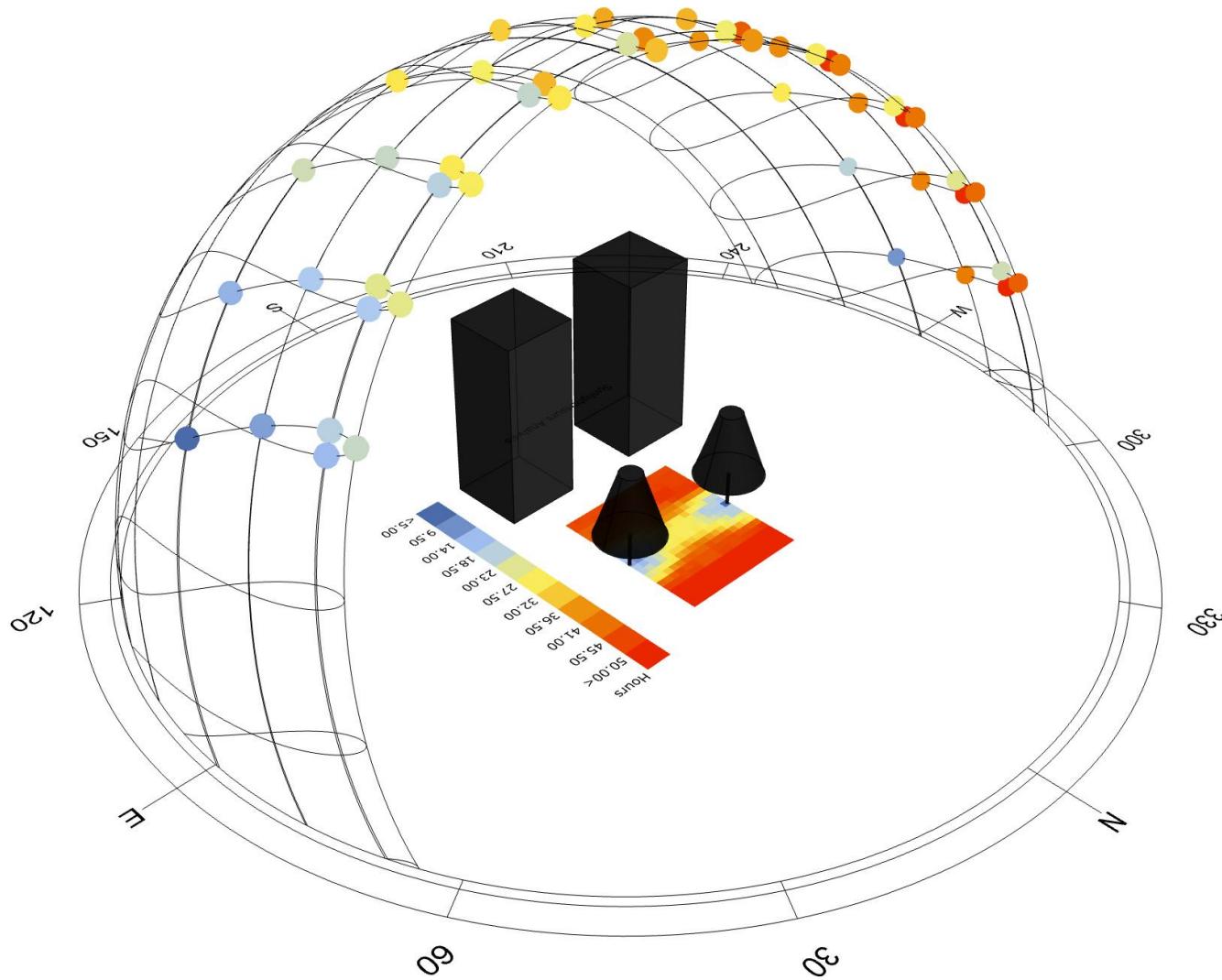
Shadow Range Study

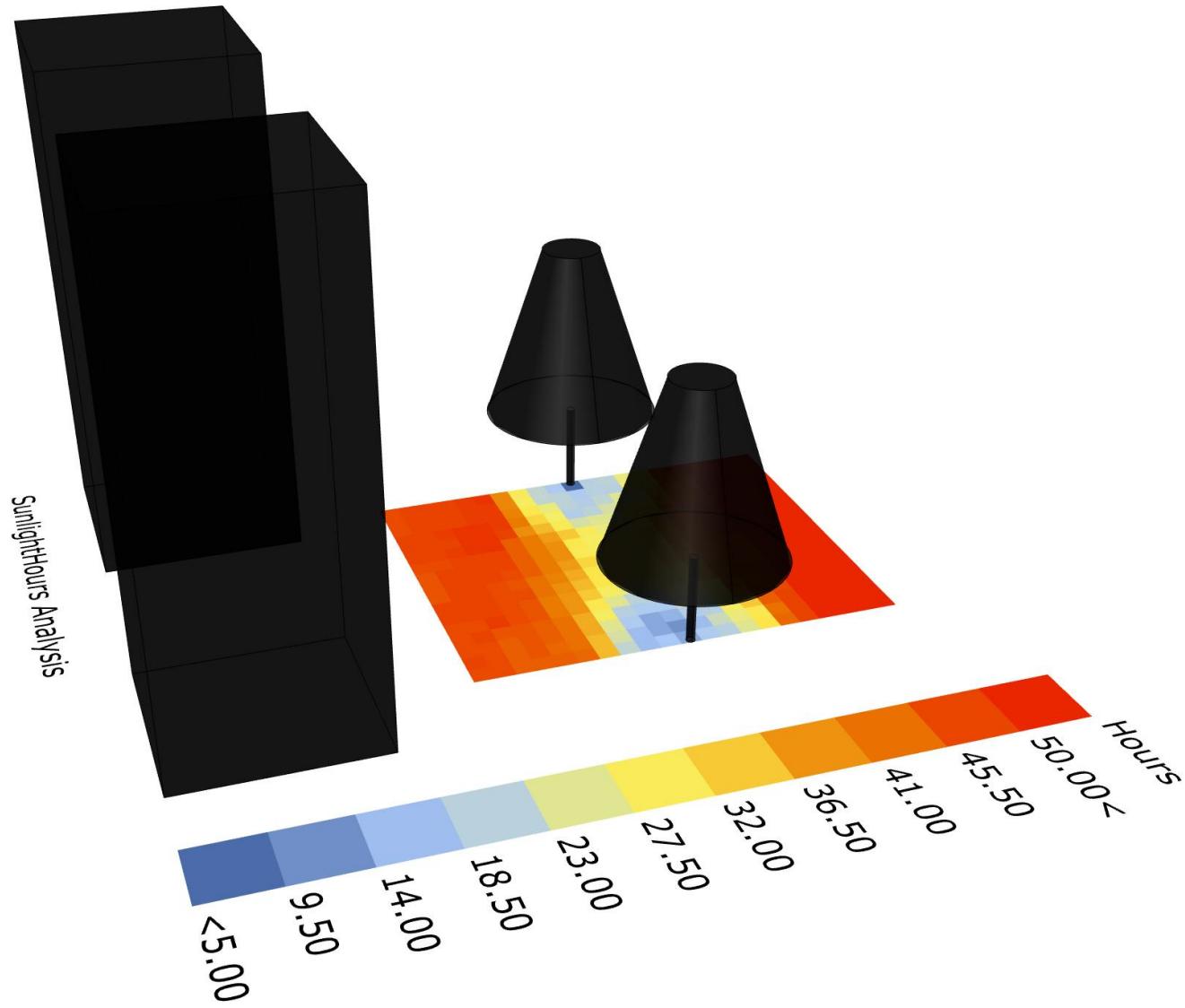


Sunlight Hours = 18711.41



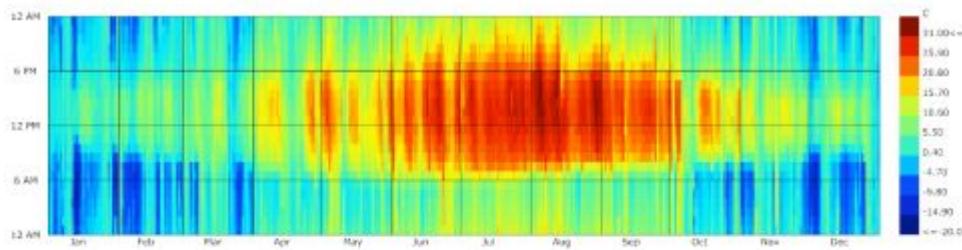
