SPATIAL ANALYSIS OF THE NATURAL GEOSYSTEM IN TOLUCA VALLEY, MEXICO STATE:

EVALUATING ITS POTENTIAL FOR THE USE OF SOLAR ENERGY

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Contents

- Introduction
- Aim
- Method
- Results
- Conclusion

Introductory comments

"Solar energy reaching the earth surface, refered as surface solar radiation, global radiation or simply solar radiation, depends on the geographic location, orientation of the Surface, time of the day, time of the year and atmospheric composition"

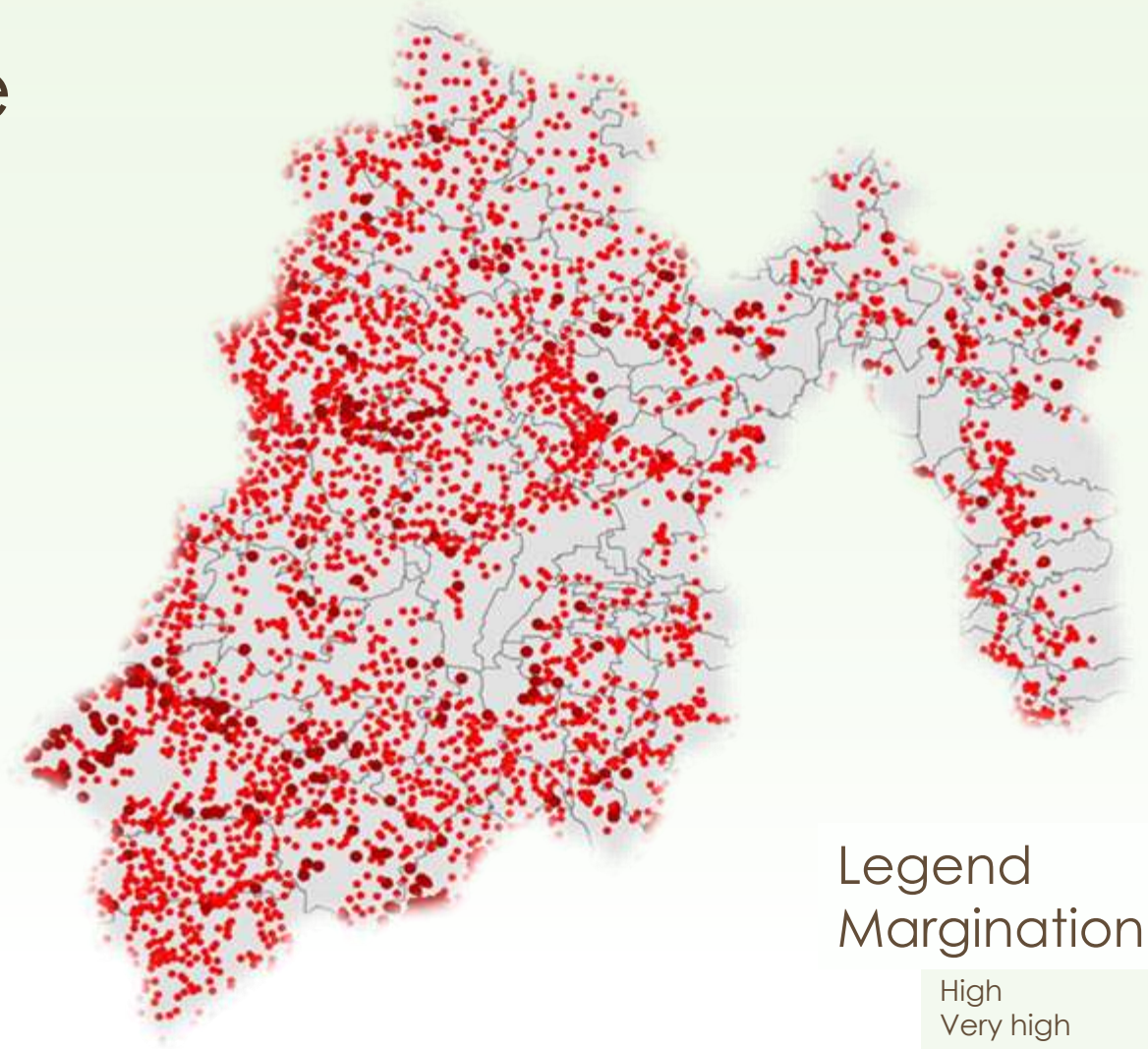
Boes, 1981, cit by Bojanowski, 2014.

Mexico State

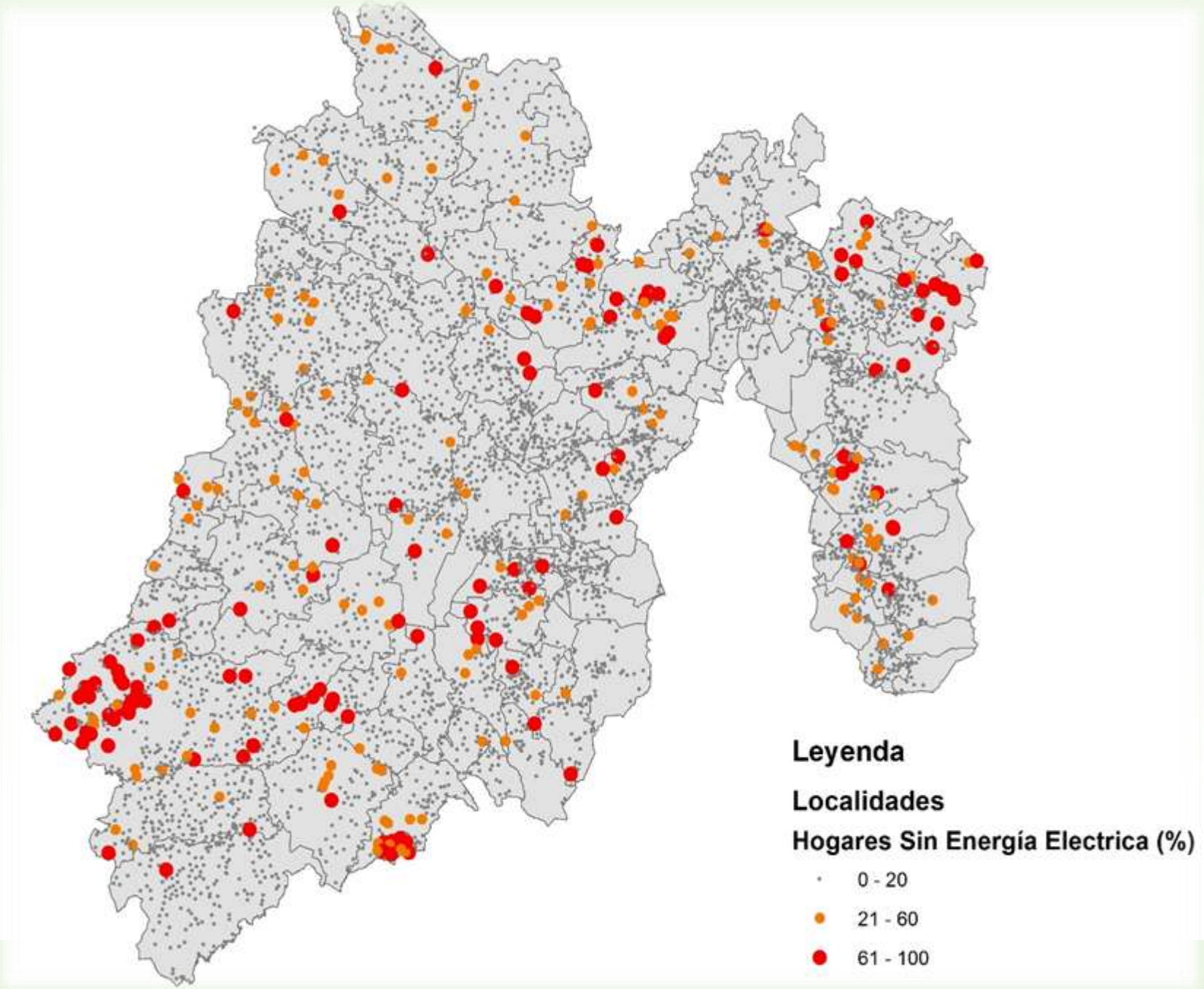
15 Mill. Inhabitants
22 sq. km

Mexico State

Despite being one of the most economically developed; Mexico State has several communities with high margination degree, which implies low access to services (electricity).

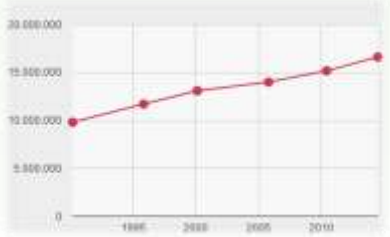


Houses without electricity



Mexico State is highly Demanding

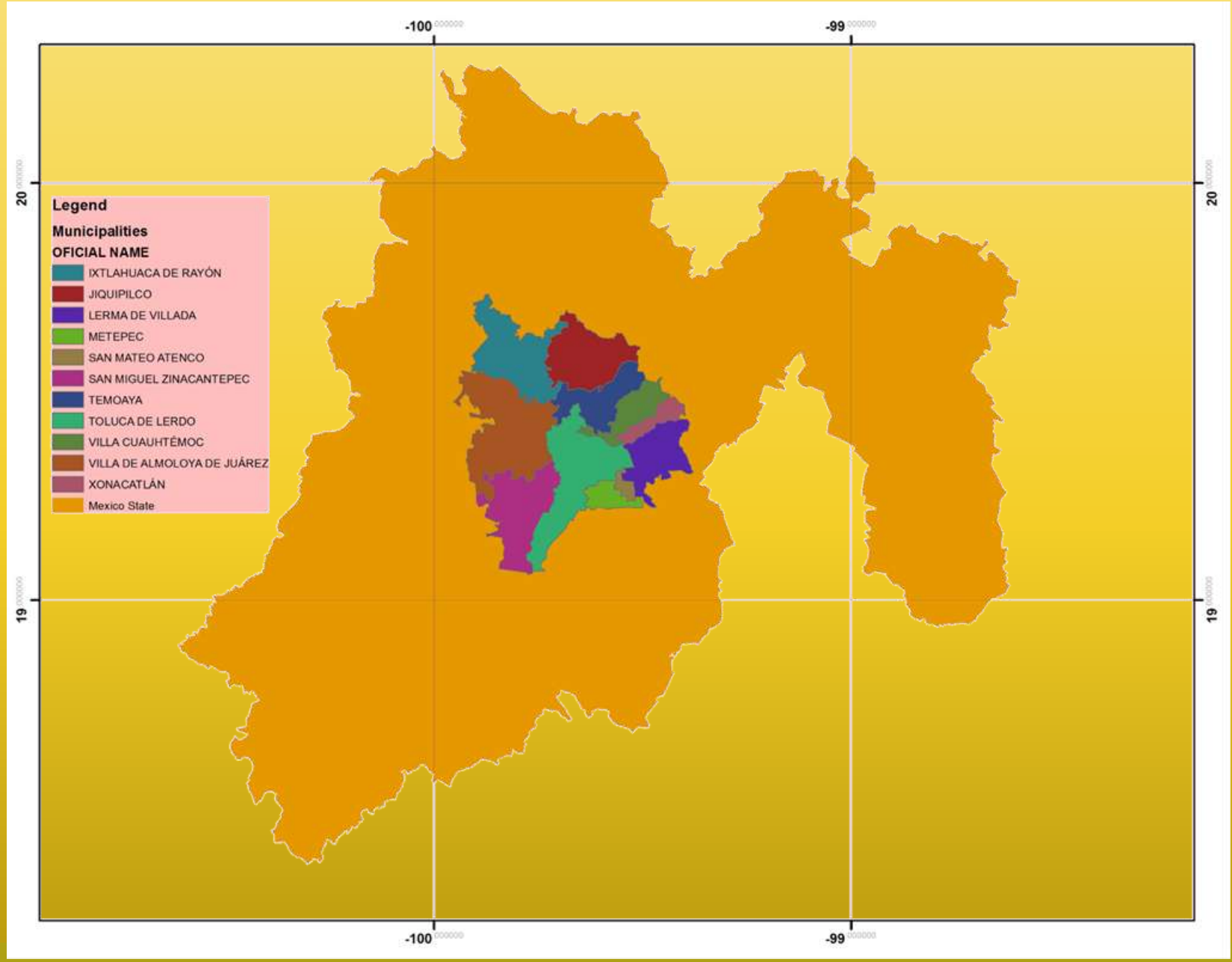
	Name	Population Projection (P 2014-07-01
1	Ecatepec	1,742,000
2	Nezahualcóyotl	1,158,100
3	Naucalpan	835,200
4	Chimalhuacán	688,800
5	Tlalnepantla	682,200
6	Ciudad López Mateos	527,700
7	Toluca	520,800
8	Cuautitlán Izcalli	517,200
9	Xico	388,000
10	Ixtapaluca	357,600



Inhabitants of the Metropolitan region of Toluca are high consumers of electric energy – There is a strong demand

NASA *earth at night project*, 2012.

