

**LANCE**

# Space Weather Activities in Mexico



AEM

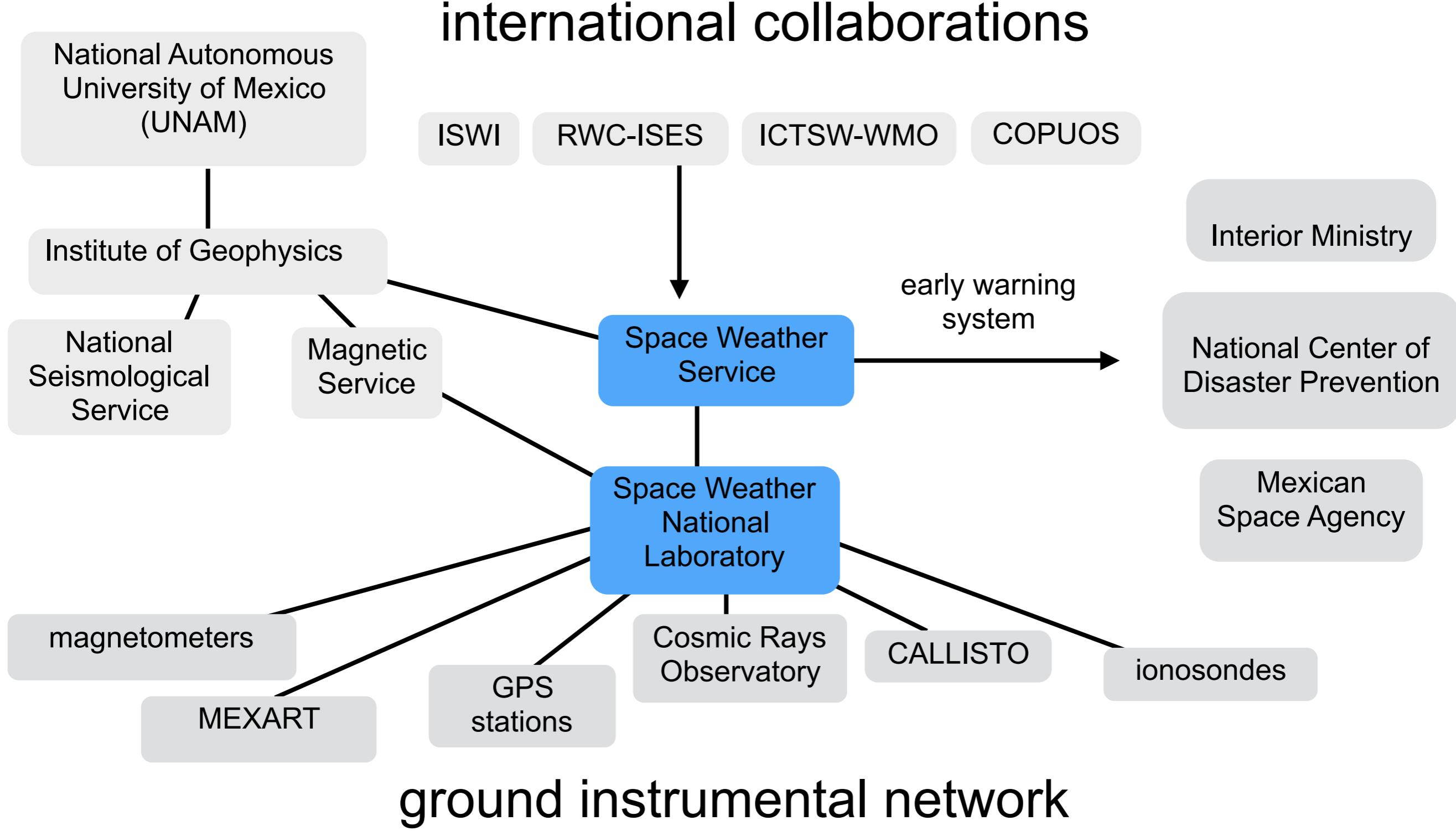
AGENCIA  
ESPECIAL  
MEXICANA



**I S E S**  
International Space  
Environment Service



- 2013-06 Mexican Space Agency (AEM)
- 2014-06 Modification to the General Civil Protection Law
- 2014-10 Mexican Space Weather Service (SCiESMEX)
- 2015-06 SCiESMEX became a RWC of ISES
- 2015-10 Working group Space Weather in Mexico
- 2016-06 Space Weather National Laboratory (LANCE)



# working group space weather in Mexico



LANCE  
Servicio Clima Espacial



AEM  
AGENCIA  
ESPACIAL  
MEXICANA



# working group space weather in Mexico



# CLIMA ESPACIAL

¿Cómo nos afecta?

## ¿Qué es?

Un fenómeno global producido por la actividad solar que puede causar afectaciones a nuestra tecnología

## Fenómenos asociados con las variaciones en el clima espacial

### 1 Eyecciones de masa coronal

Nube de partículas cargadas eléctricamente que sale de la atmósfera solar

#### Efecto

Fallas en las órbitas de los satélites y daños en las corrientes eléctricas de alta tensión (apagones)

### 2 Fulguraciones solares

El Sol emite rayos X, gamma, ultravioleta, luz visible, infrarrojos, microondas y ondas de radio.

#### Efecto

Interferencias en telecomunicaciones y radiocomunicaciones, fallas en los sistemas de posicionamiento global