Sunlight Hours = 14678.99



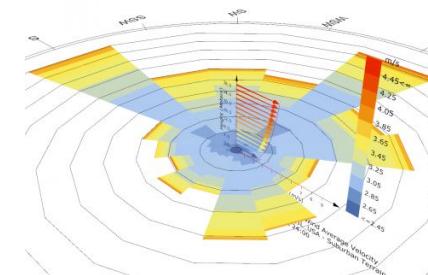


Simulation Driven Design Process

Weather Data Analysis

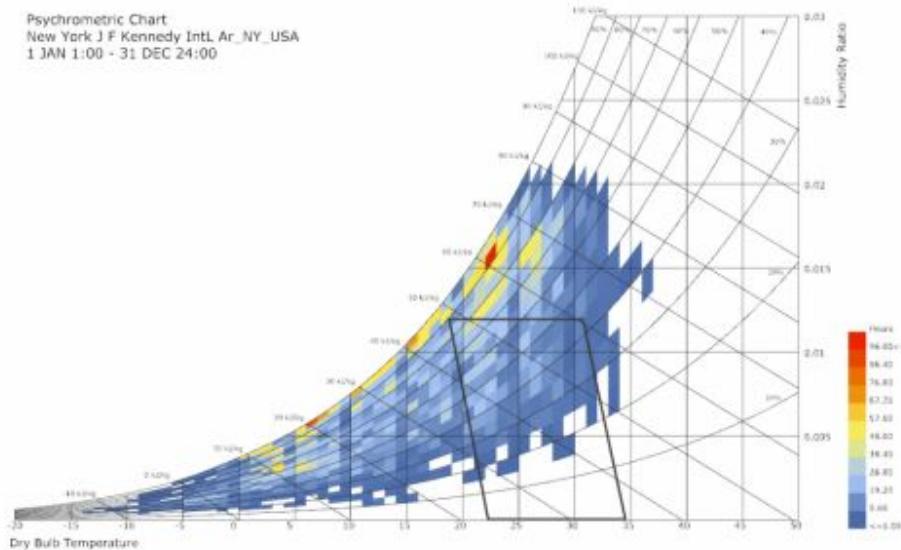


Dry Bulb Temperature



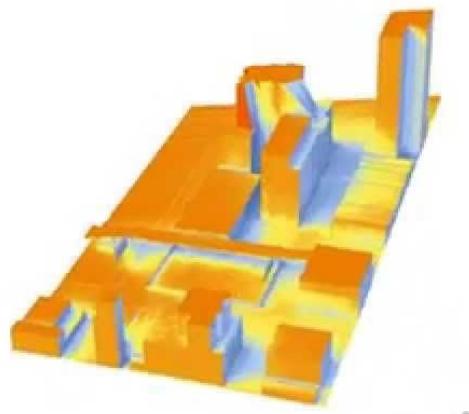
Windrose

Psychrometric Chart
New York J F Kennedy Intl Ar_NY_USA
1 JAN 1:00 - 31 DEC 24:00