Study Area


-100
-99
20
19
Legend
Municipalities
OFICIAL NAME
IXTLAHUACA DE RAYÓN
JIQUIPILCO
LERMA DE VILLADA
METEPEC
SAN MATEO ATENCO
SAN MIGUEL ZINACANTEPEC
TEMOAYA
TOLUCA DE LERDO
VILLA CUAUHTÉMOC
VILLA DE ALMOLOYA DE JUÁREZ
XONACATLÁN
Mexico State

Aim

- This is a first approach to the potential that the State of Mexico has for the explotation of solar energy for the instalation of fotovoltaic cells
- Does not reach the site-level of detail
- Nor account for detailed technical aspects of the installation of cells

But

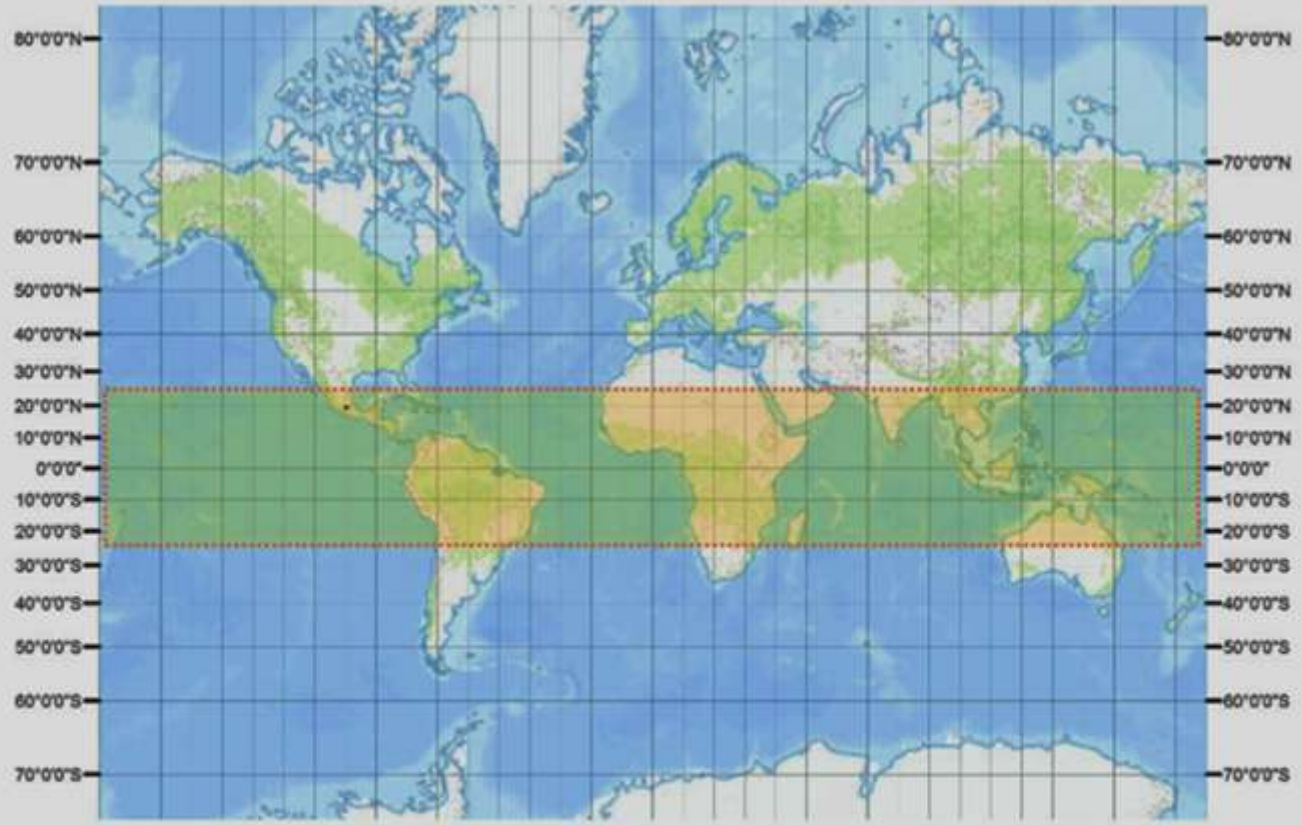
Performs a geographic analysis based on cartography of the overall potential for the use of solar energy

Method

- A cartographic review and analysis of the characteristics of the State of Mexico
- Acquisition and geo processing of data regarding sun radiation recorded at the meteorological station

Results

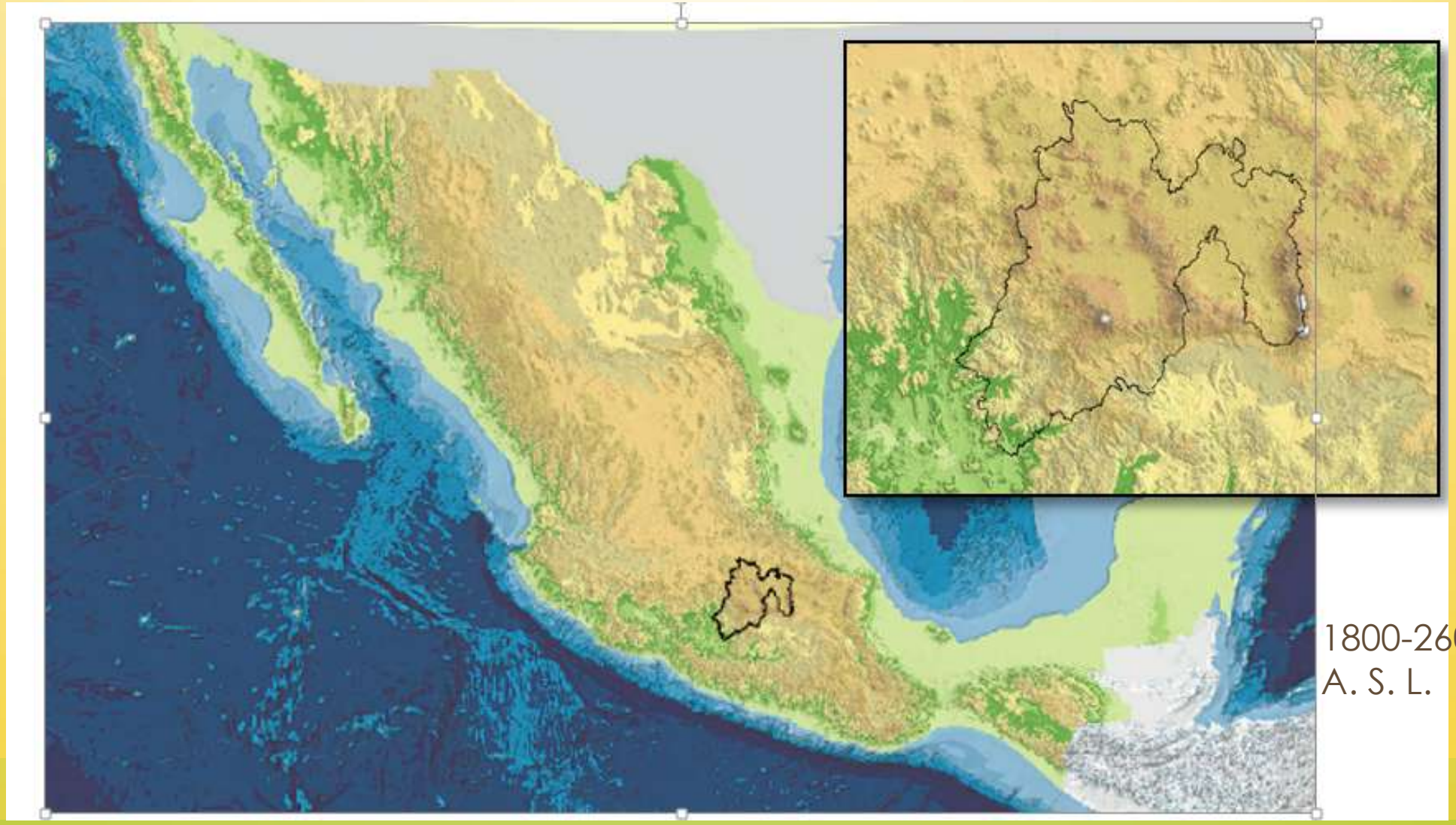
First factor: Location



Mexico State is located at the intertropical fringe

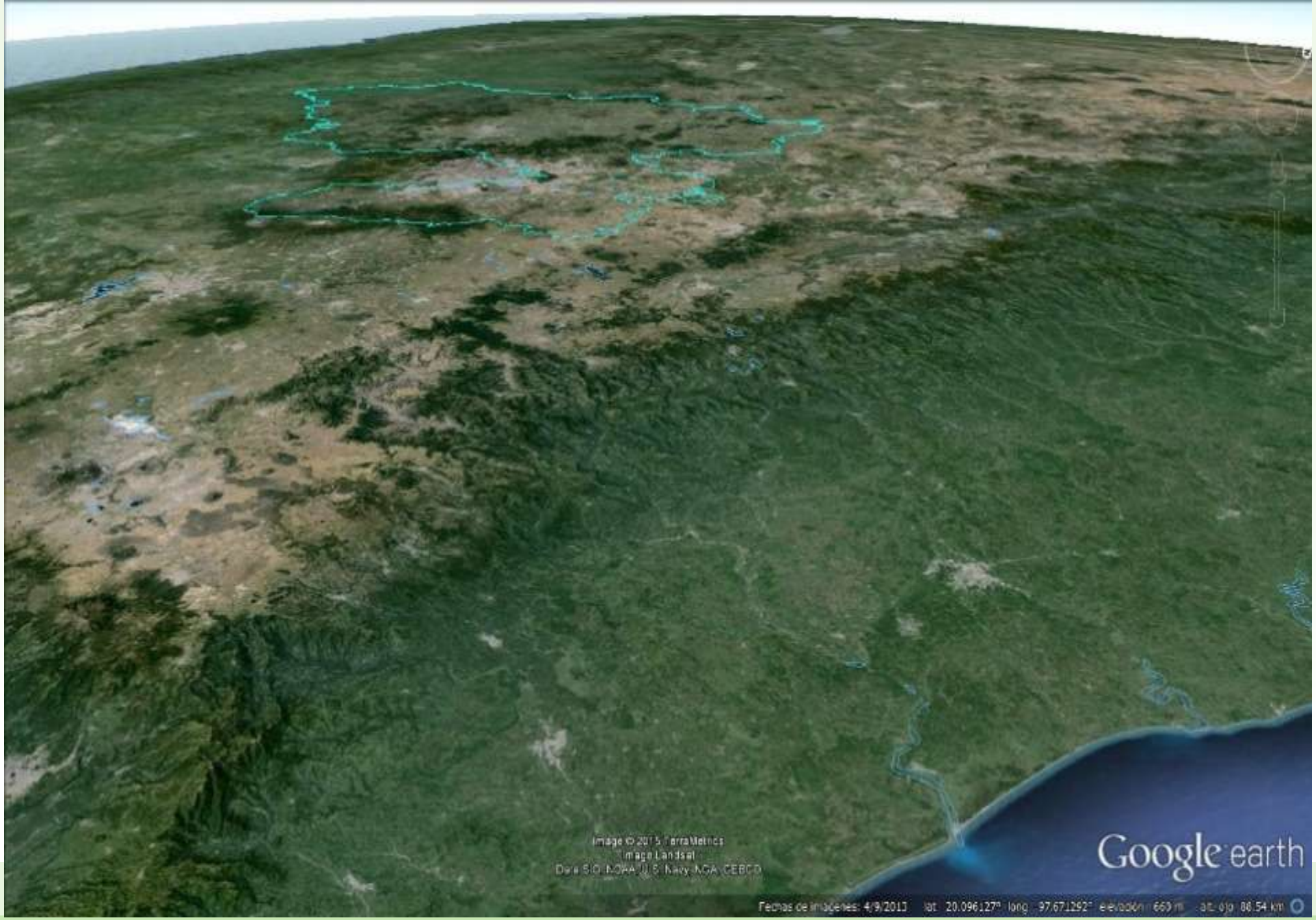
Fuente: World Topo Map, ESRI (2013).

Second factor: Elevation



1800-2600 Height A. S. L.

