Workshop for the Cool Roofs and Pavement Working Group – GSEP

September 12-13, 2011

10 Actions by Mexico City to Address Climate Change

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CENIDET/CIICAP-UAEM

SEP

SECRETARÍA DE EDUCACIÓN PÚBLICA

Sistema Nacional de Educación Superior Tecnológica

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Centro Nacional de Investigación y Desarrollo Tecnológico

XX Aniversario 1987 - 2007

National Center for Research and Technology Development-DGEST-SEP

1987-2011

Cuernavaca, Morelos, México


UNITED STATES
MEXICO
Gulf of Mexico
Caribbean Sea
Cuernavaca, Morelos, México

Mexico City Action Program

- Mexico City was the first city in Latin America to implement a Climate Action Program (DF has an area of 1400 Km2).

- This program has enabled the reduction of 4 % of Mexico City's greenhouse gas emission (1,397,942 metric tons of carbon dioxide).

- The 2008–2010 Mexico City Climate Action includes:

- 1 Transport Corridors / Zero Emissions Transport Corridor
- 2 ECOBICI Individual Transport System
- 3 Minibus and Taxis Replacement Program
- 4 Metro Line 12
- 5 Sustainable Housing Program
- 6 Solar Energy Use Regulations
- 7 Mexico City Goverment Enviromental Management System
- 8 Green Roofs Program
- 9 Recovery of the Rivers Magdalena and Eslava
- 10 Restoration of Ecosystems and Compensation for Maintaining Environmental Services

The Green Roof Program's objectives are:

- To encourage and promote the construction and use of urban green roof systems.
- To create the necessary conditions for the use of green roof systems, with the aim of creating green belts that act like lungs for the city, retaining dust and suspended particles in the atmosphere, filtering the air, regulating the humidity of the area and creating microclimates.
- To promote and manage the creation of regulations, quality requirements, economic and tax incentives and projects for the use of green roof systems.
- To create environmental awareness. It is expected that, with the implementation of the Program, 10,000 square meters (m^2) of green roofs will be established per year in the 2010–2012 period.

In December 2008 the Environmental Regulations for the Federal District NADF-013-NAT-2007 were published, which establish the technical specifications for the installation of green roof systems in the Federal District.

Yautlica Environmental Education Center.

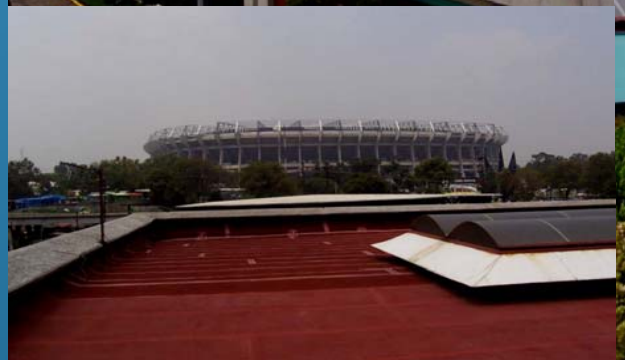
- In 2007 and 2008 results for green roof construction on urban buildings in Mexico City were 3,578.82 m2 and 6,200 m2 respectively.

- In2009, by means of resolute measures to mitigate environmental impact, the following buildings have green roofs:
- Plaza Central with a green surface area of 3,000 m2
- Preparatory School "General Lázaro Cárdenas del Río" with a green surface area of 183.50 m2.
-
- In 2010, there are 13 public buildings (hospitals and schools) whose structural analysis enables them to participate in the program.
- Their combined total green surface area comes to 13,012 m2.

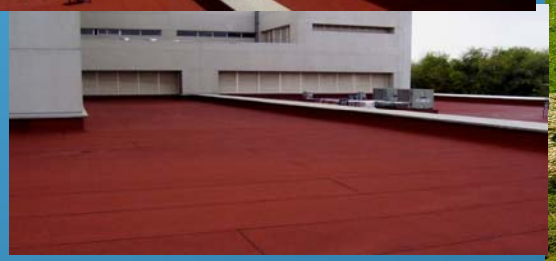
Some of the buildings with green roofs include:

- The Natural History Museum,
- Technical Secondary School No. 14
- "Cinco de Mayo", CENDI located on the street Delicias,
- Insurgentes metro station building, Coyoacán
- Preparatory School "Ricardo Flores Magón",
- Dr. Belisario Domínguez Specialities Hospital,
- Iztacalco Preparatory School "Felipe Carrillo puerto",
- Yautlica Environmental Education Center.