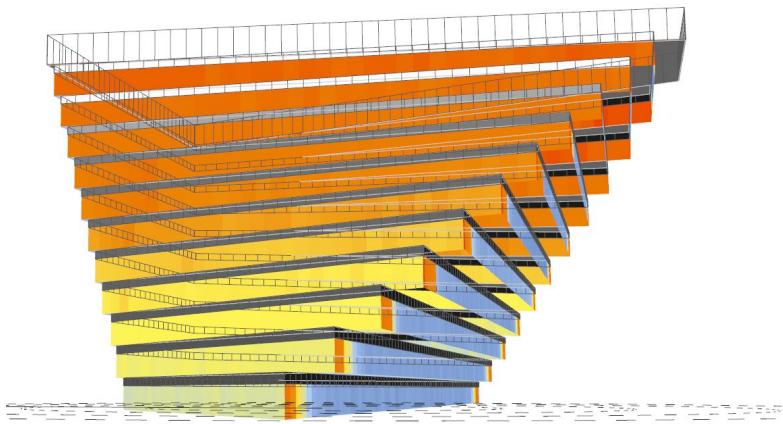


Psychrometric Chart

Climate Studies

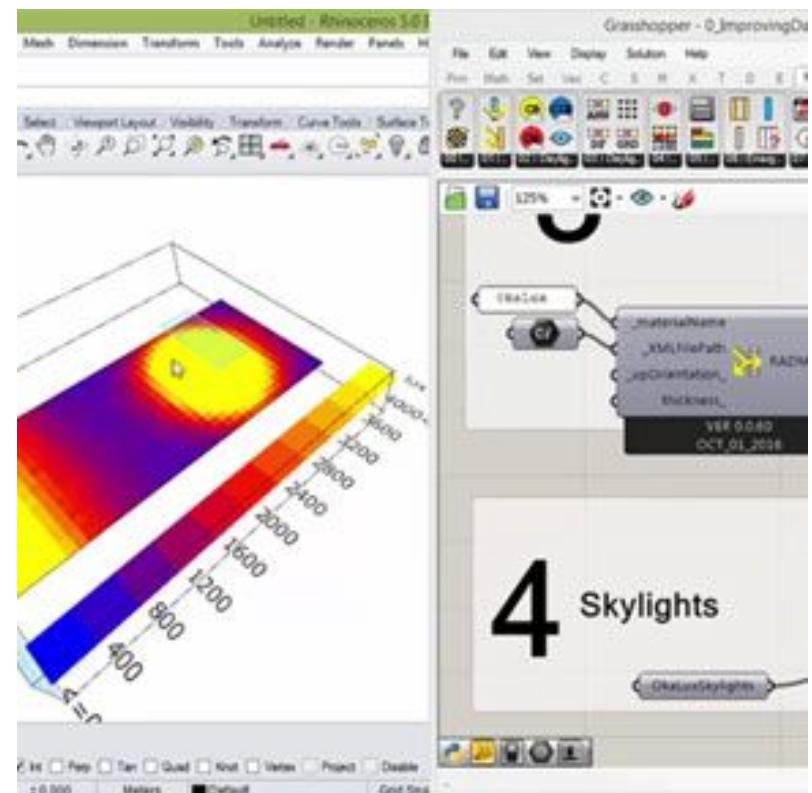
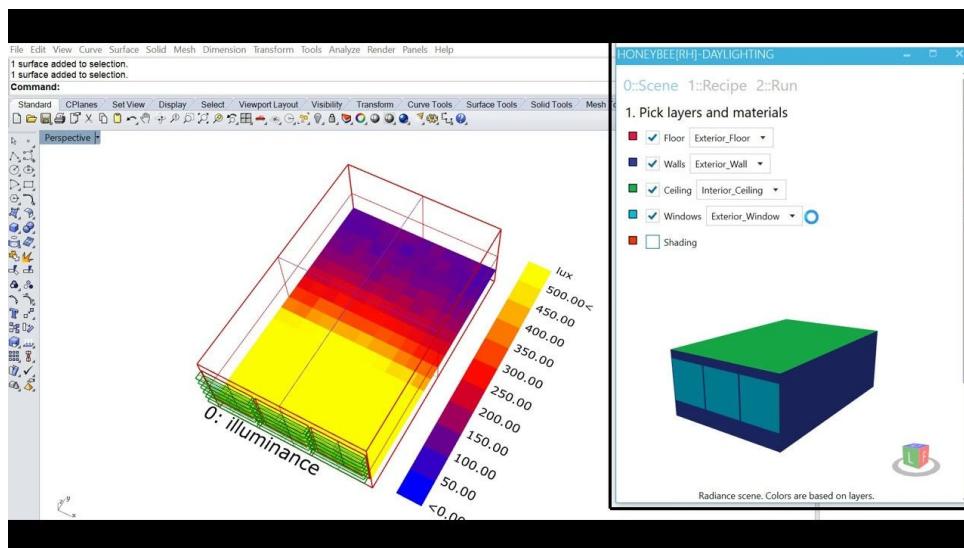