Second factor: Elevation

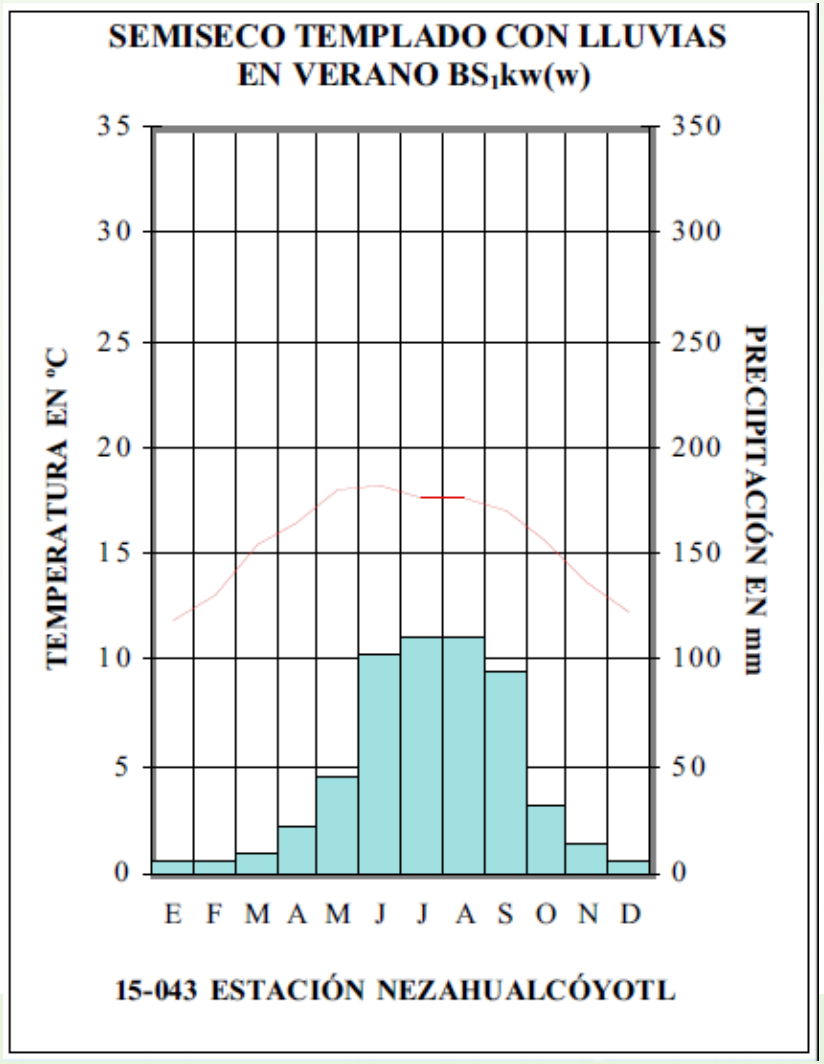


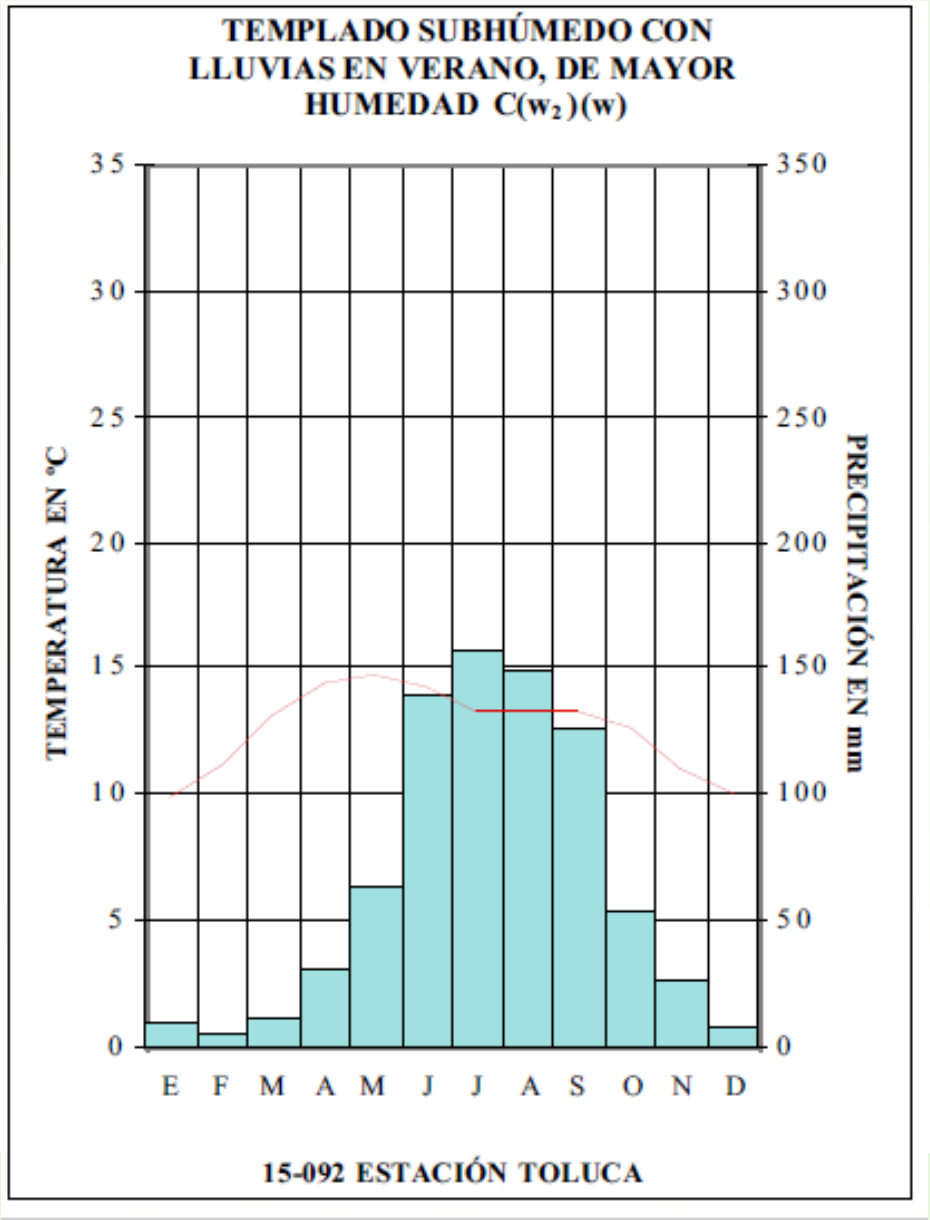
Third Factor: Climate

Templado subhúmedo	73%*
Cálido subhúmedo	21%*
Seco y semiseco	6%*
Frío de alta montaña	0.16%*

*Referido al total de la superficie estatal.
FUENTE: Elaborado con base en INEGI. Carta de Climas 1:1 000 000.