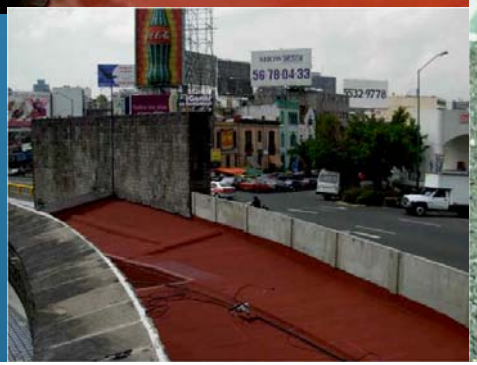
Preparatory School "Ricardo Flores Magón"



Dr. Belisario Domínguez Specialities Hospital,



Insurgentes Metro Station



The Mechanical Engineering Department is divided into two Groups, each with its own research area:

Mechanical Design Group

Thermal Systems Group

Each group has one main research area:

Optimization of **Mechanical Systems**

5 Professors

Energy in Buildings and related solar systems

6 Professors

Energy in buildings and related solar systems

Energy Efficiency in buildings

- Climate characterization and strategies of comfort in buildings
- Evaluation of thermal loads of buildings
- Studies of movement of air in rooms-Ventilation
- Thermal studies of components: glazing, window frames, roofs, walls and its thermal effect in rooms.
- Thermal studies in passive systems.

Thermophysical and optical material properties

- Devices for the measurement of thermophysical properties of materials
- Analysis of thermophysical and optical properties of materials

Select one area

Studies of related solar systems

- Air and water solar collector systems
- Solar drying systems
  - Corn
  - Cactus
  - Ceramic
  - Mango
- Thermal Studies in open cavities

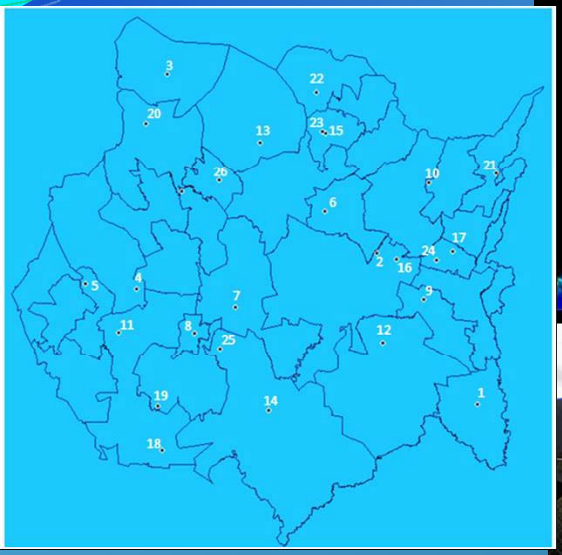
Research projects related to roofs

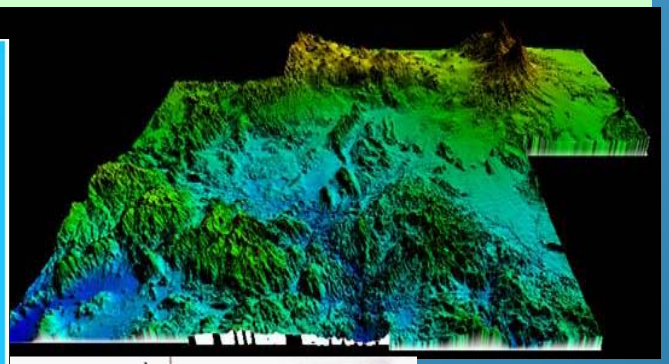
- **Thermal studies in building components: Temperature distribution study of test modules considering different windows and roofs (CONACYT).**

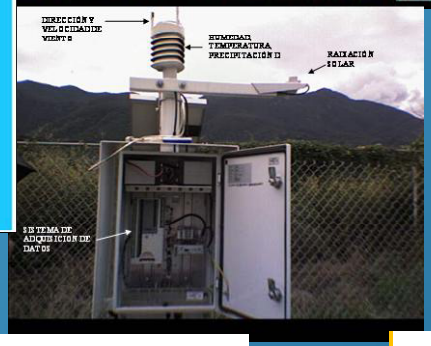
- **Thermal evaluation of the heat load and building rating in the State of Morelos (FOMIX-2004)**

- **Development and validation of a methodology to measure the impact of energy savings for the use of passive systems in buildings in Mexico (in process)**
- **SENER-CONACYT.**