Sunlight Hours Analysis



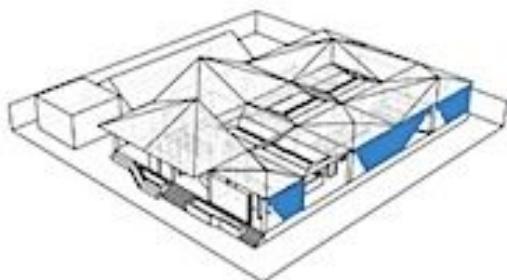
Radiation Analysis

Daylight Studies

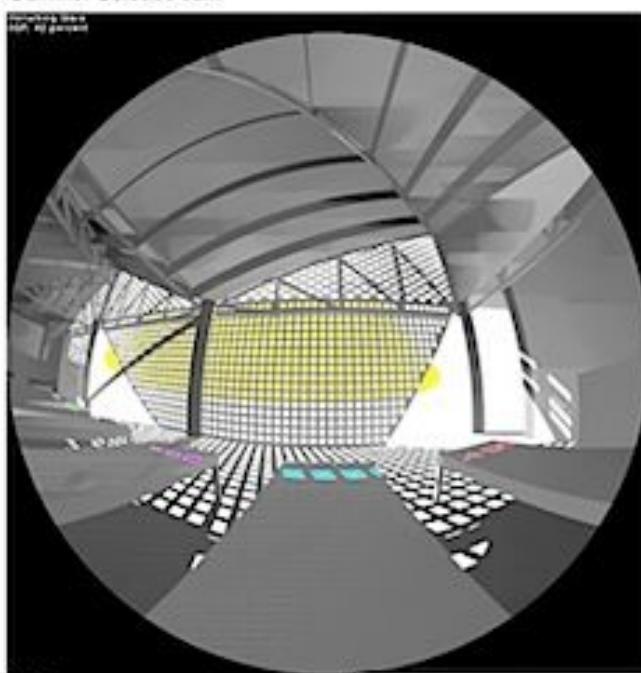


Illuminance Analysis

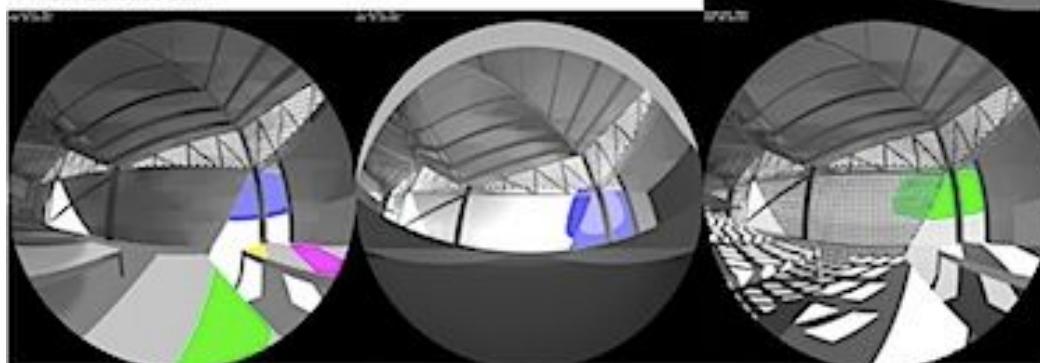