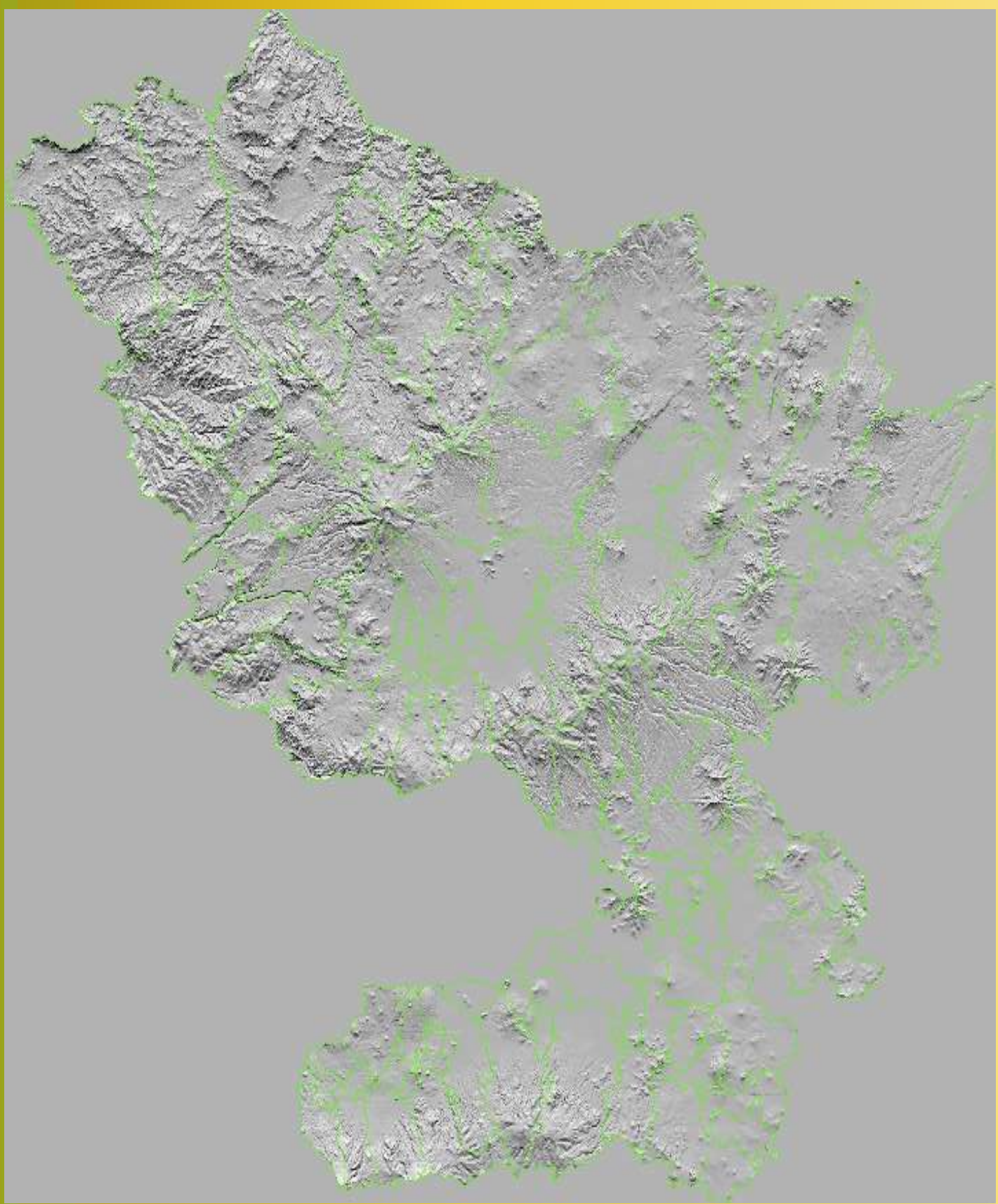
Third Factor: Precipitation



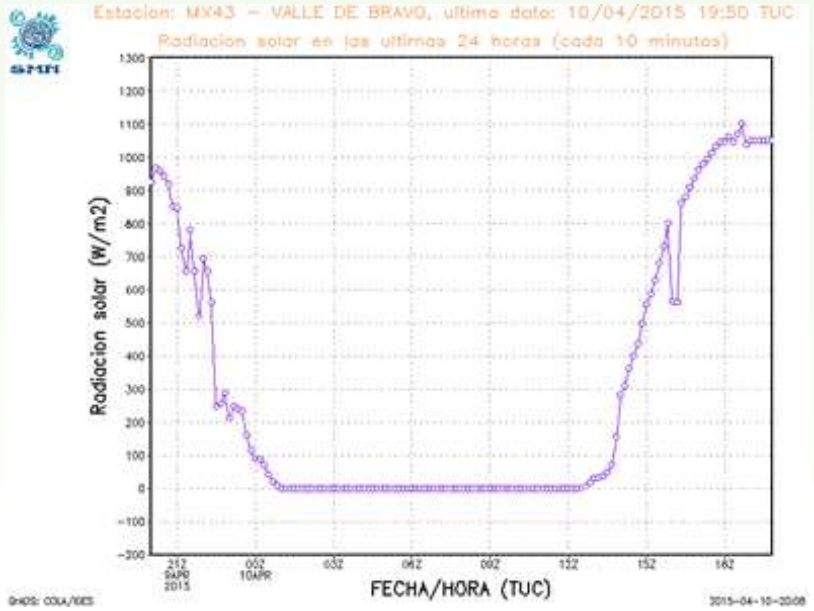


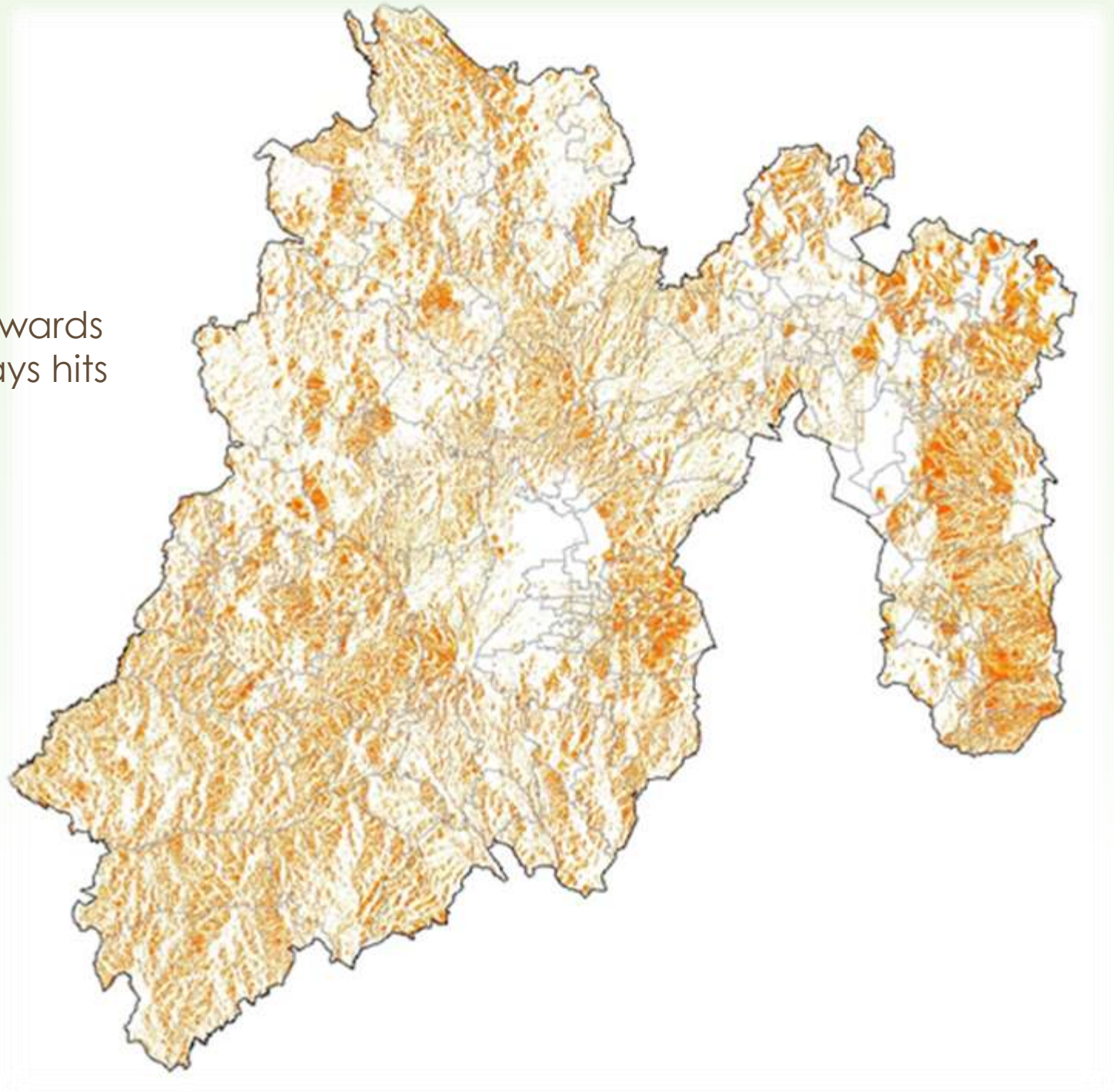
Summer drought

Fourth factor: Terrain form



35% of the Surface is orientated towards The West, where most of the sun rays hits during afternoon