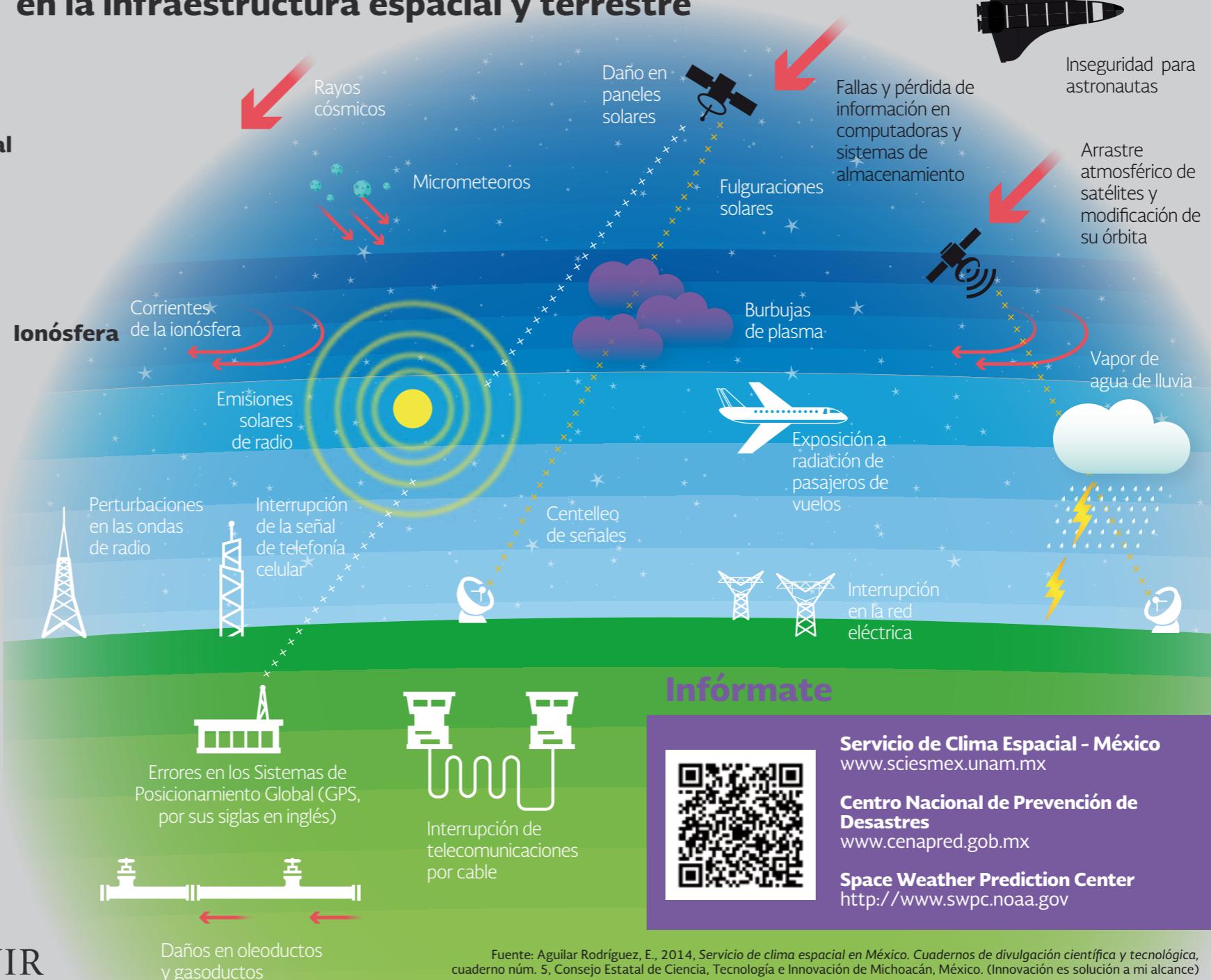
### 3 Partículas energéticas solares

Protónes, neutrones y electrones acelerados por fulguraciones solares

#### Efecto

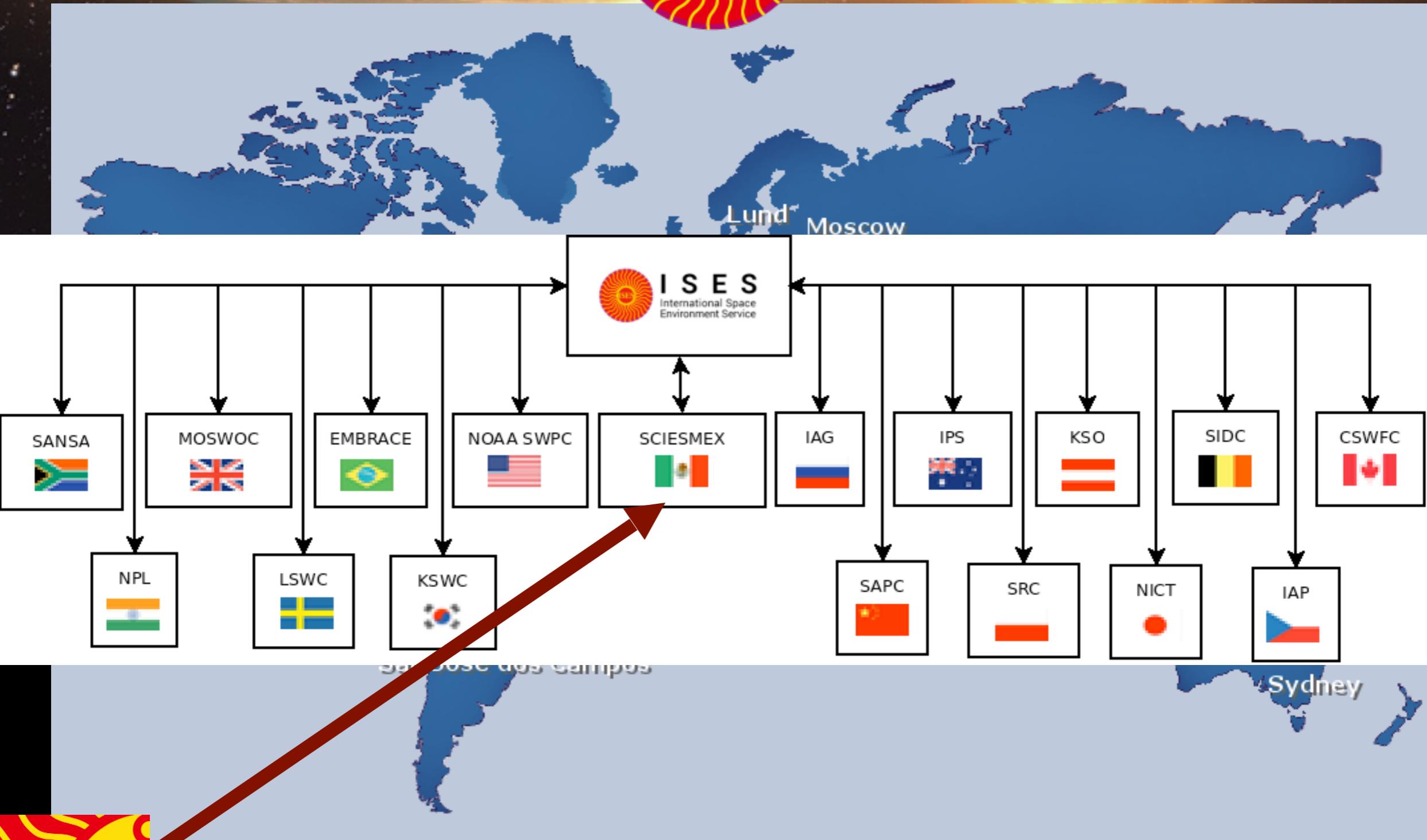
Daño en componentes de los satélites, dosis de radiación peligrosa para astronautas y afectaciones a pasajeros de vuelos transpolares

## Efectos más importantes en la infraestructura espacial y terrestre



#PREVENIRESVIVIR

Fuente: Aguilar Rodríguez, E., 2014, Servicio de clima espacial en México. Cuadernos de divulgación científica y tecnológica, cuaderno núm. 5, Consejo Estatal de Ciencia, Tecnología e Innovación de Michoacán, México. (Innovación es solución a mi alcance)



June 2015 / Mexico new ISES RWC



# products

warning system replaying NOAA-SWPC alerts in real time  
(translated to Spanish and adapted to the region)