Local climate studies
State of Morelos







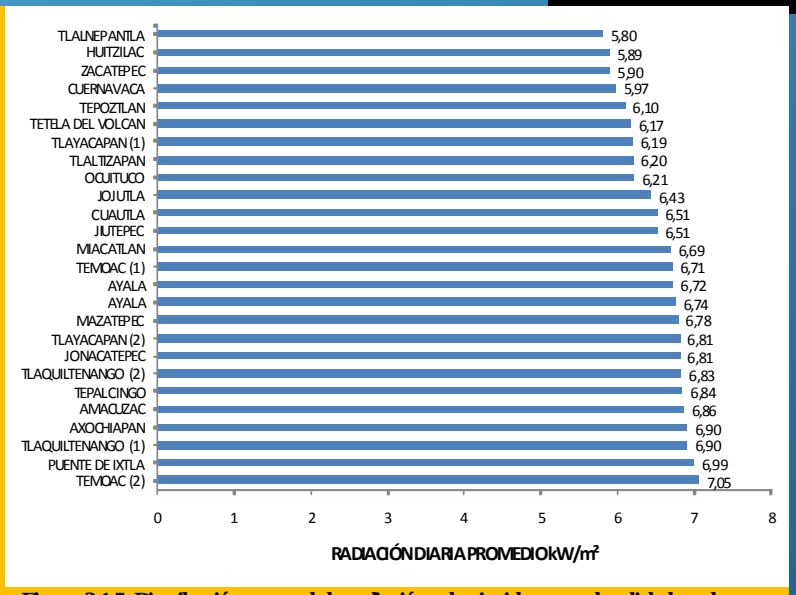


Figura 3.1.5. Distribución mensual de radiación solar incidente por localidad en el Estado de Morelos para el mes de Mayo de 2007.

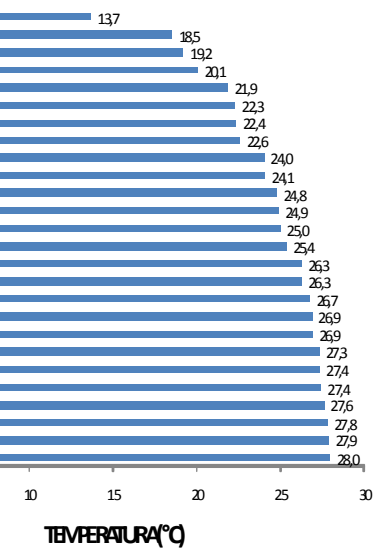
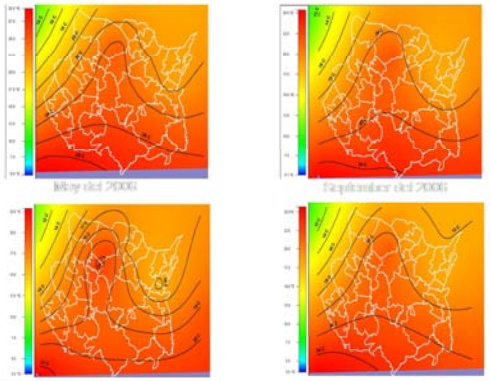


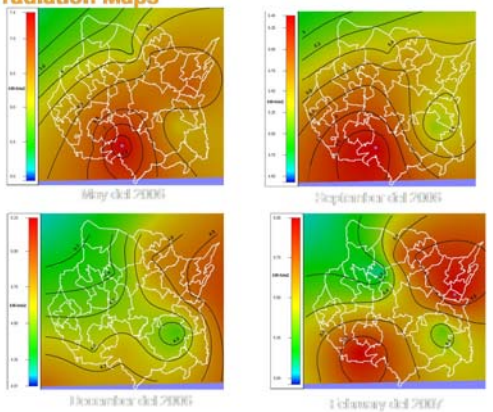
Figura 3.2.5. Distribución mensual de temperatura por localidad en el Estado de Morelos para el mes de Mayo de 2007.