A multifactorial explanation

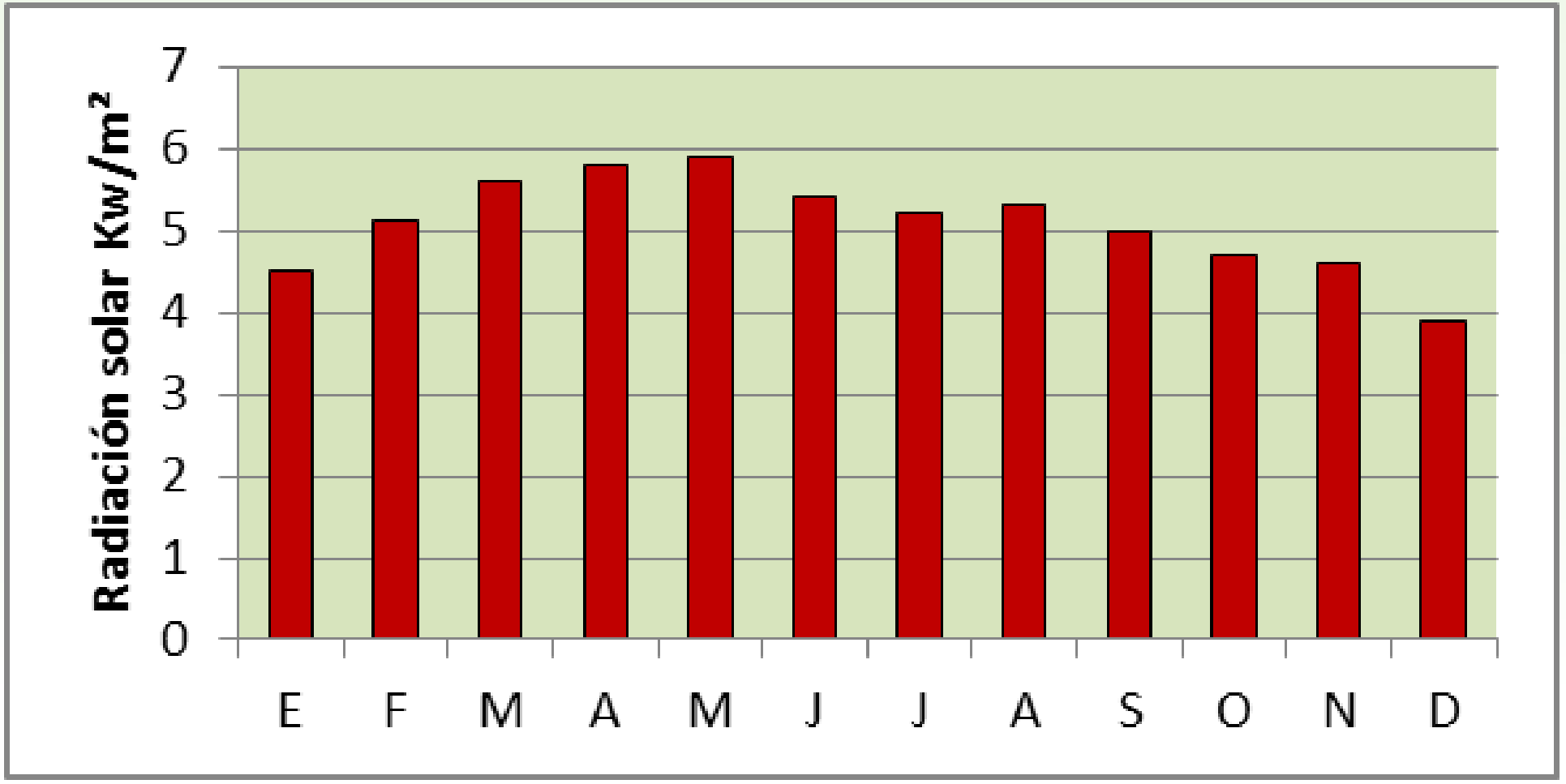
Location

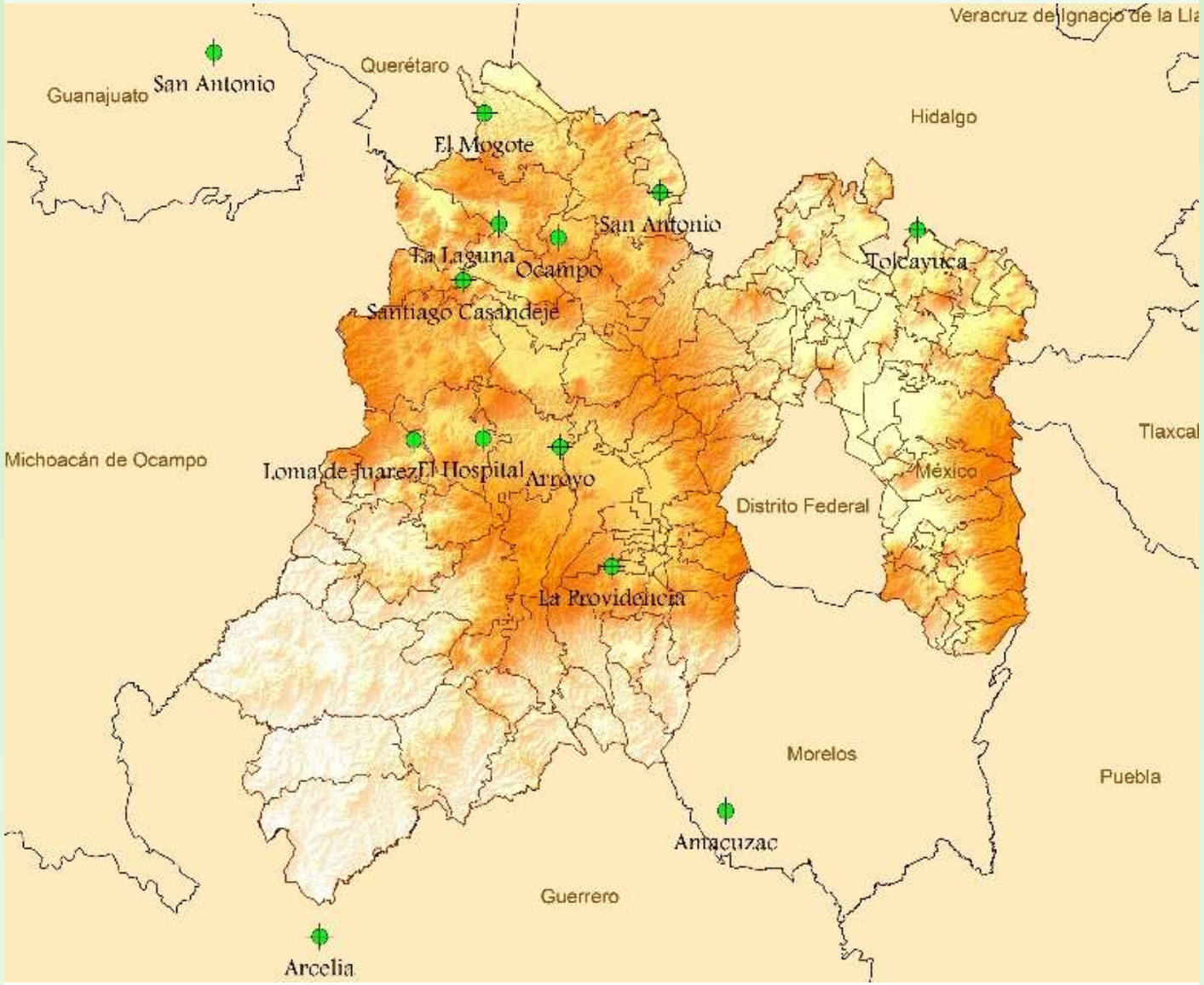
Elevation

Climate

Terrain

Medium sun radiation -Estación Chapingo

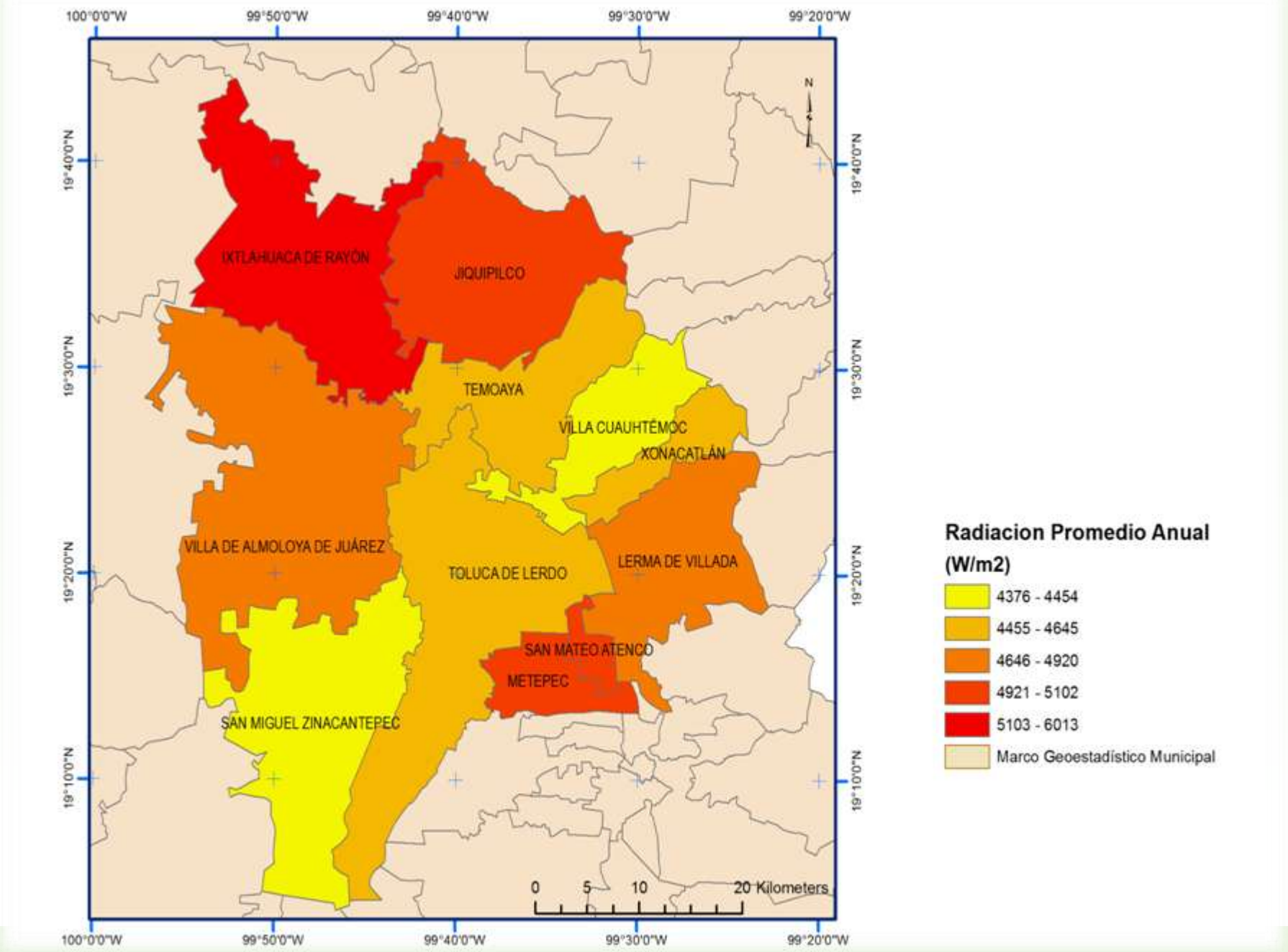




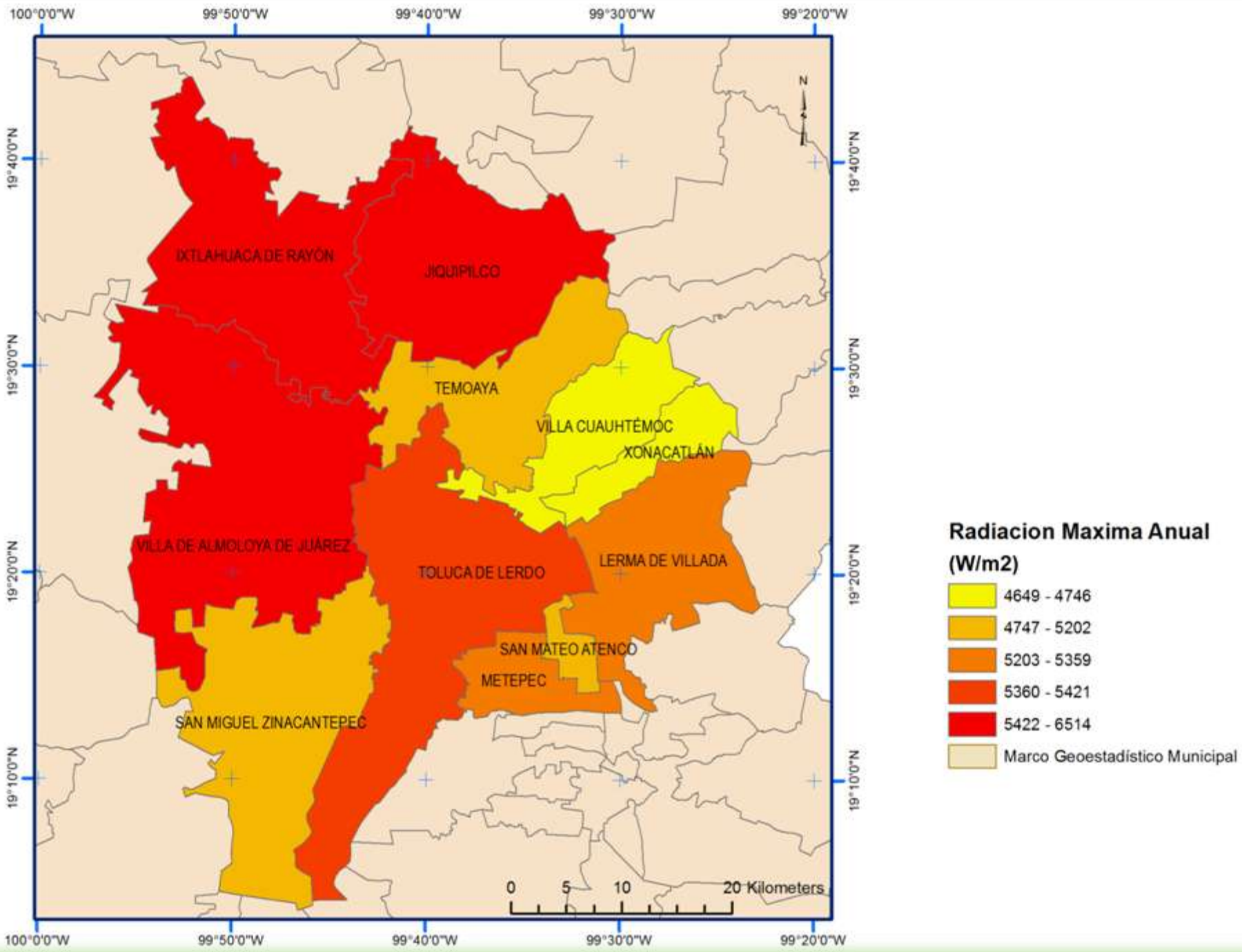
Agrimeteorological stations INIFAP

With complete –all year round - readings for sun radiation in 2014

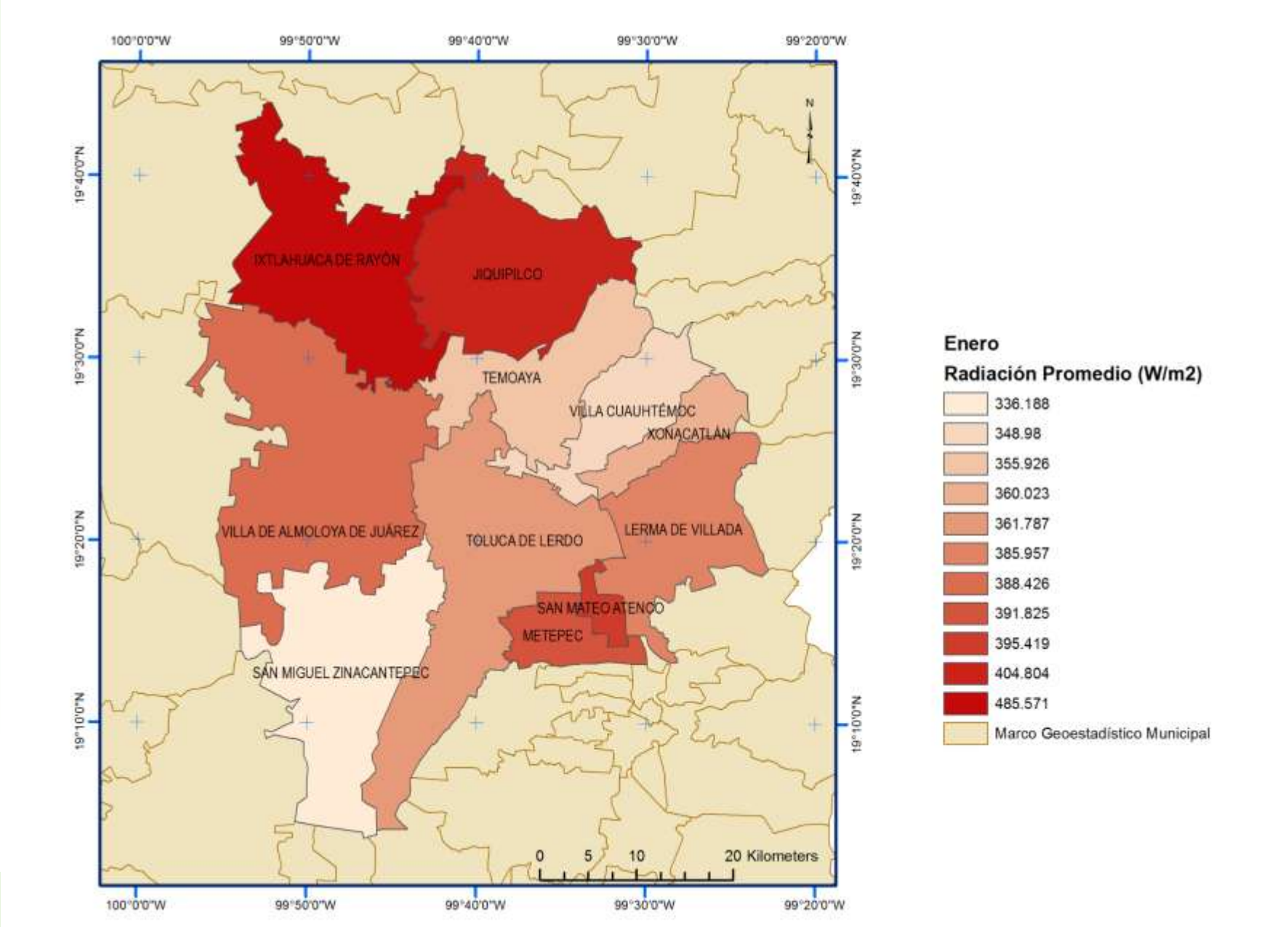