web server to store and publish information related to space weather in Spanish

daily records of space weather alerts

email service for delivering space weather alerts in real time

social media space weather alert system

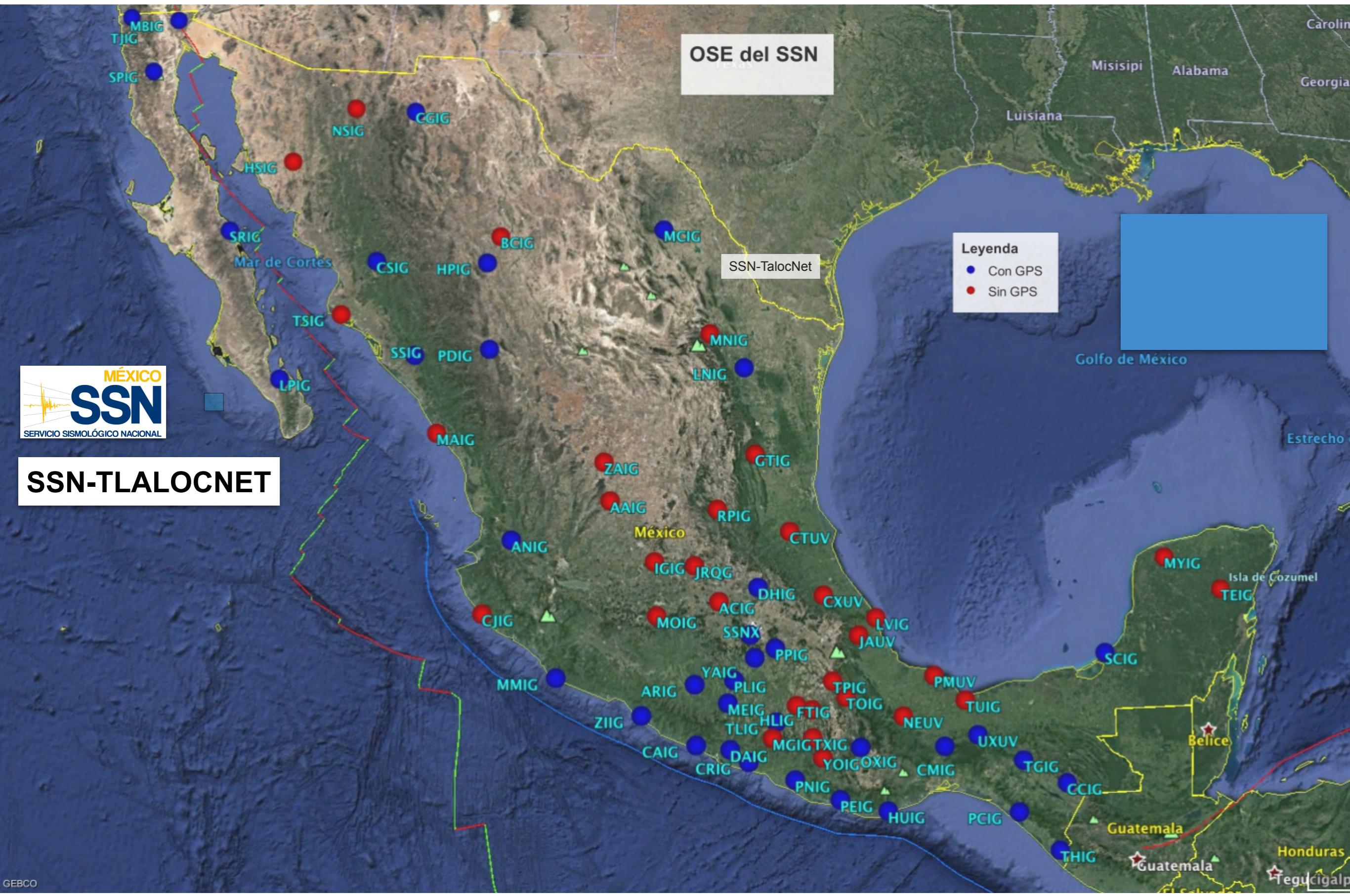
SMS space weather alert system

weekly report of space weather events in Spanish

special reports of significant space weather events in near-real time in Spanish

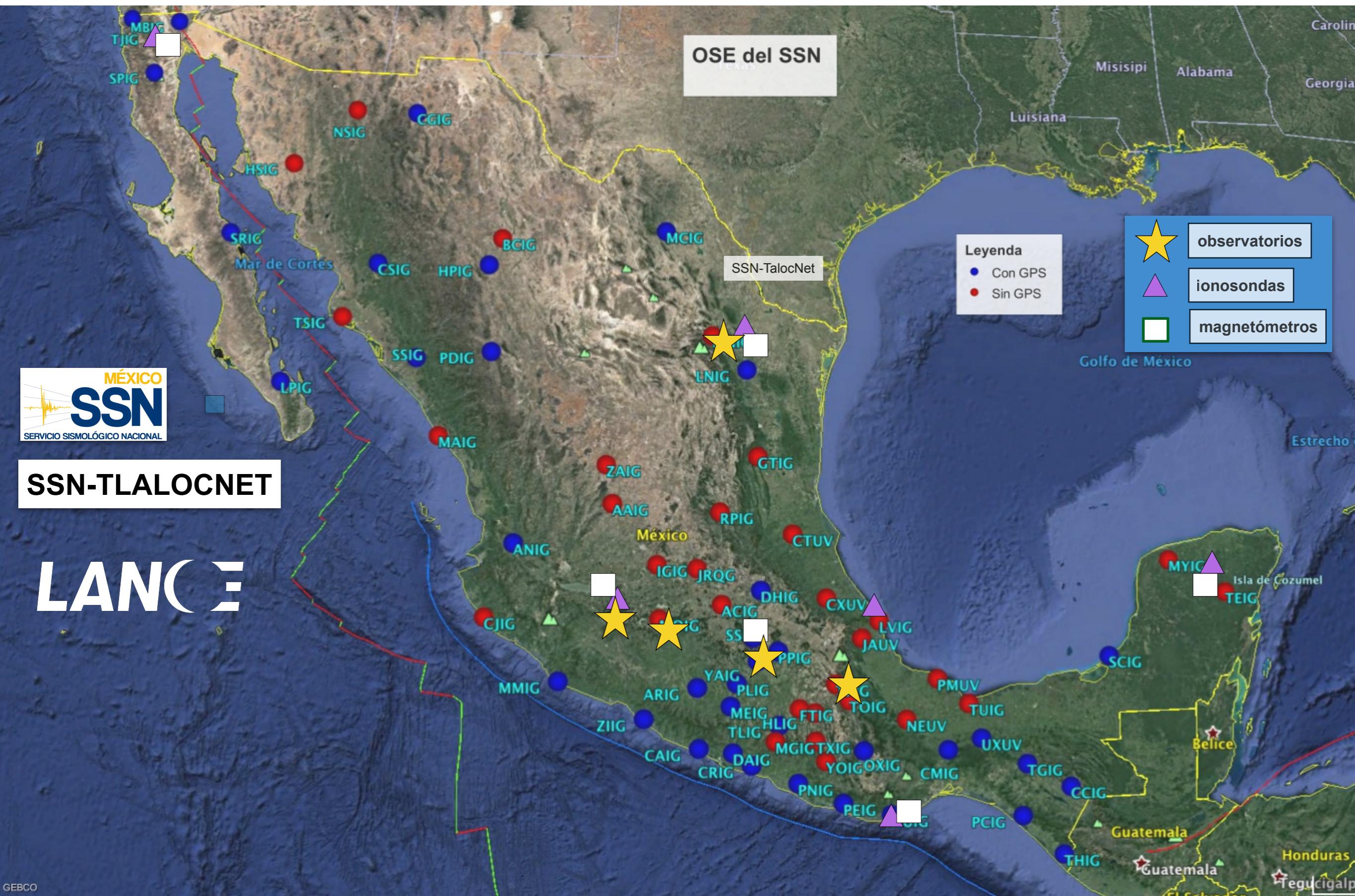
## Ground instrumental network

- MEXART IPS radiotelescope (Michoacan)
- Geomagnetic observatory (Edo. de México)
- Cosmic rays observatory (Mexico City)
- Muon detector (Puebla)
- TEC analysis / GNSS receivers network (SSN-TLALOCNet)
- Callisto system (MEXART site)
- all-sky viewer (MEXART site)
- Schumann resonance (MEXART site)