Mean Temperature maps

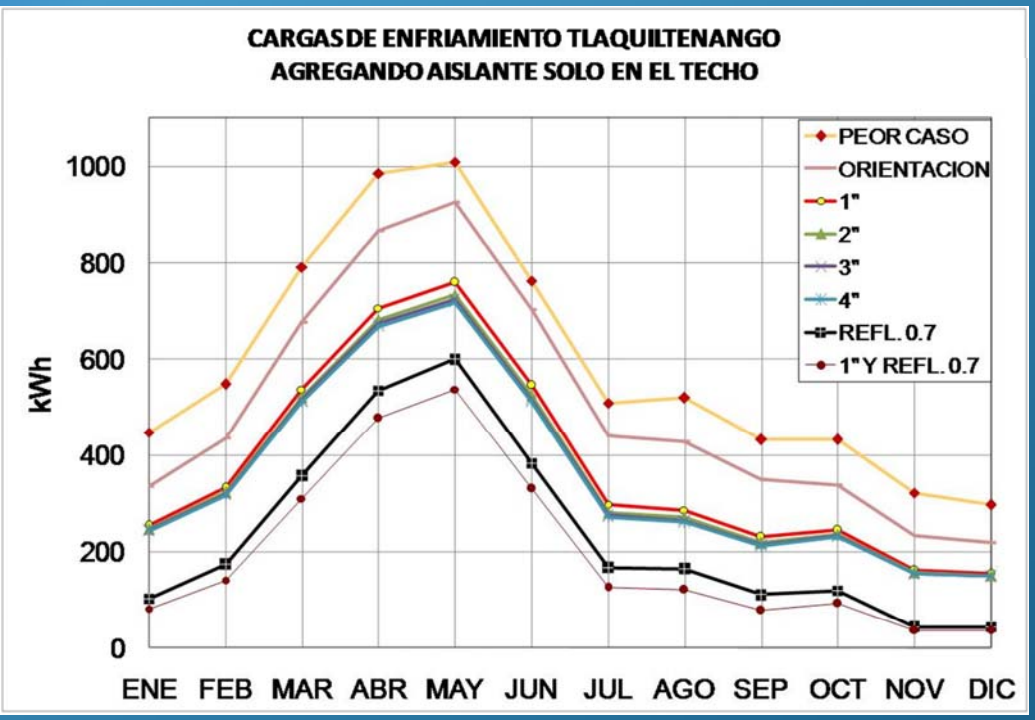


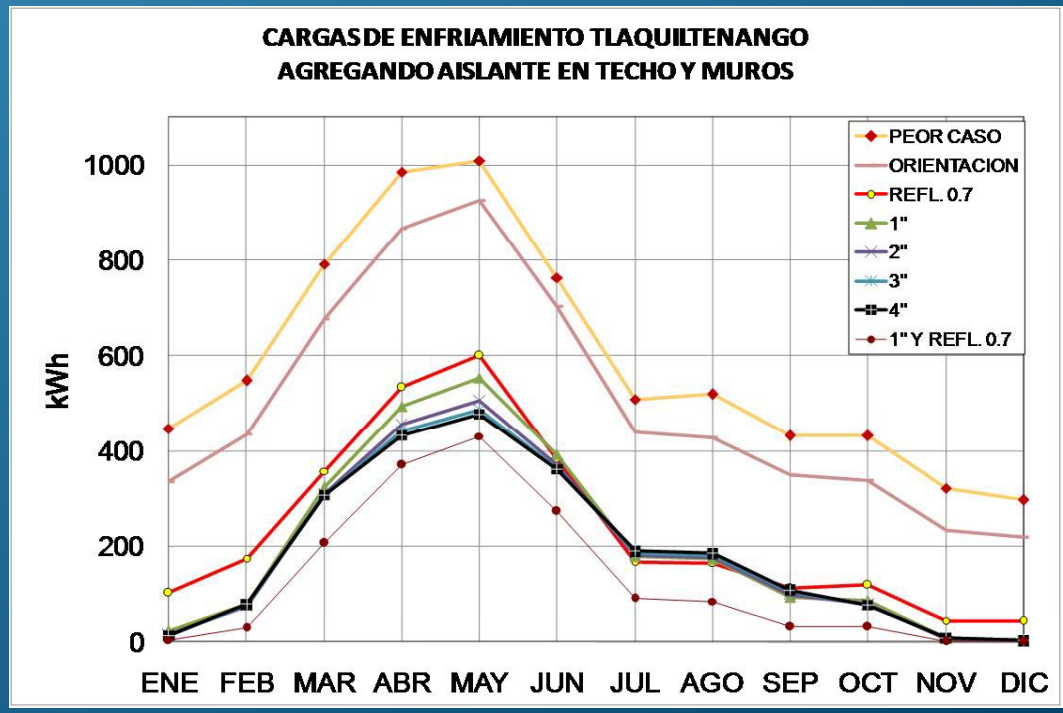
Morelos State

Solar radiation Maps

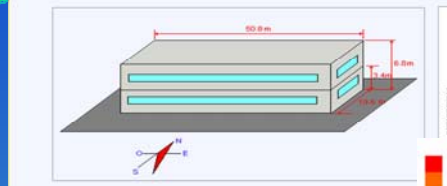


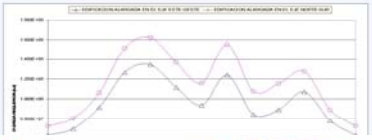
Thermal loads in buildings

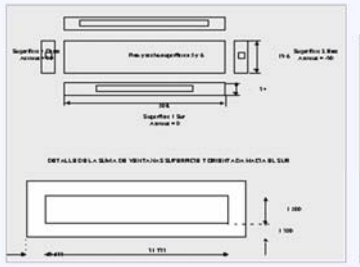


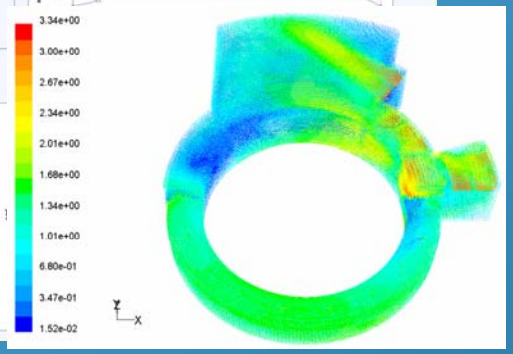


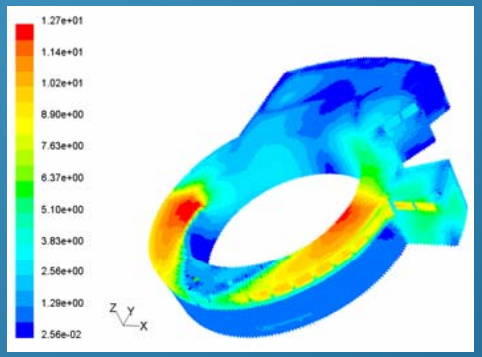
Evaluation of thermal loads of buildings