Average Year radiation



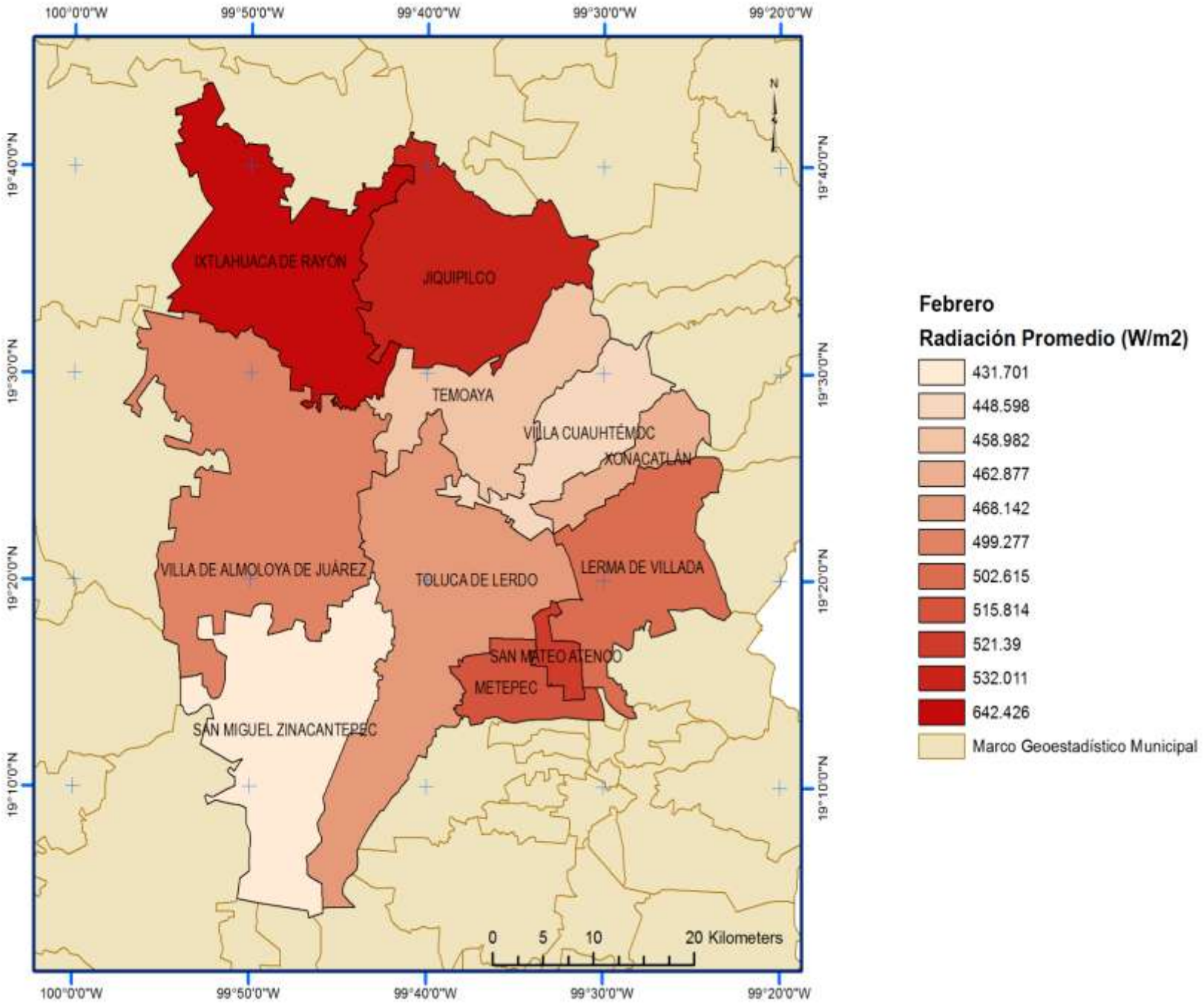
Maximal Year Values



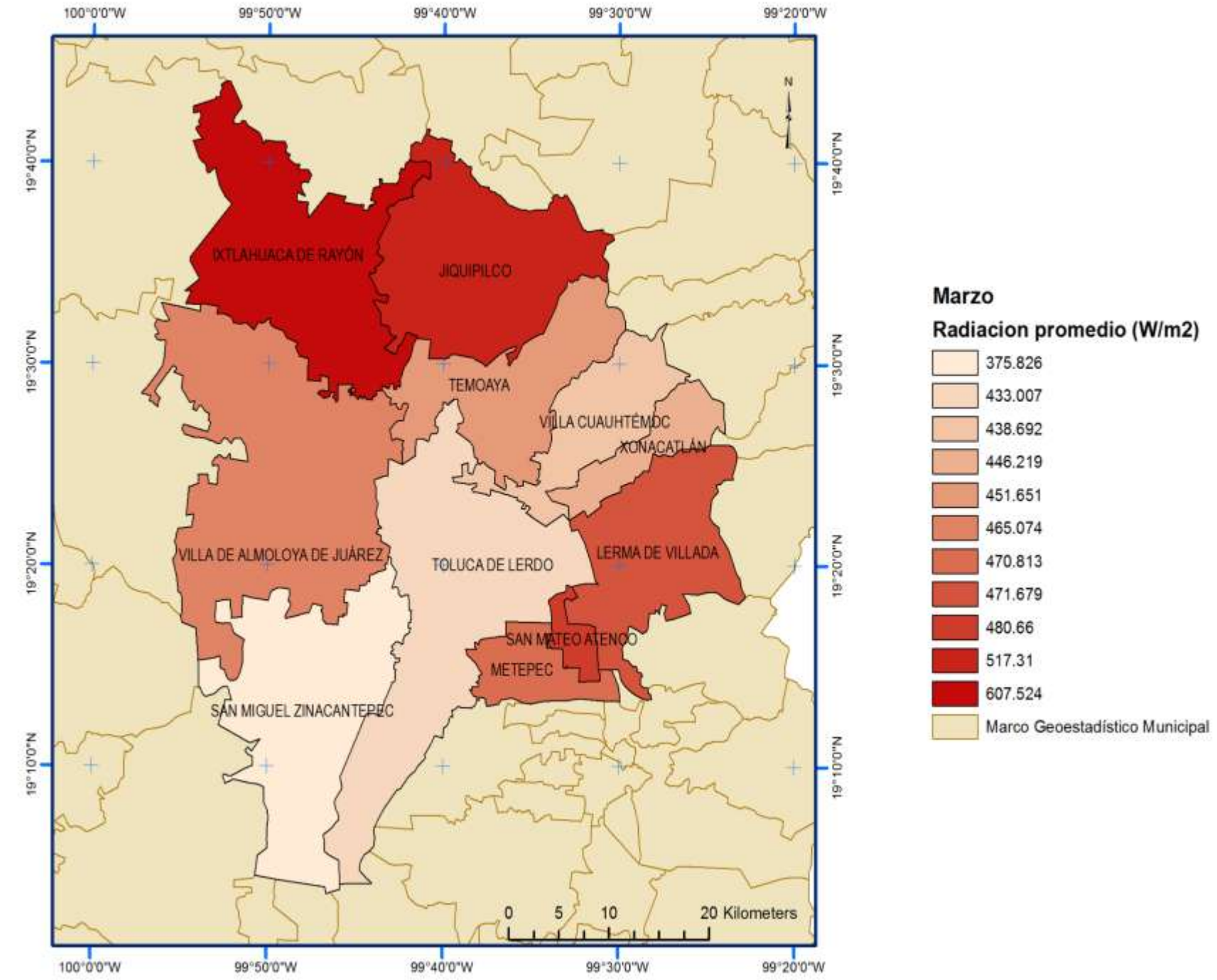
Monthly radiation January



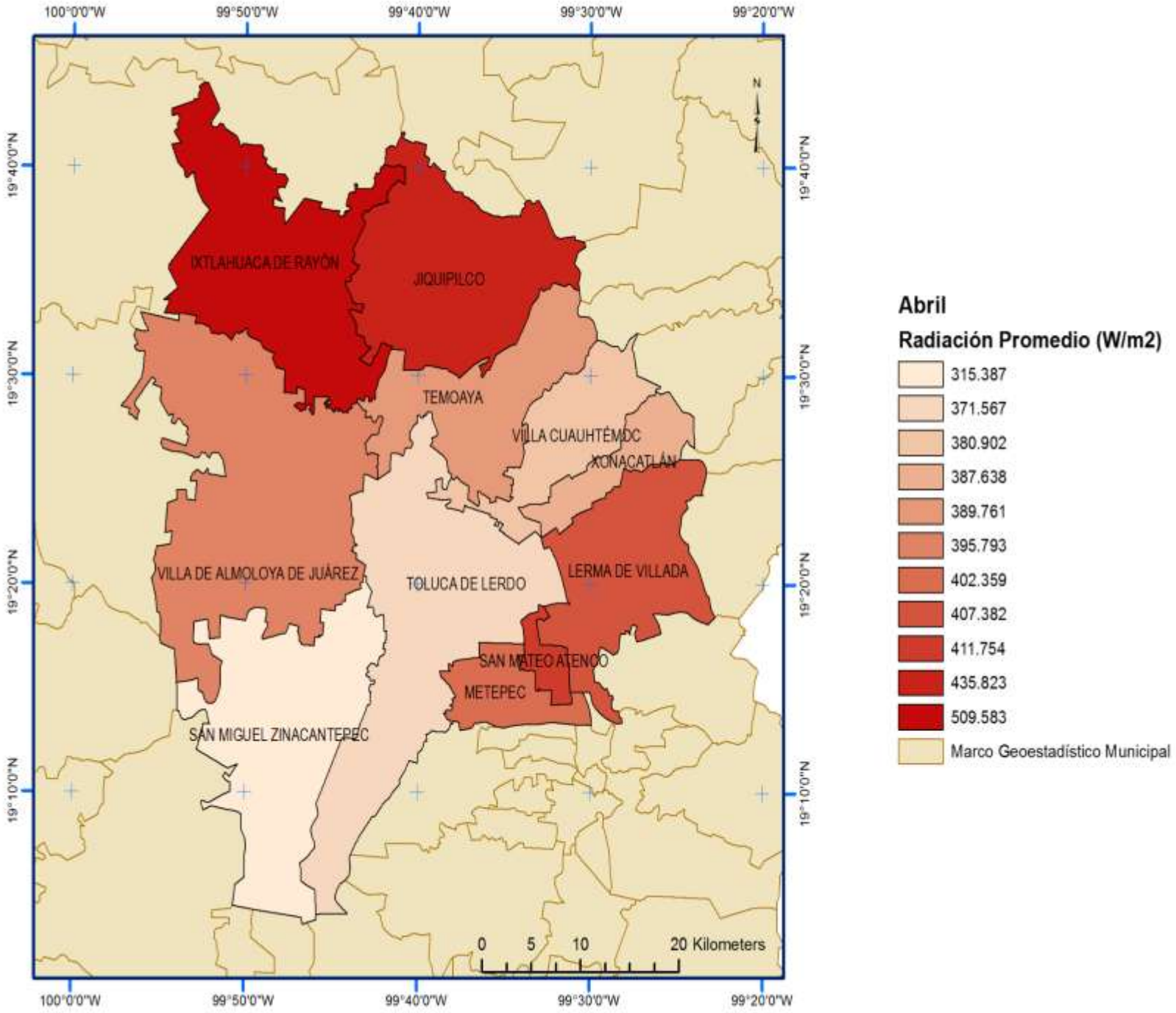
Monthly radiation February



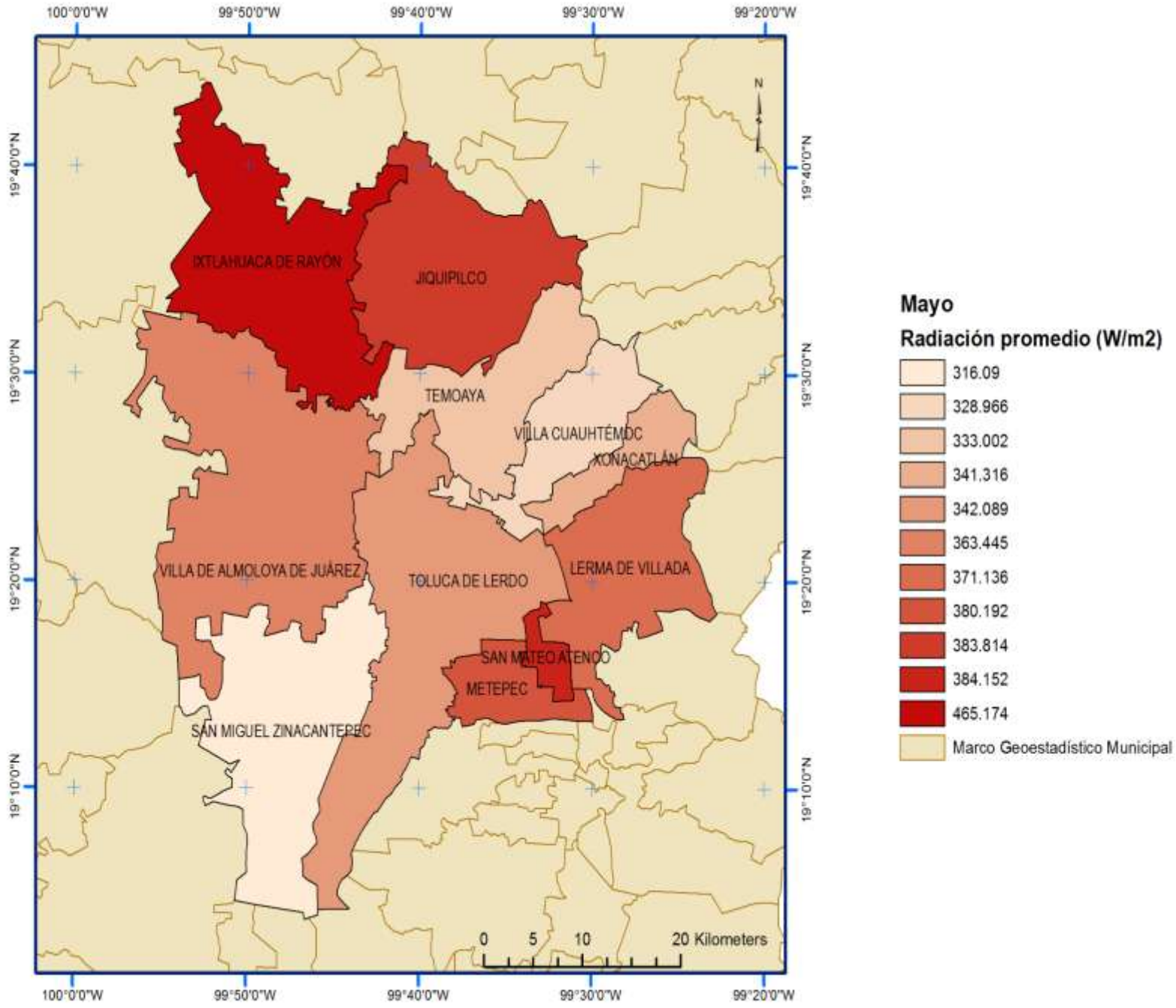
Monthly radiation March



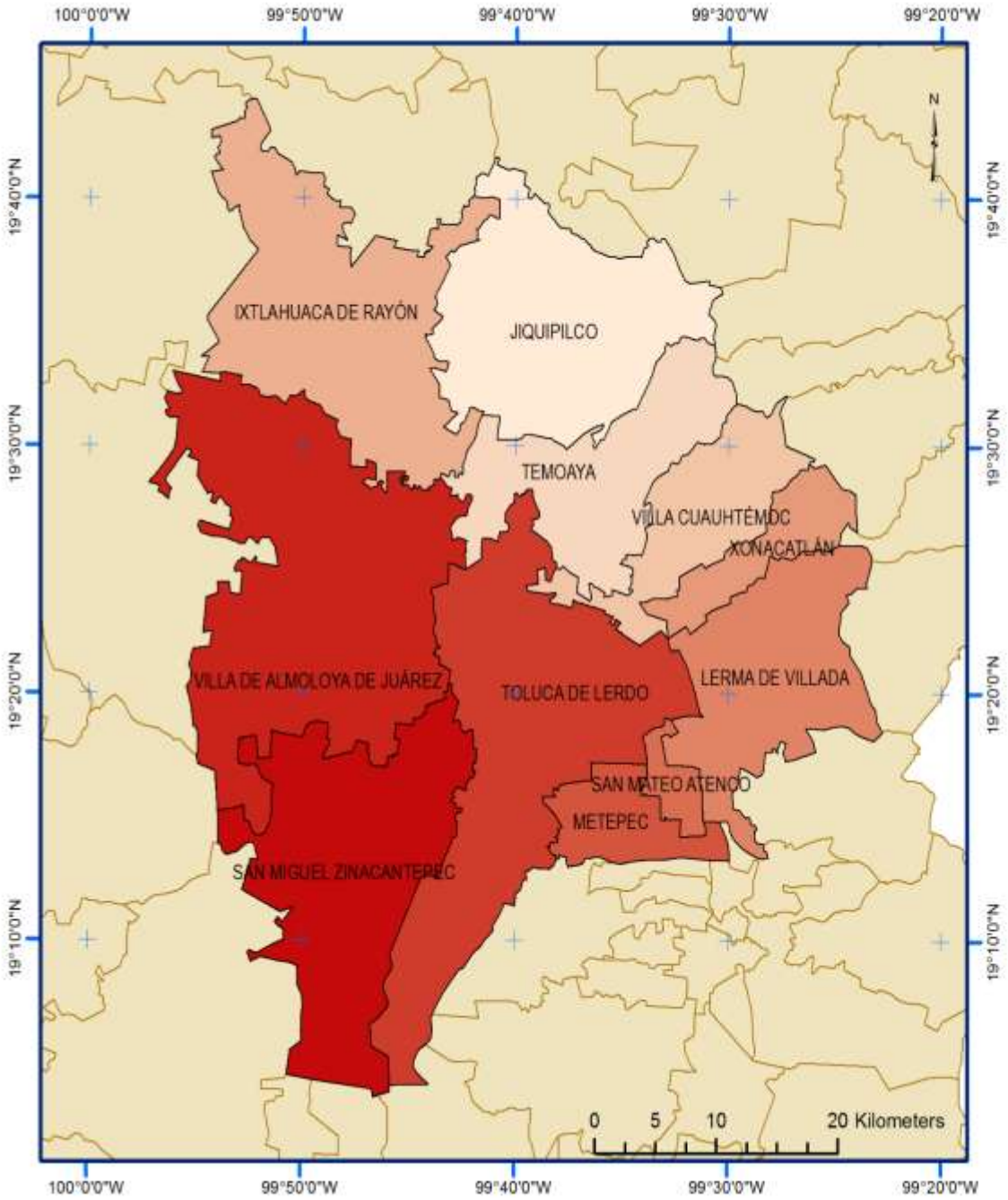
Monthly radiation April



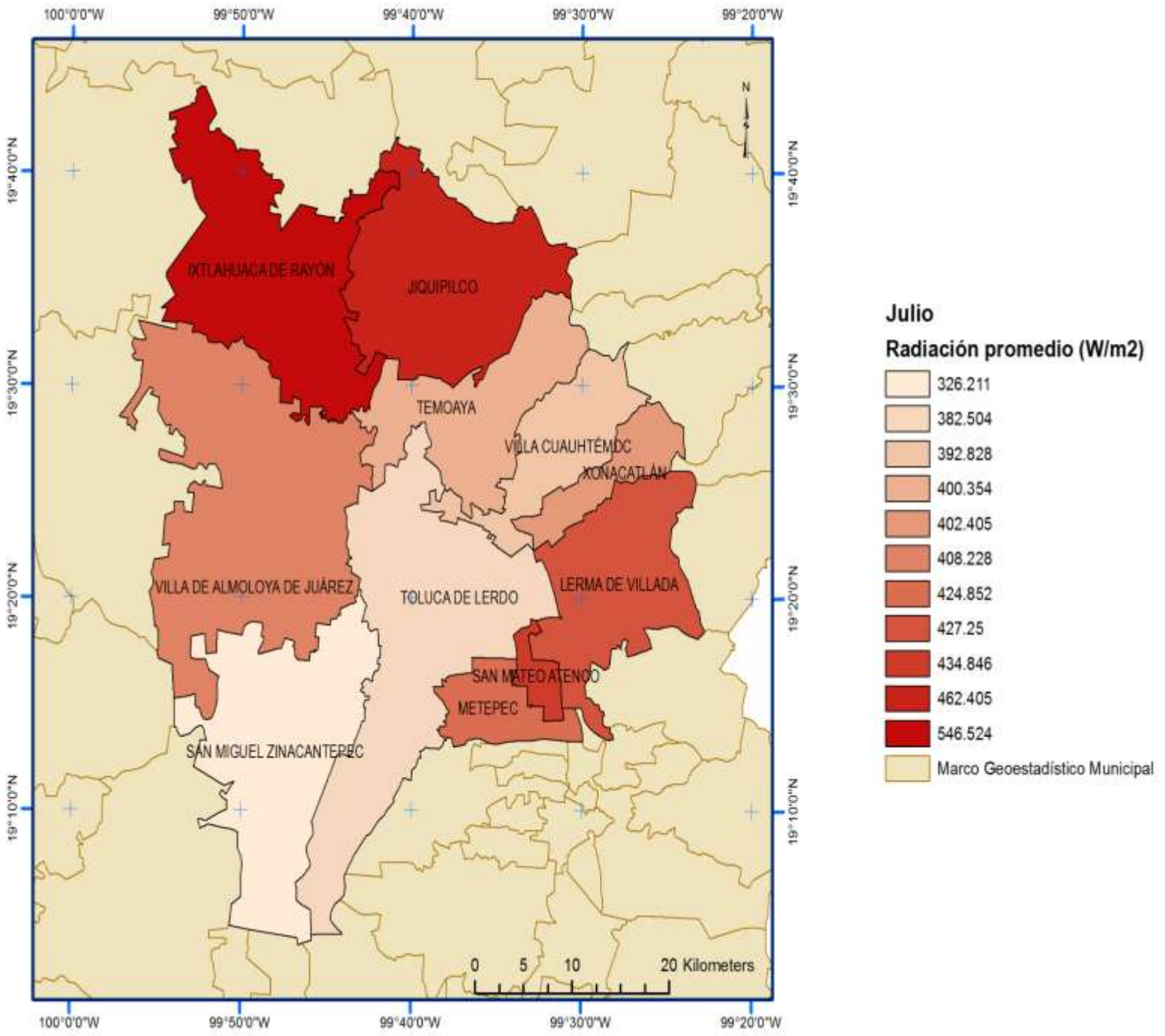
Monthly radiation May