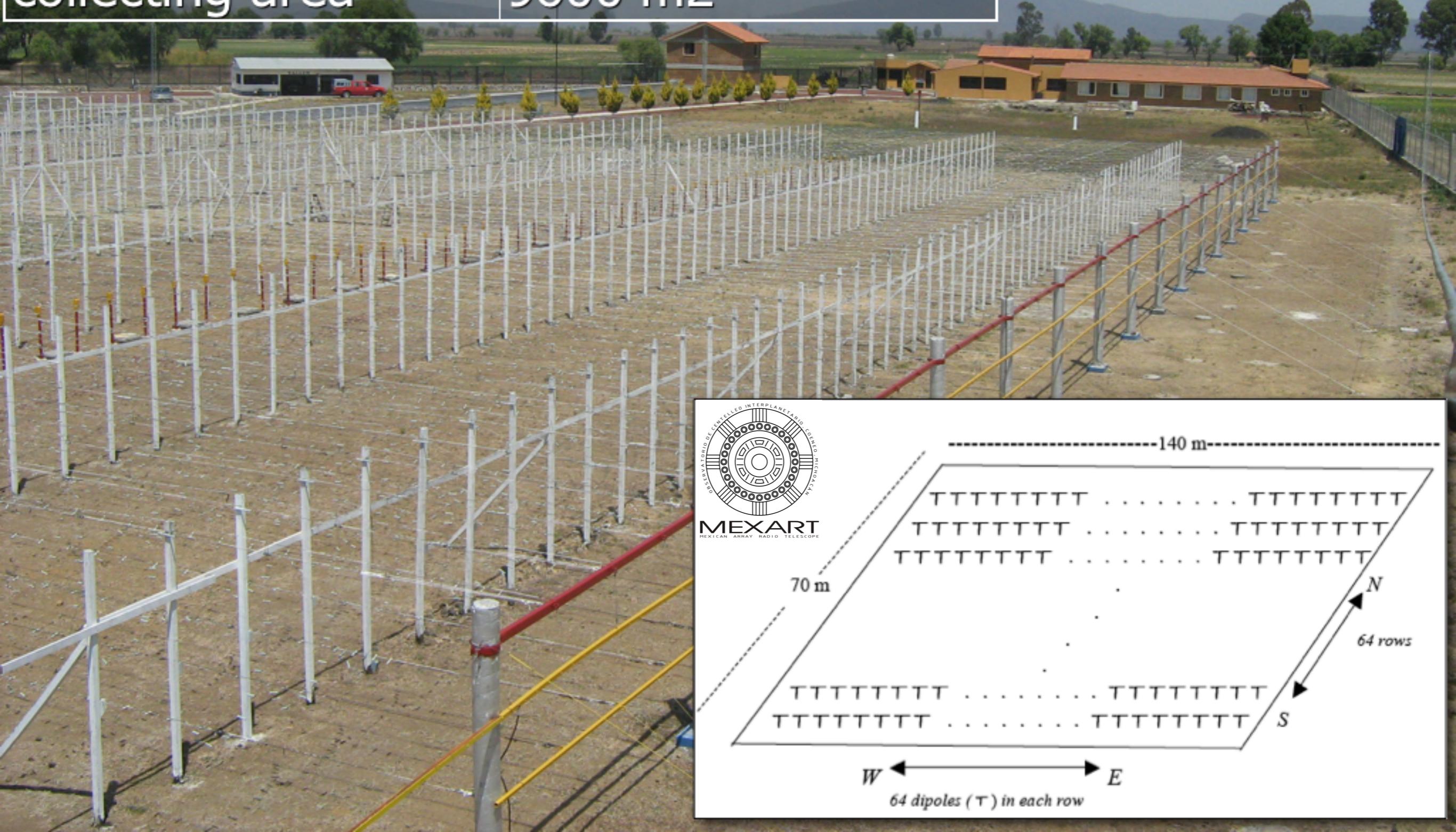




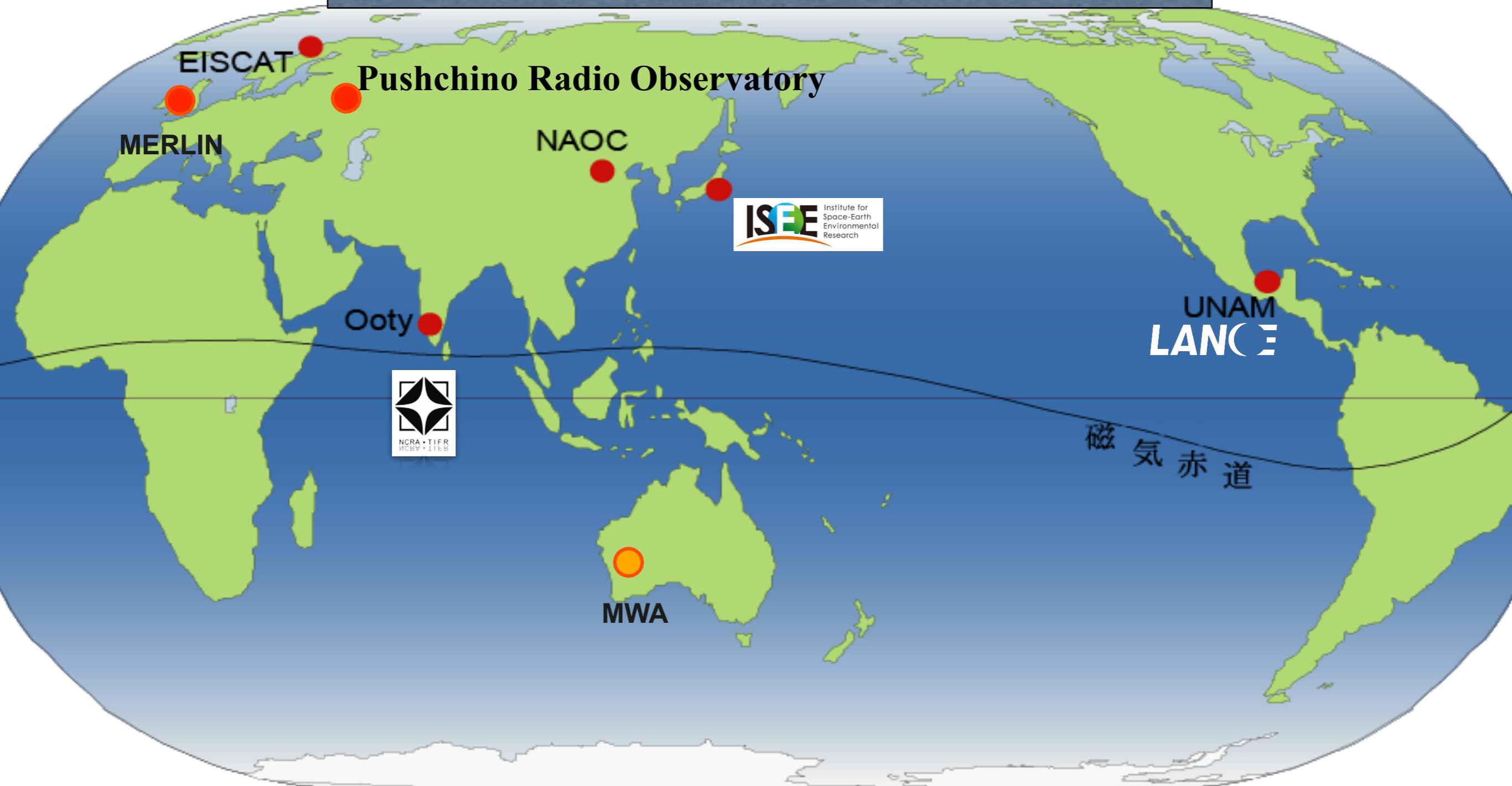


# LANCE

operation frequency	139.6 MHz
bandwidth	2.0 MHz
no. dipoles	$64 \times 64 = 4096$
collecting area	9600 m <sup>2</sup>