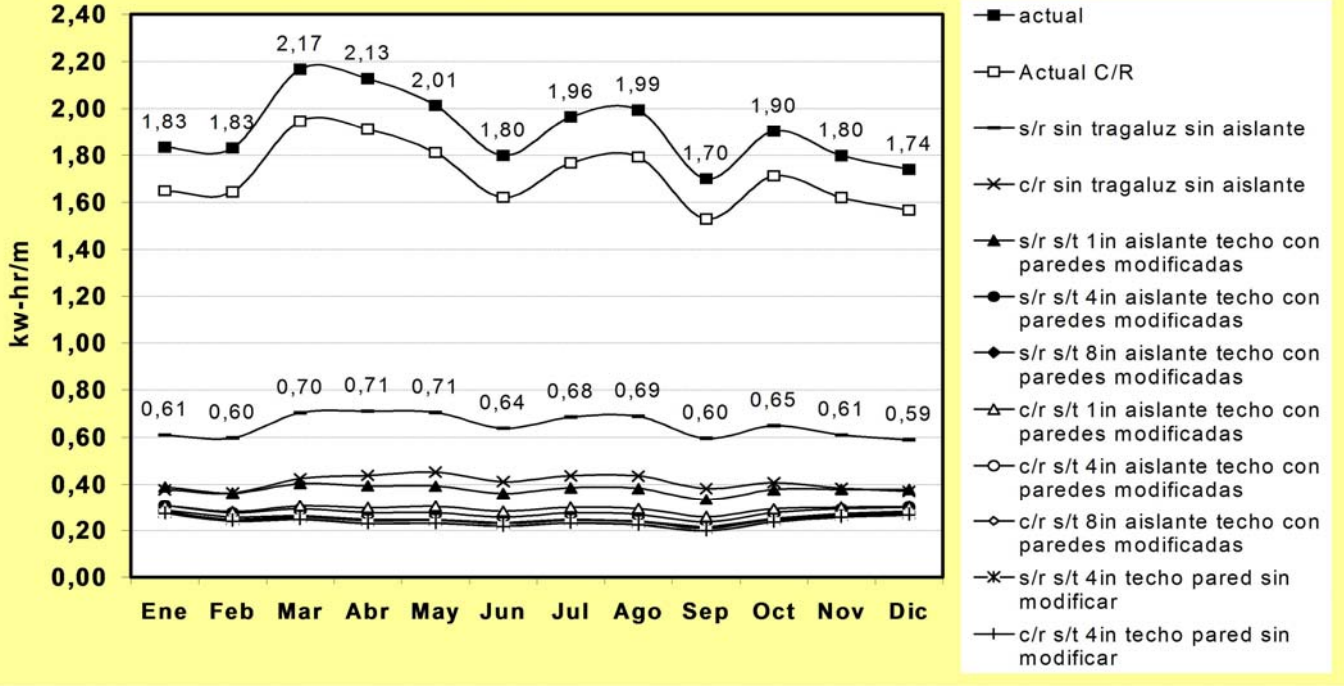




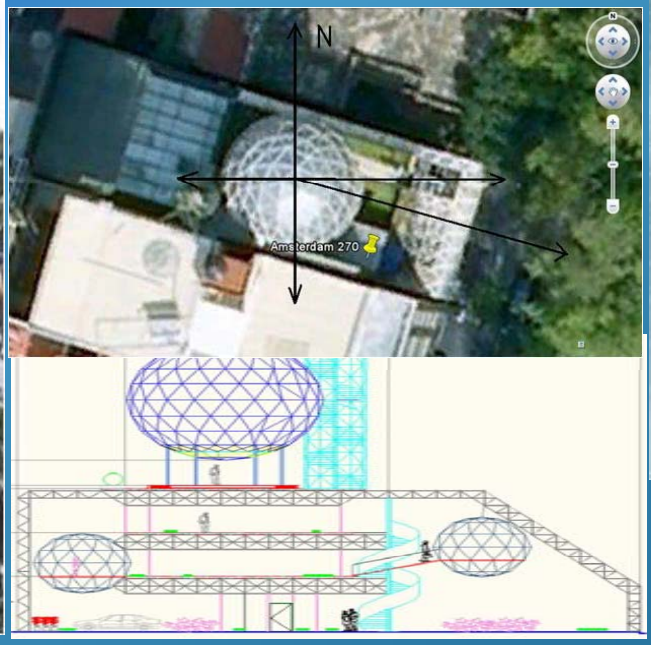






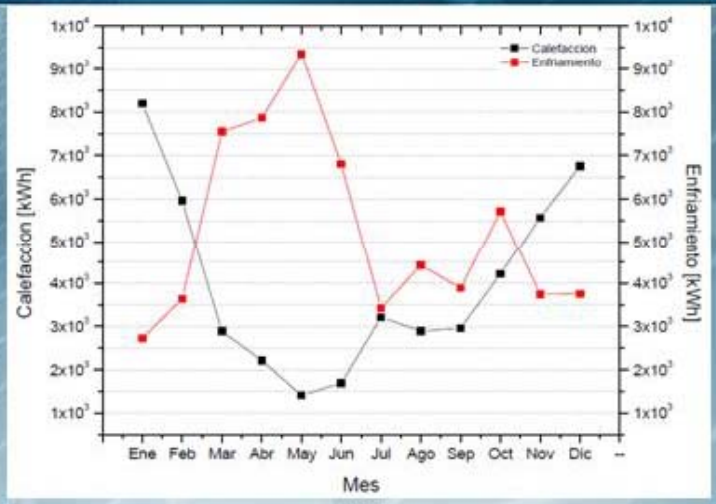


Thermal loads in buildings of low thermal mass



A continuación se presentan las cargas térmicas requeridas mensualmente para calefacción y refrigeración para el edificio completamente.