Daylight Studies



Summer Solstice 9am



Winter Solstice 9am



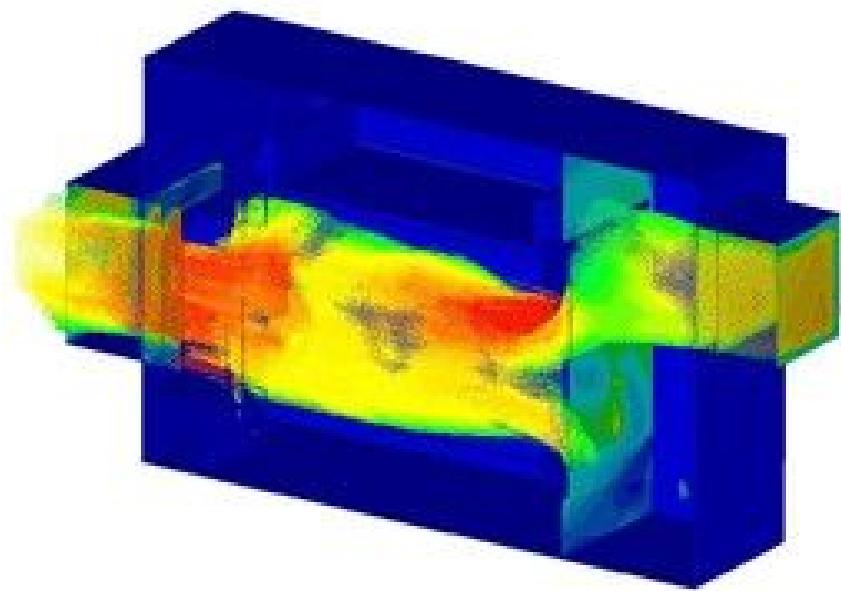
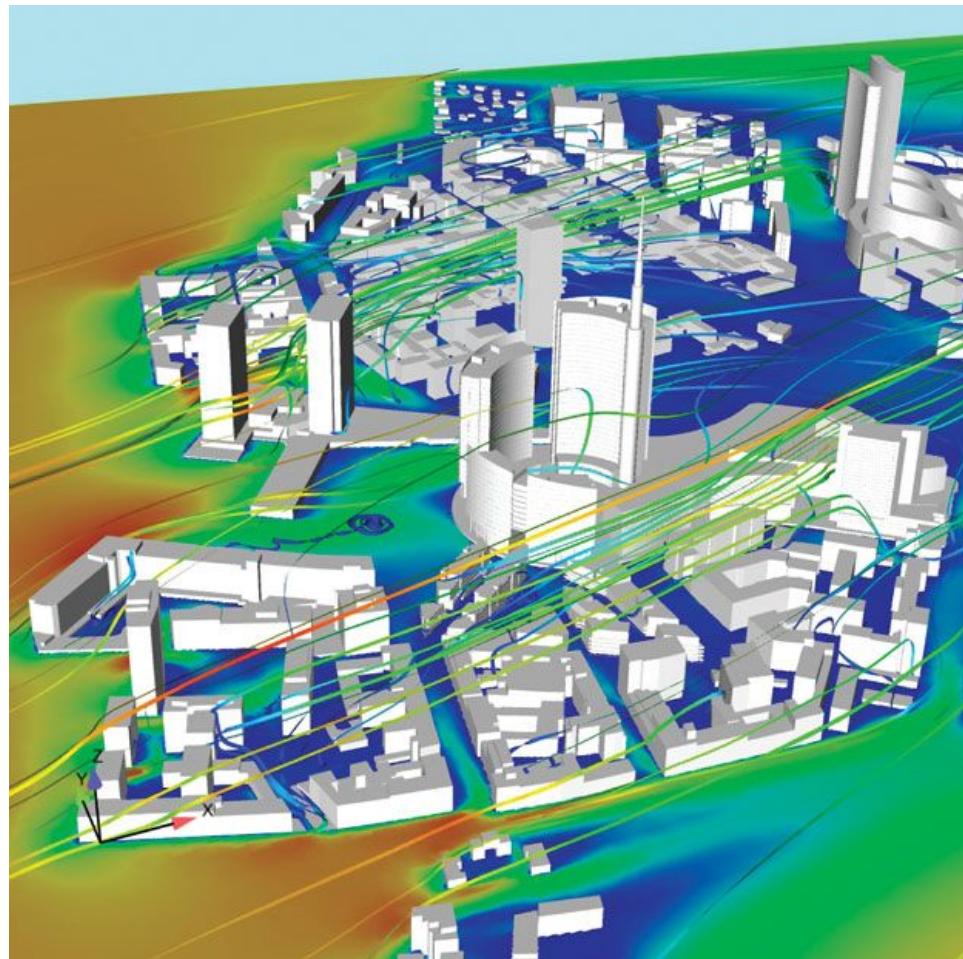
Opaque Panel
50% Reflectance
Perceptible Glare