# WIPSS



LANCE

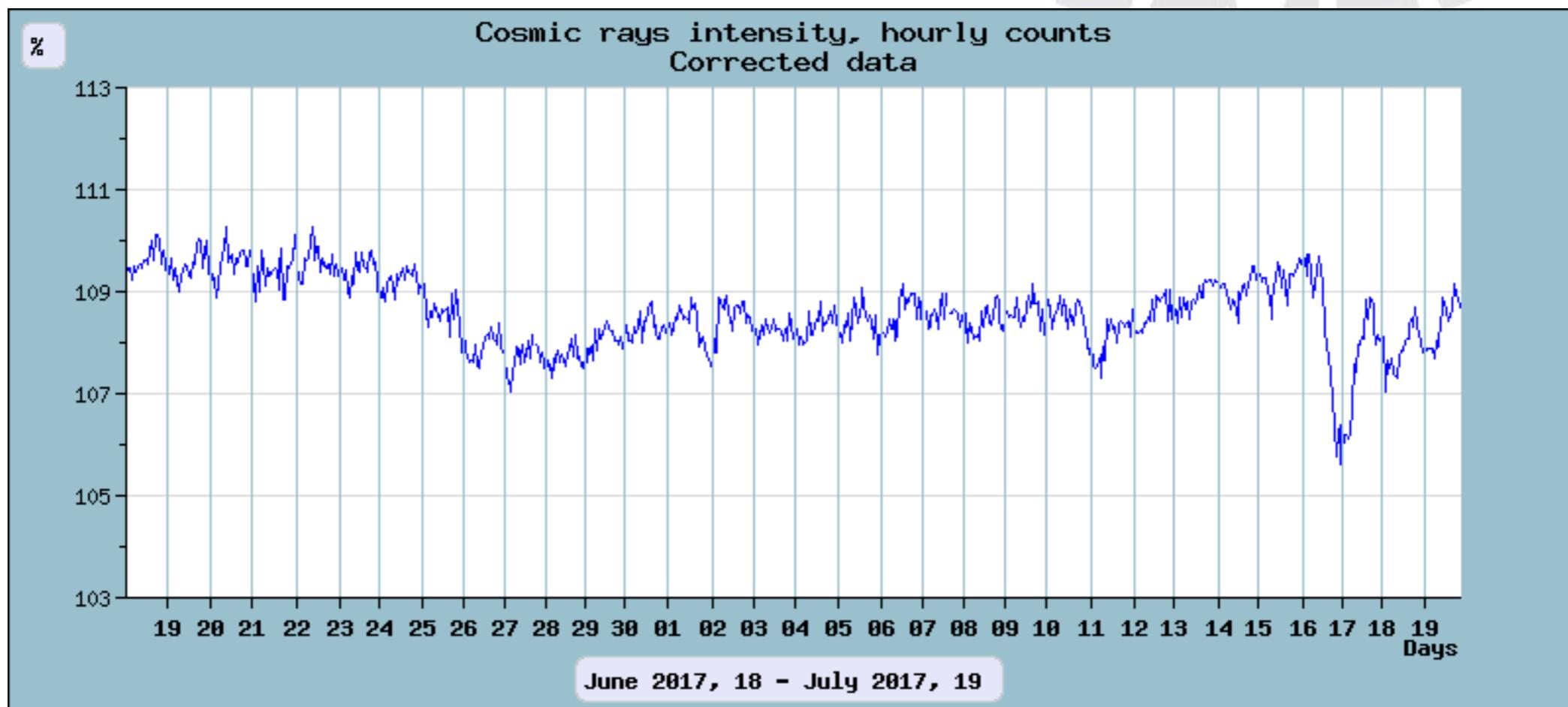


ISEE Institute for Space-Earth Environmental Research