Diseño Original



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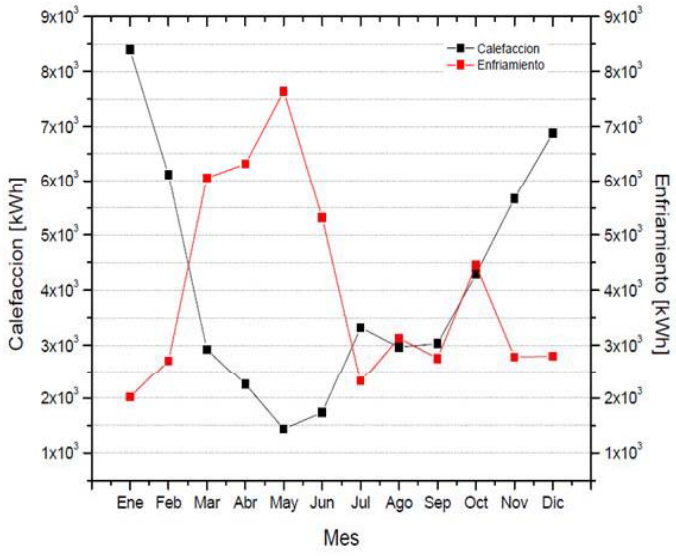
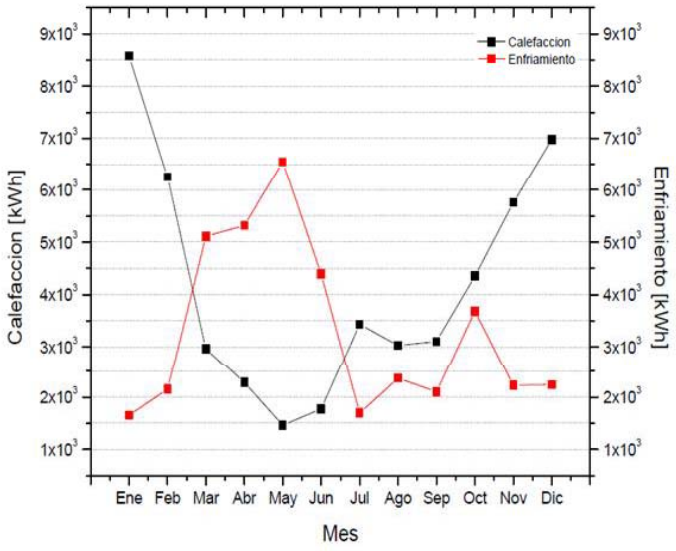
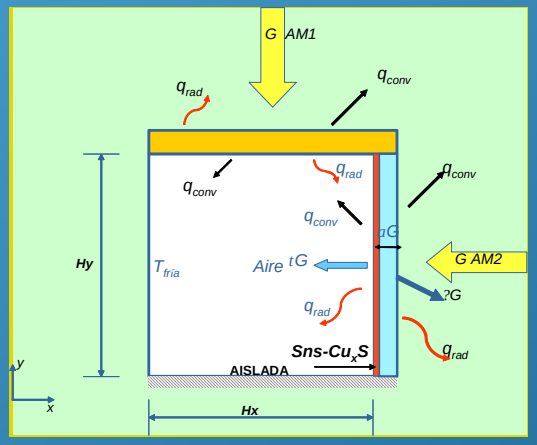
Sombreado de Techo Vidriado 30% de su Área