Translucent Panel
40% Transmission
Perceptible Glare

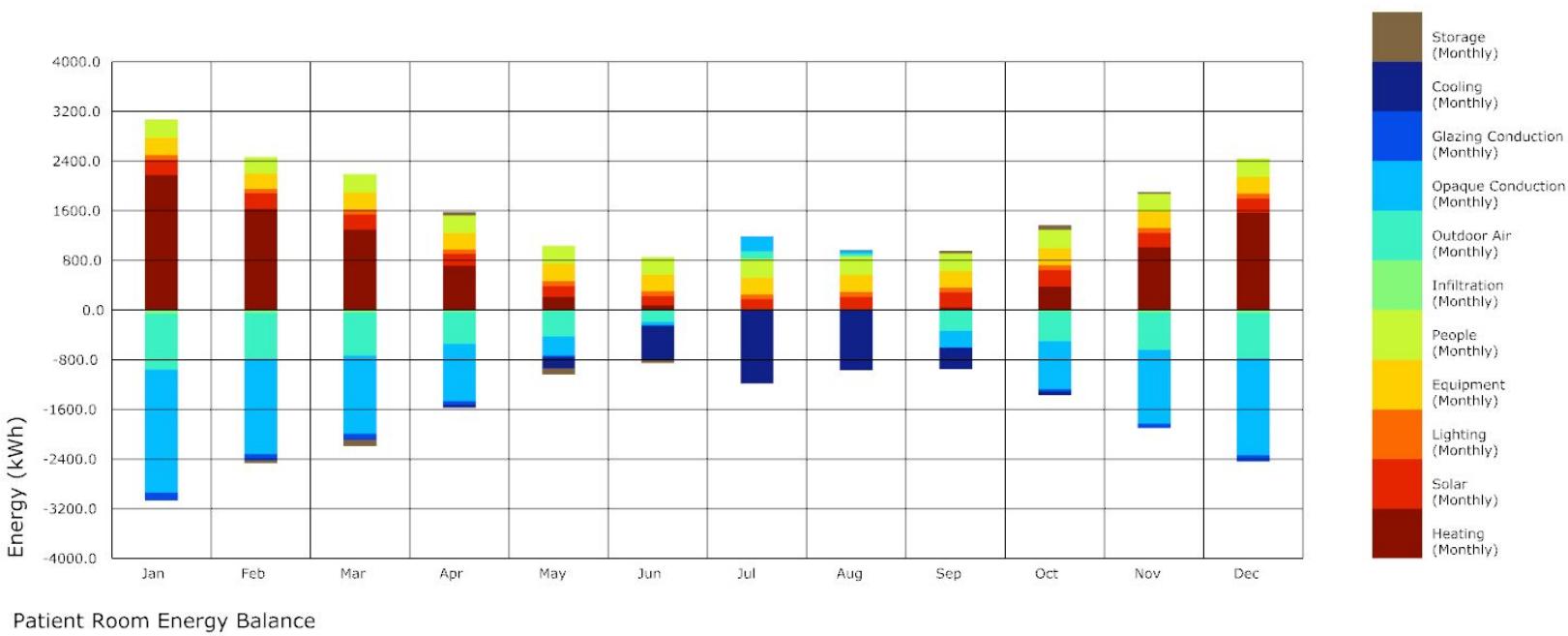
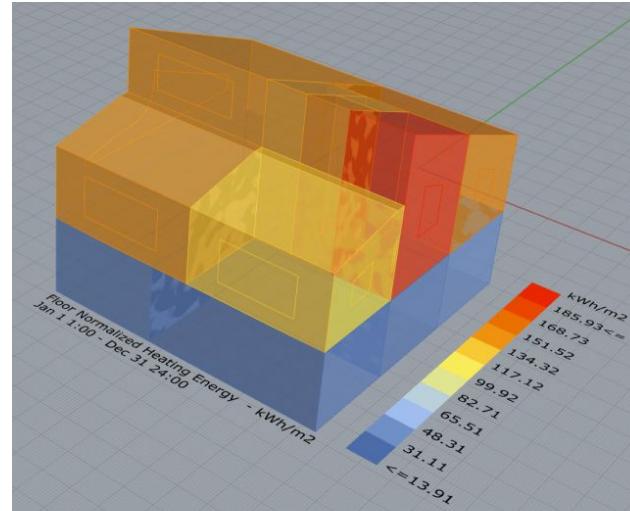
Open Screen
40% Open
Intolerable Glare