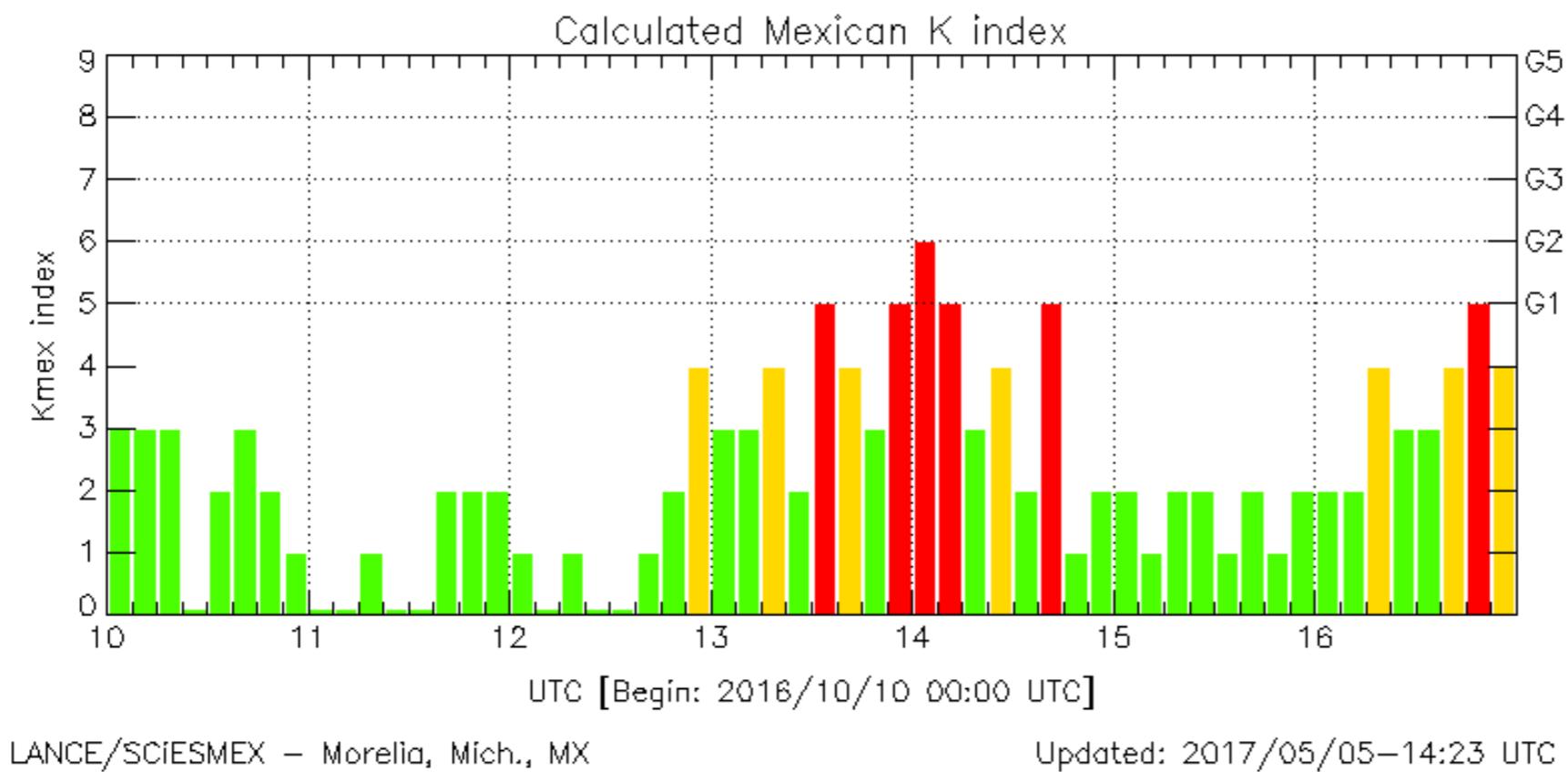
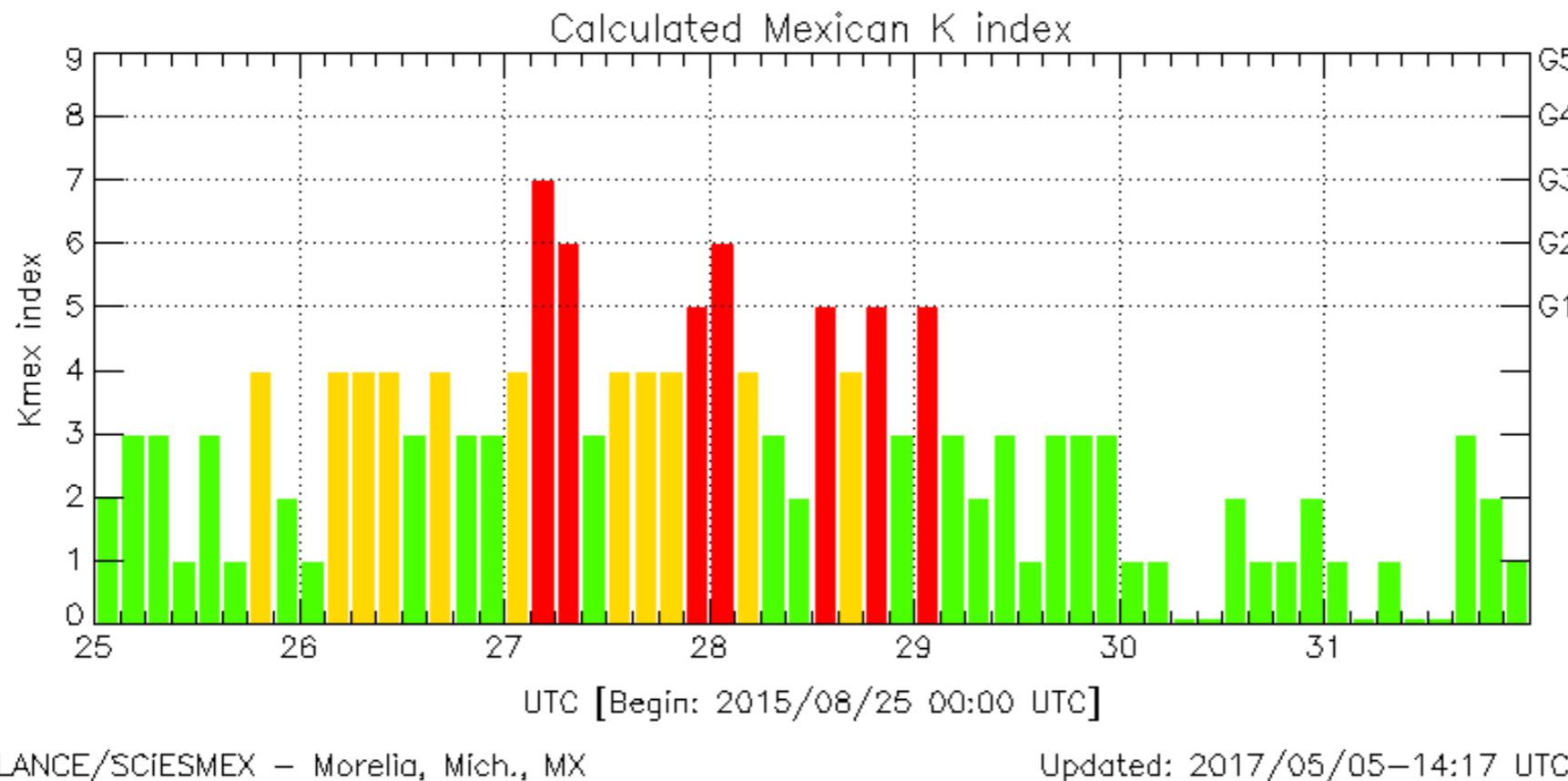
RAL Space