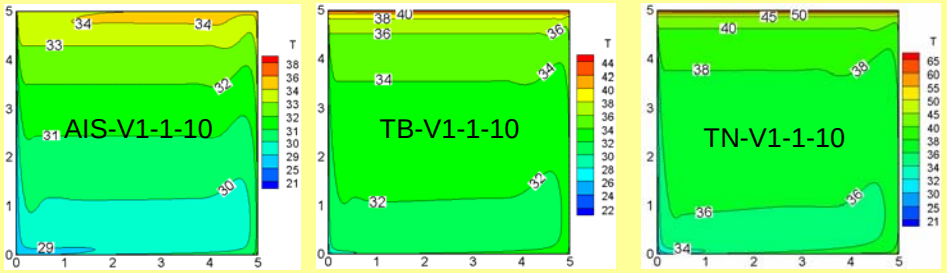
Sombreado de Techo Vidriado 50% de su Área



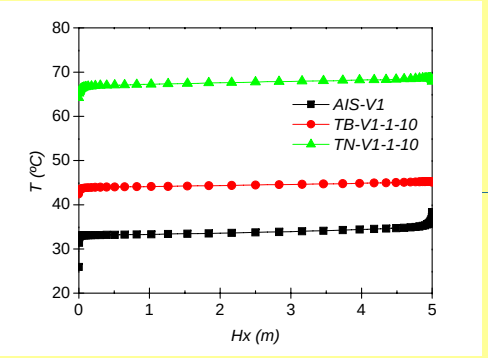
Thermal studies of the influence of window and roofs in cavities



Analysis of thermal conduction through the roof.



Isotherms 6mm single glazing, 3 kinds of roofs

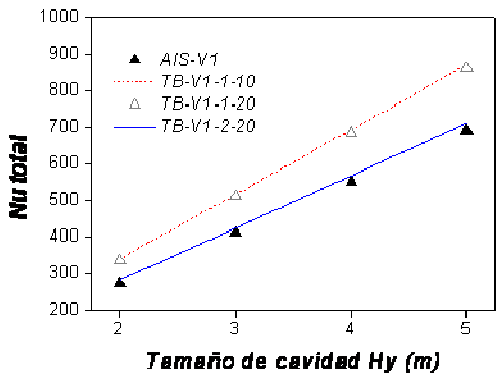


Temperature distribution on roof

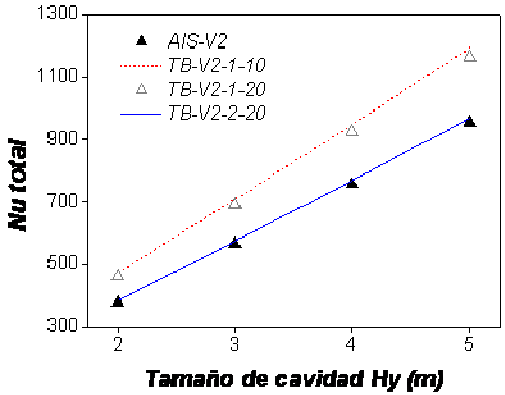
Average temperature in the cavity and roof

Temperatura promedio	Sin filtro de control solar		
	AIS-V1	TB-V1-1-10	TN-V1-1-10
Tcavidad (ºC)	31.61	33.84	38.06
Ttecho (ºC)	33.86	44.48	67.71
Dif. horizontal (ºC)	12.45	2.81	4.49

Nusselt Numbers for the cavity with a clear glass



Nusselt Numbers for the cavity with a solar control glazing



Thermal studies in building components: windows and roofs

Sistemas de edificaciones | Transferencia de calor en ventanas | Transferencia de calor en materiales de construcción

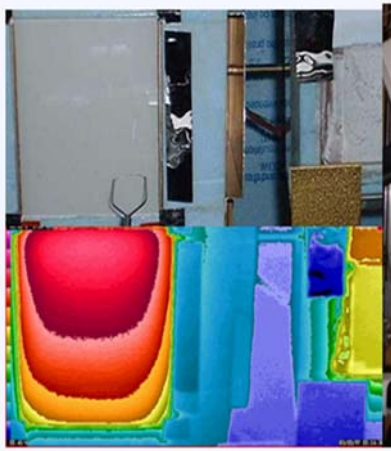
Estudios de la transferencia de calor en materiales de construcción (losas, ventanas y paredes).