Glare Analysis

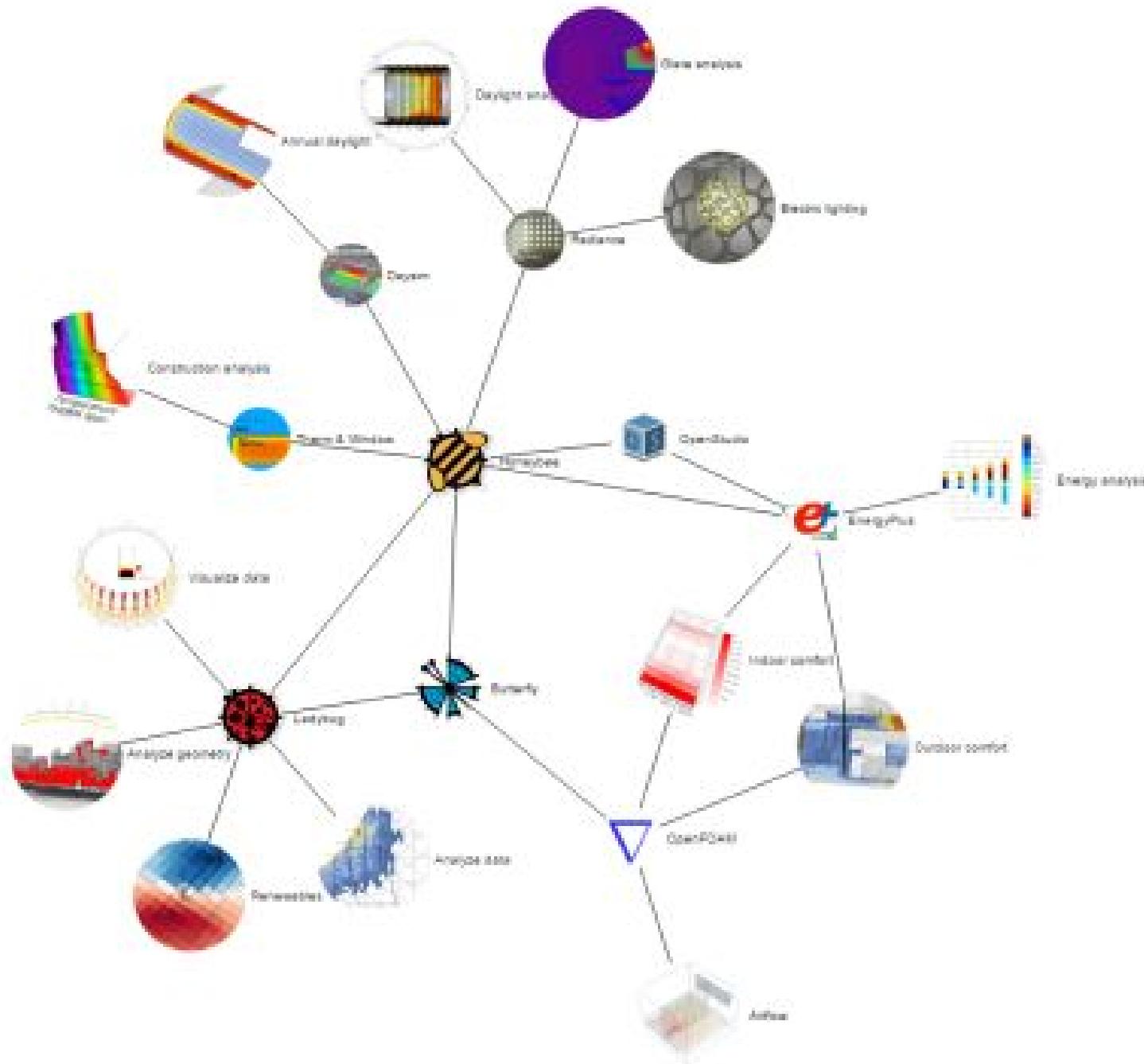
Airflow Studies



Energy Modelling



Simulation tool overview



Questions & Comments

Thank you all!