## Cosmic Rays

- Cosmic Ray Observatory of Mexico City UNAM  
(Neutrons and Muons)
  - Forbush decreases



# preliminar Mexican k index



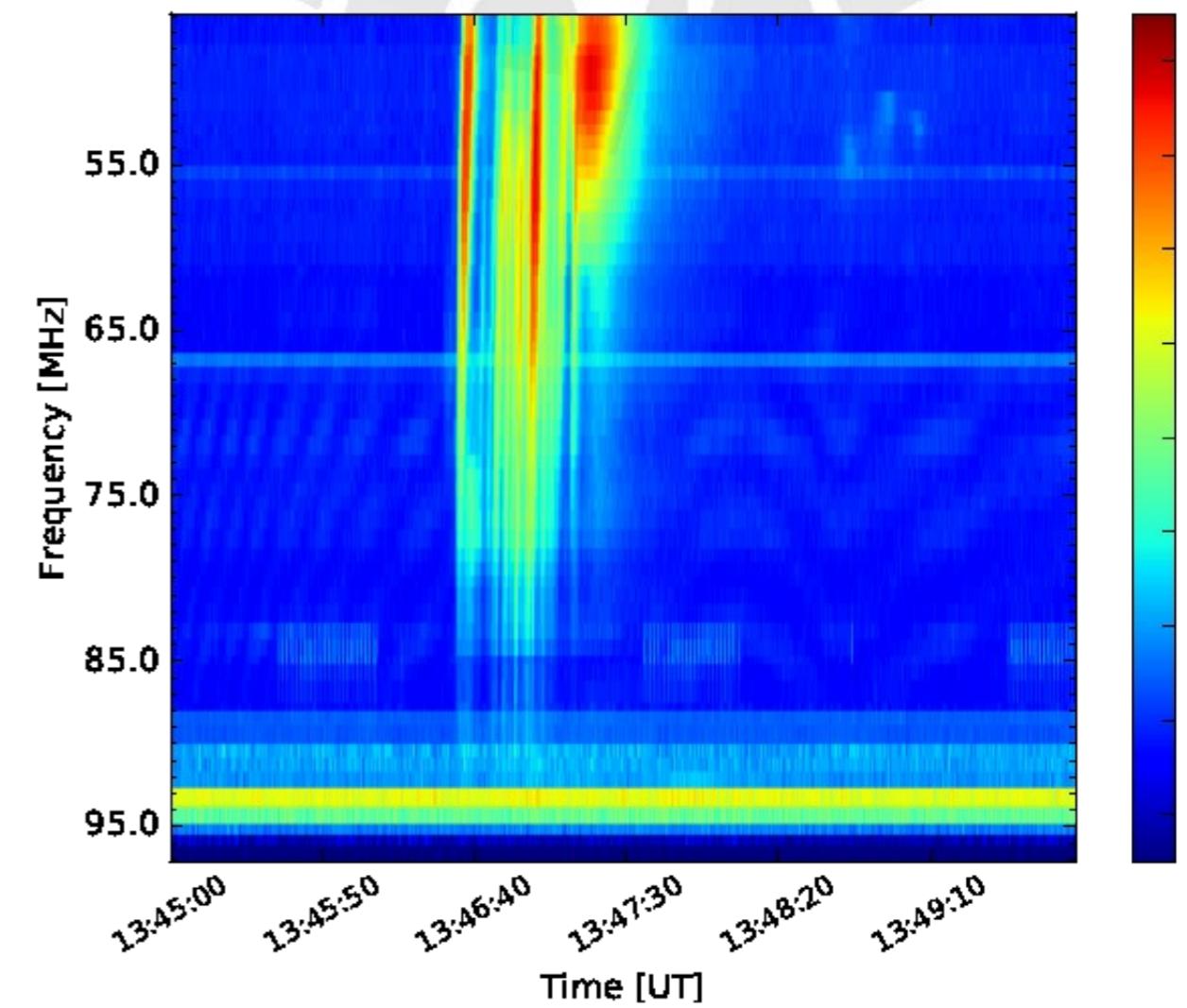
LANCE

## Callisto-Mexart

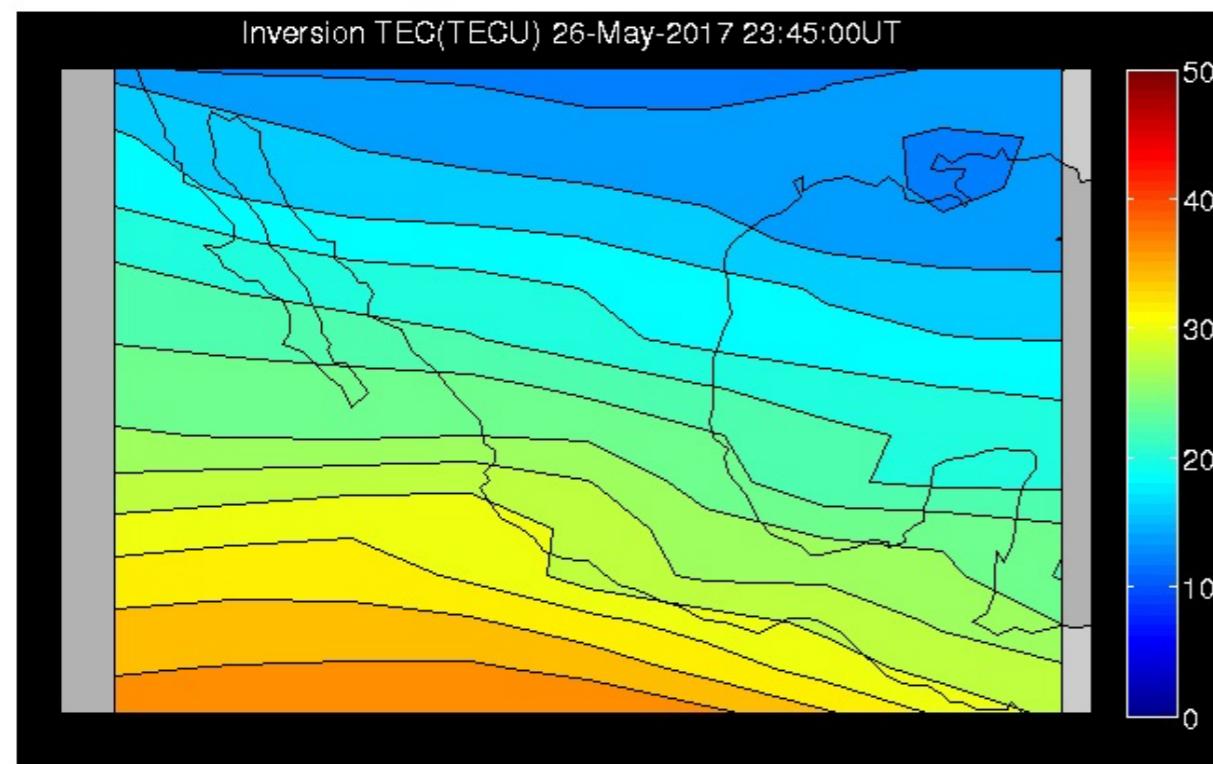


- Radiospectrograph 50 – 250 MHz (06/2015).
  - Solar radio burst (in collaboration with e-callisto).

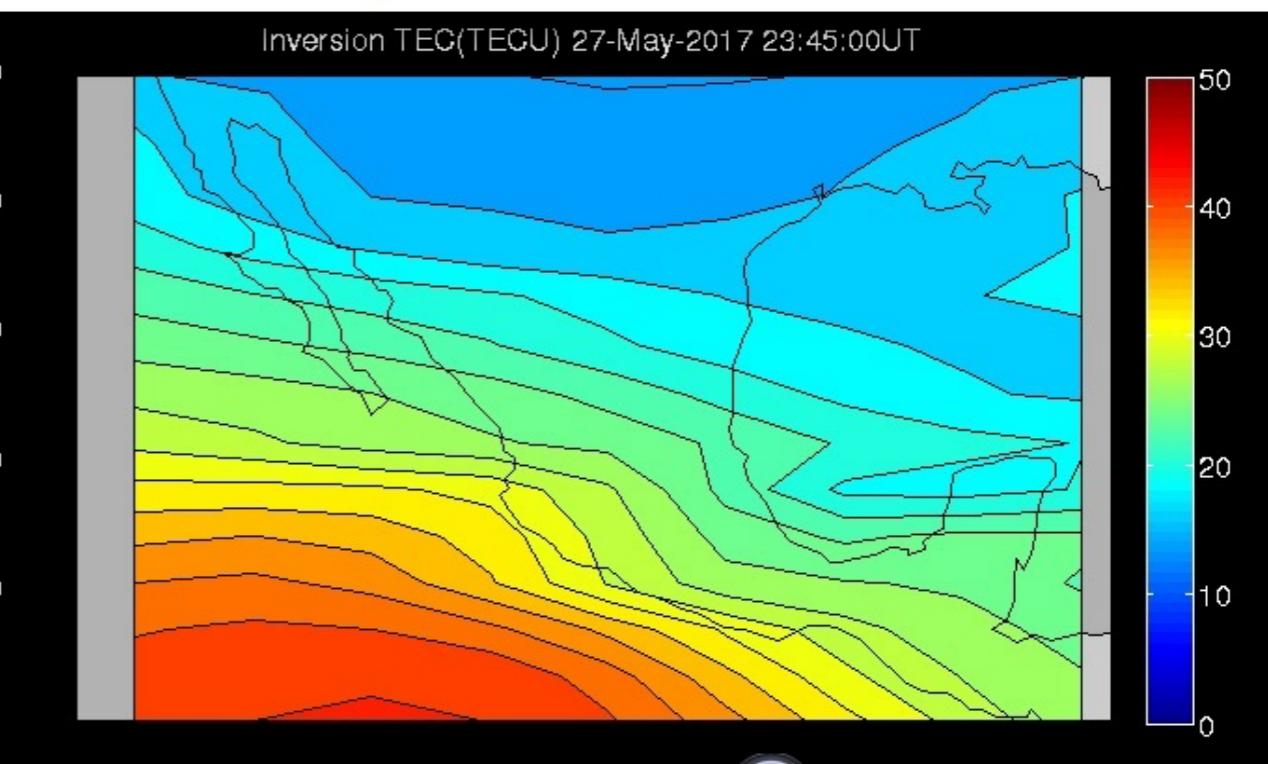
26 May 2016 Radio flux density (MEXART)