Regresar

Análisis térmico de vidrios, techos, y paredes

Sistemas de edificaciones | Transferencia de calor en ventanas | Transferencia de calor en materiales de construcción

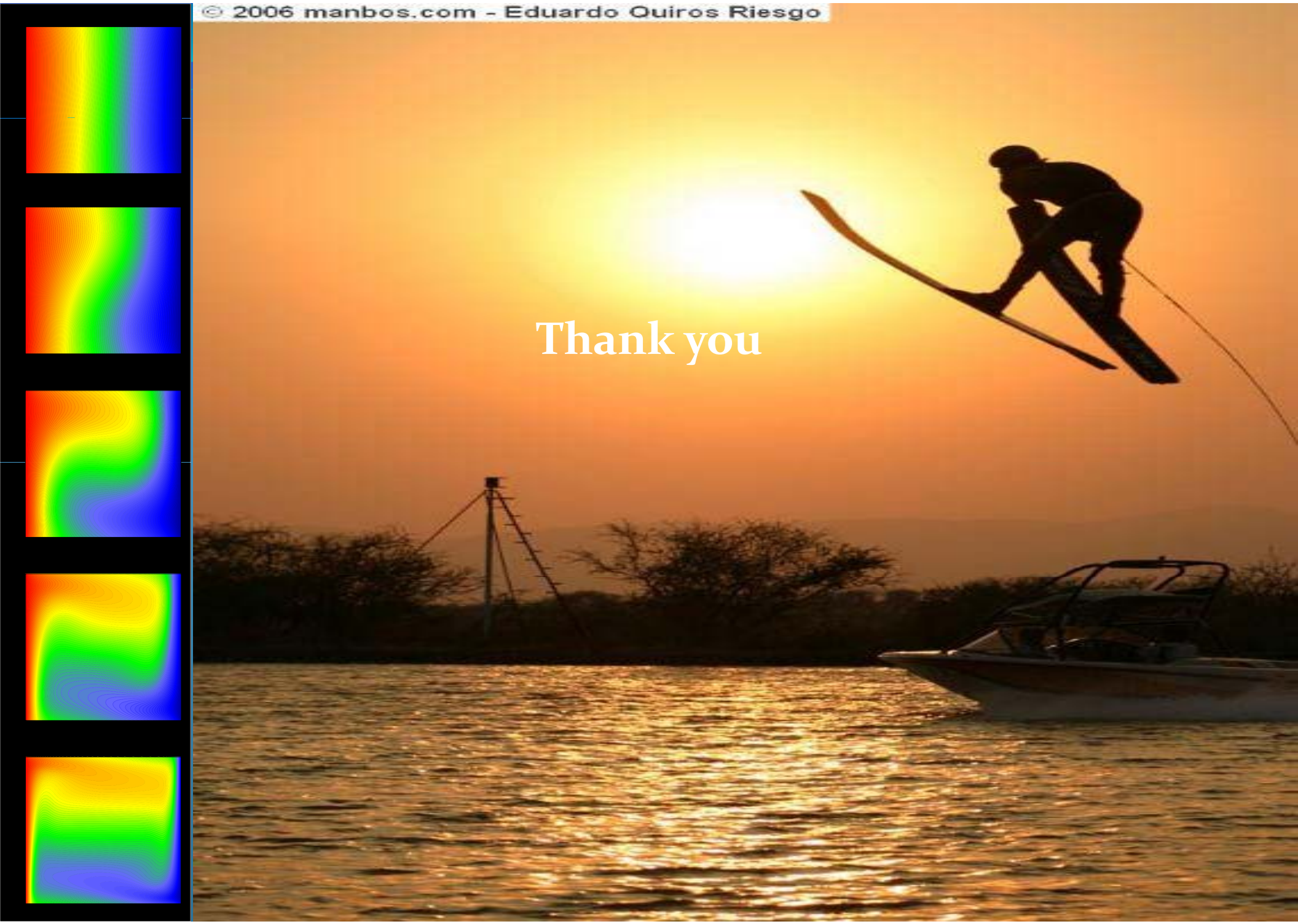
Estudios de la transferencia de calor en ventanas utilizando procesamiento de imágenes infrarrojas.



Regresar

Funding Research Projects

- CONACYT
- MINISTERY OF EDUCATION
- Industrial Sector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Thank you