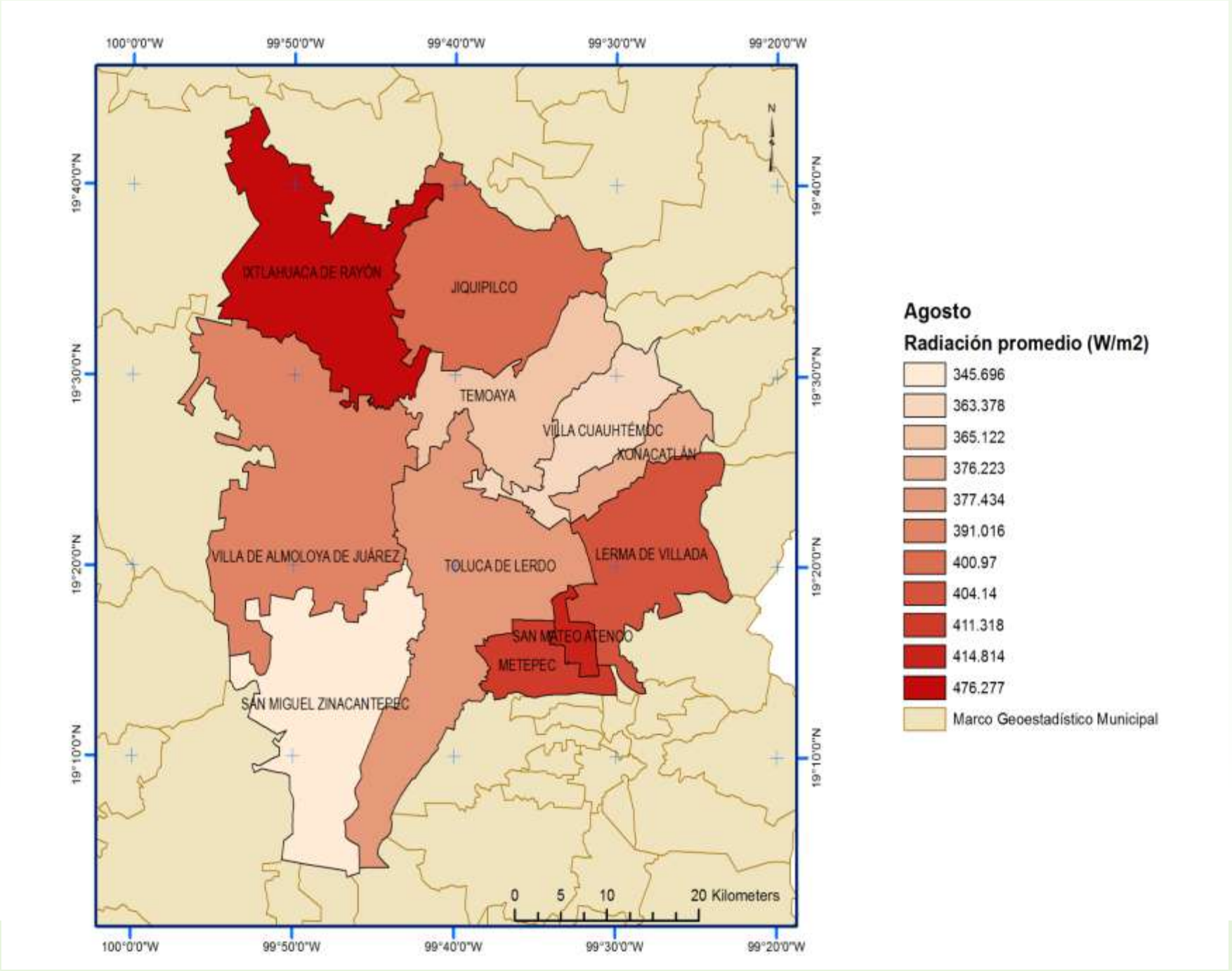
Monthly radiation June



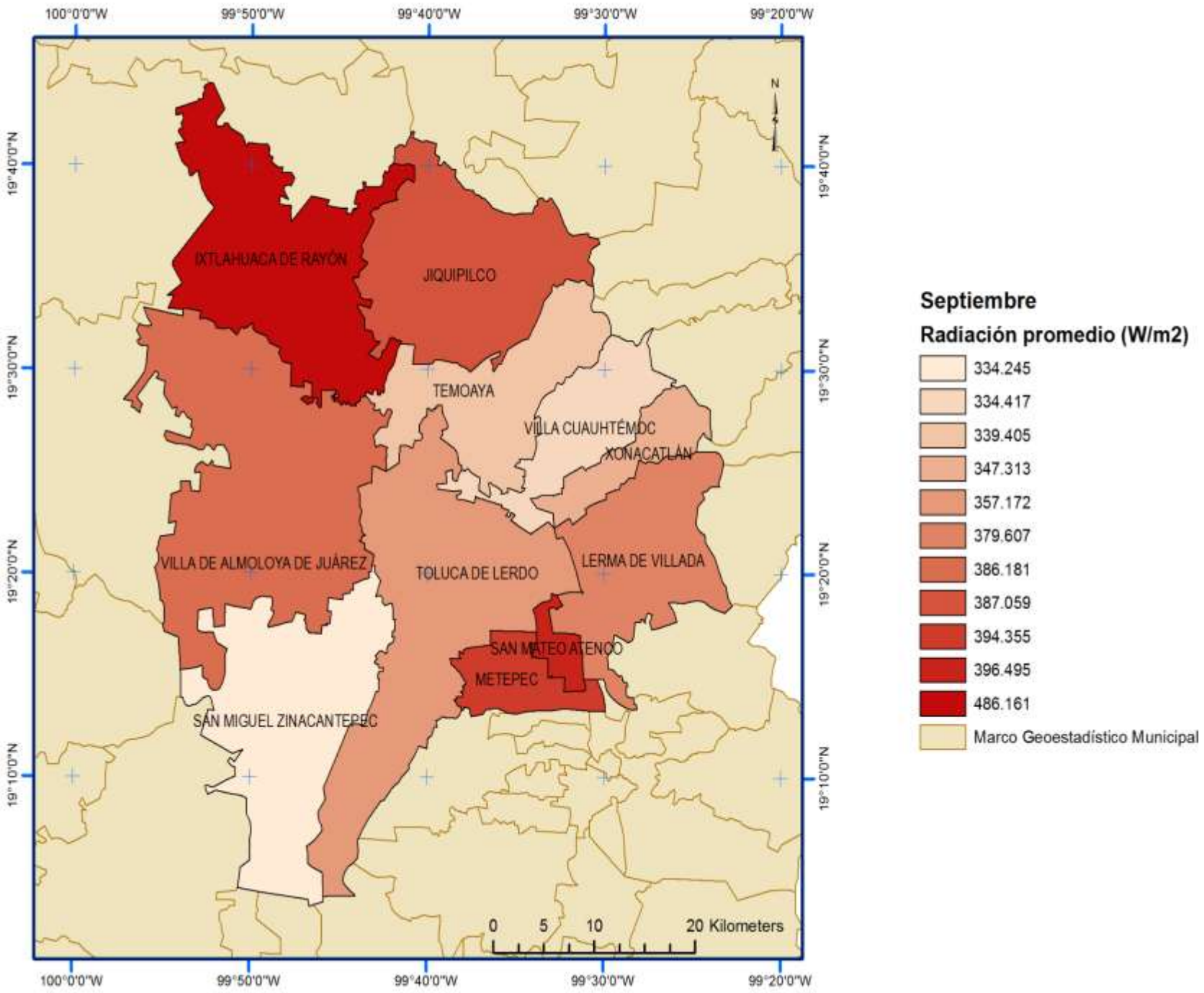
Monthly radiation July



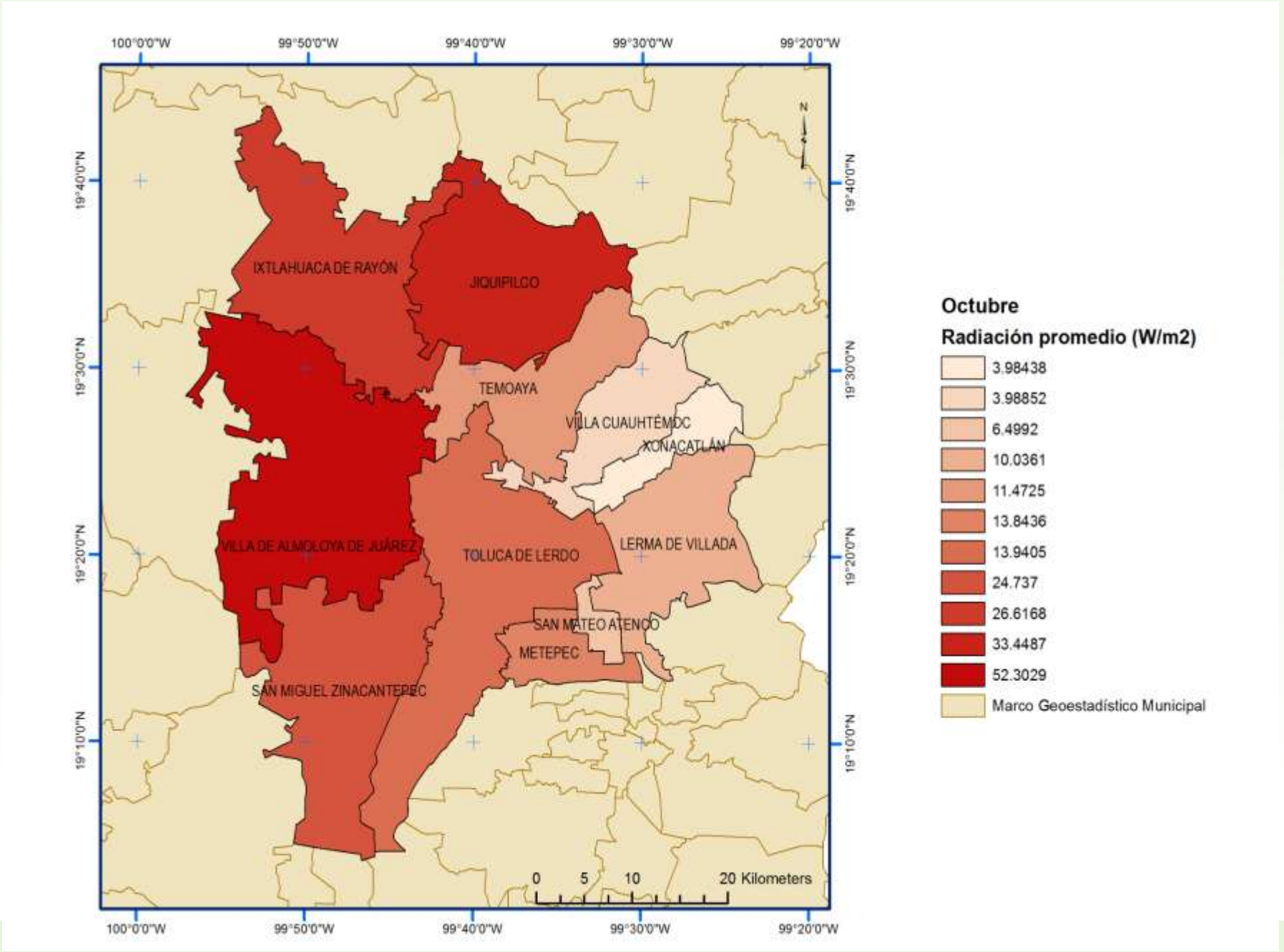
Monthly radiation August



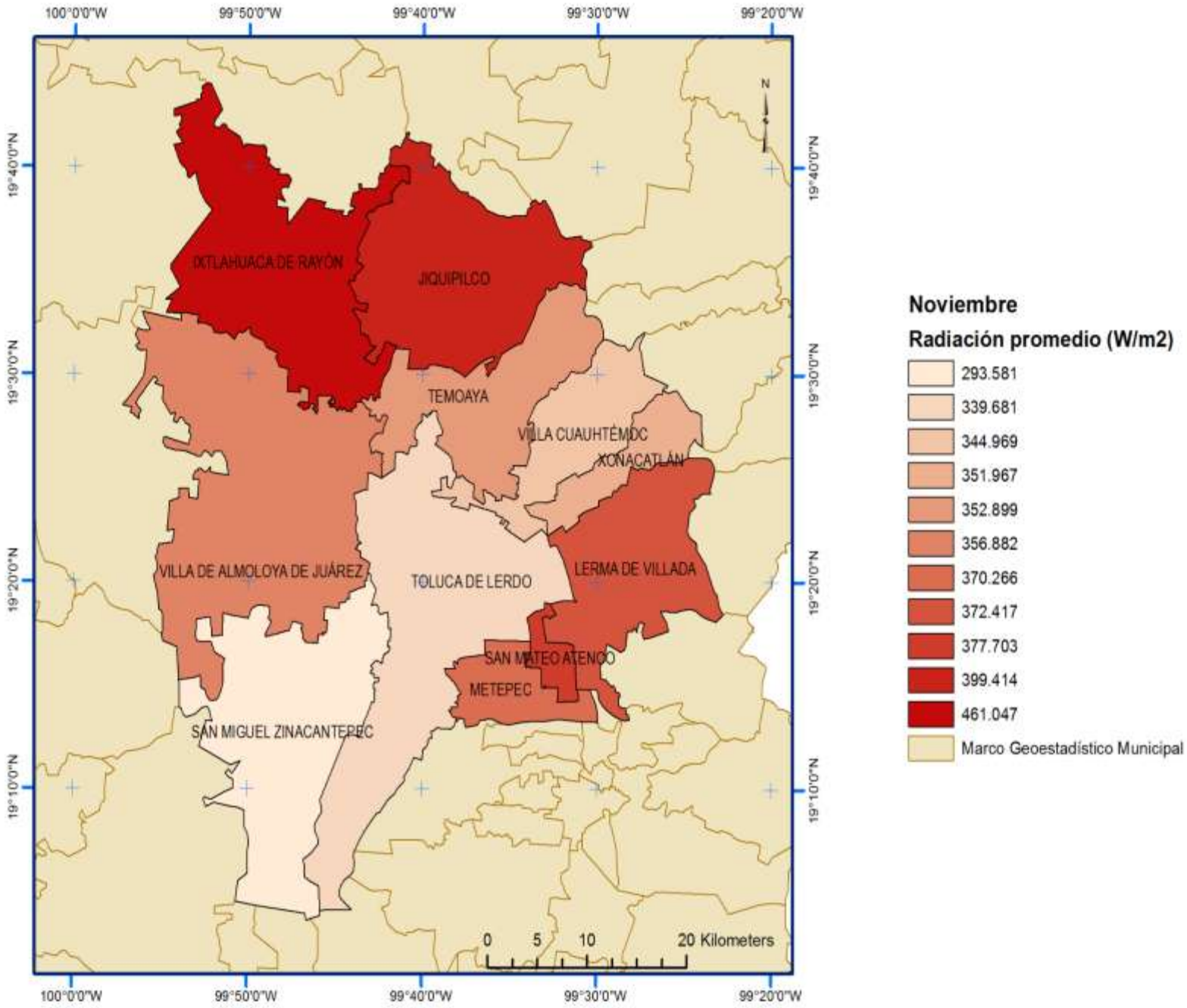
Monthly radiation September



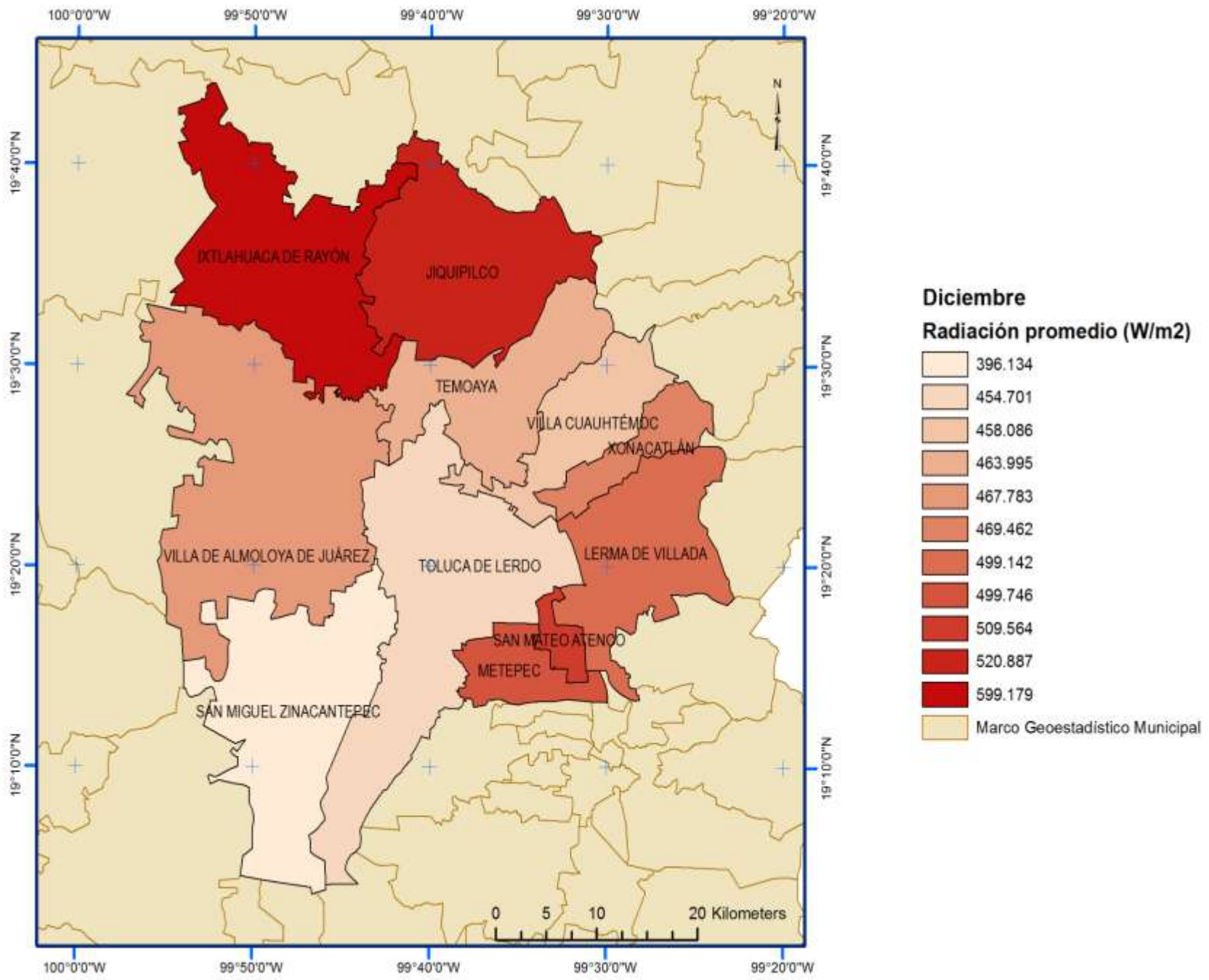
Monthly radiation October



Monthly radiation November



Monthly radiation December



Some final remarks

- Mexico State has several geosystemic elements that make possible the use of sun radiation for the generation of Energy for domestic purposes.
- These elements include location, elevation, climate and terrain form.
- Average Sun radiation in the Toluca Valley can be as high as 6.5 Kw per square meter
- Ixtlahuaca, Lerma, and Metepec show consistent and high values of sun radiation along the year.

Thanks for your attention