Dia quieto



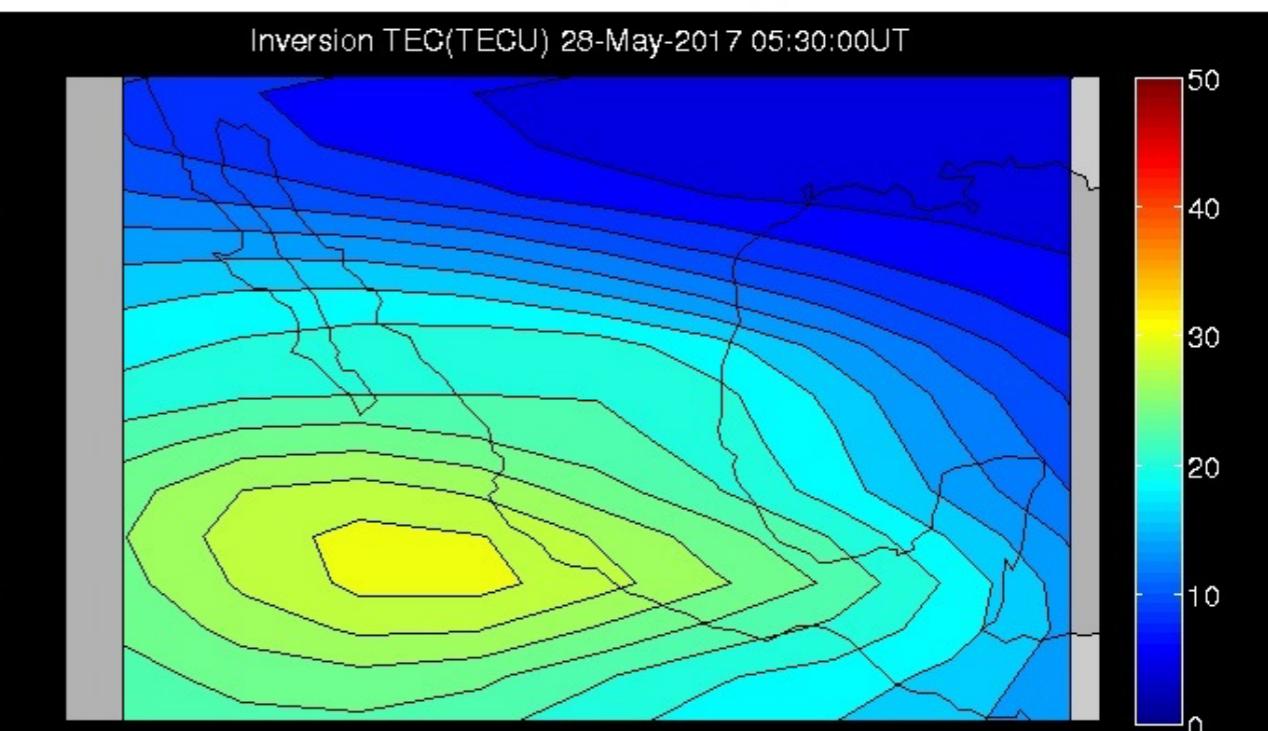
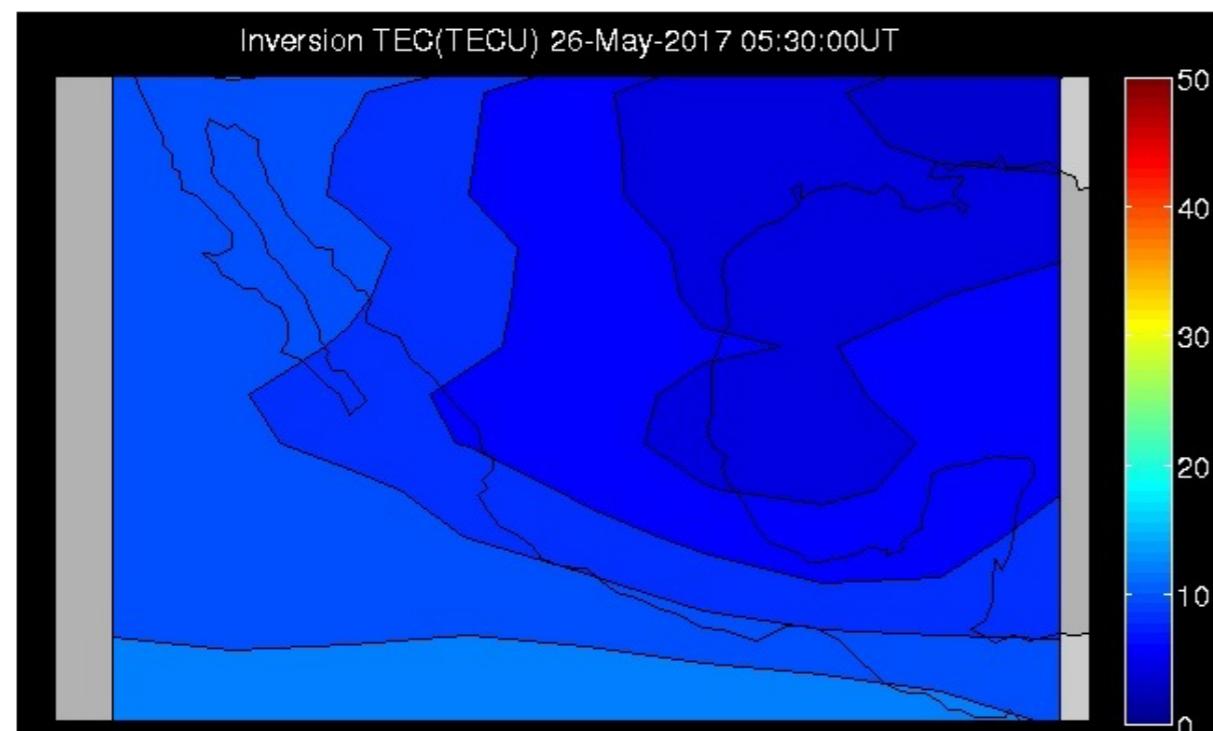
Dia perturbado



lado dia

Contenido Total de Electrones, TECU

lado noche

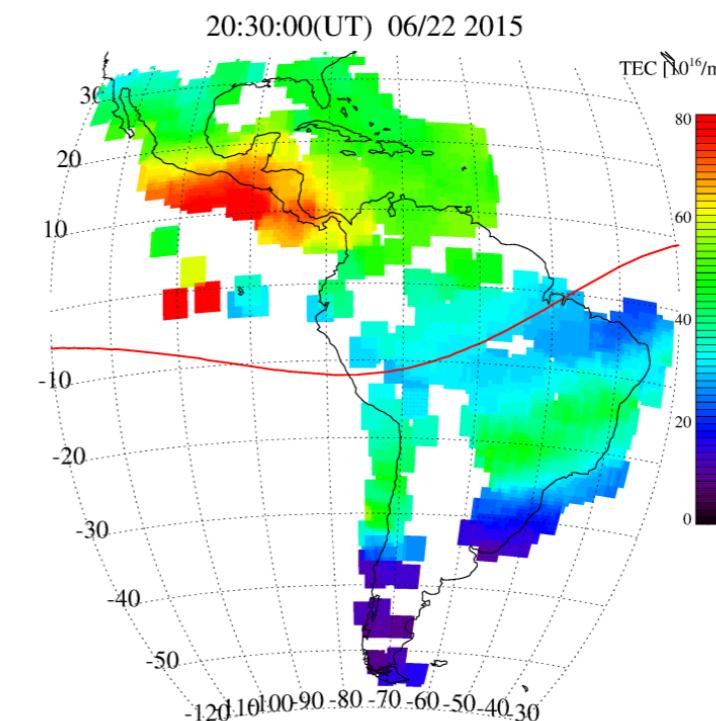
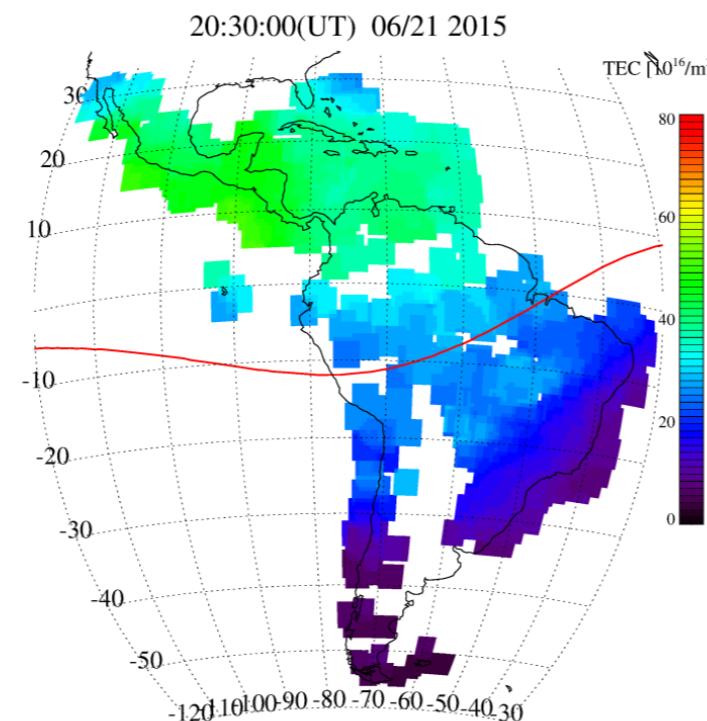


US-TEC maps NOAA-SWPC / T. Fuller & D. Fuller

LANCE

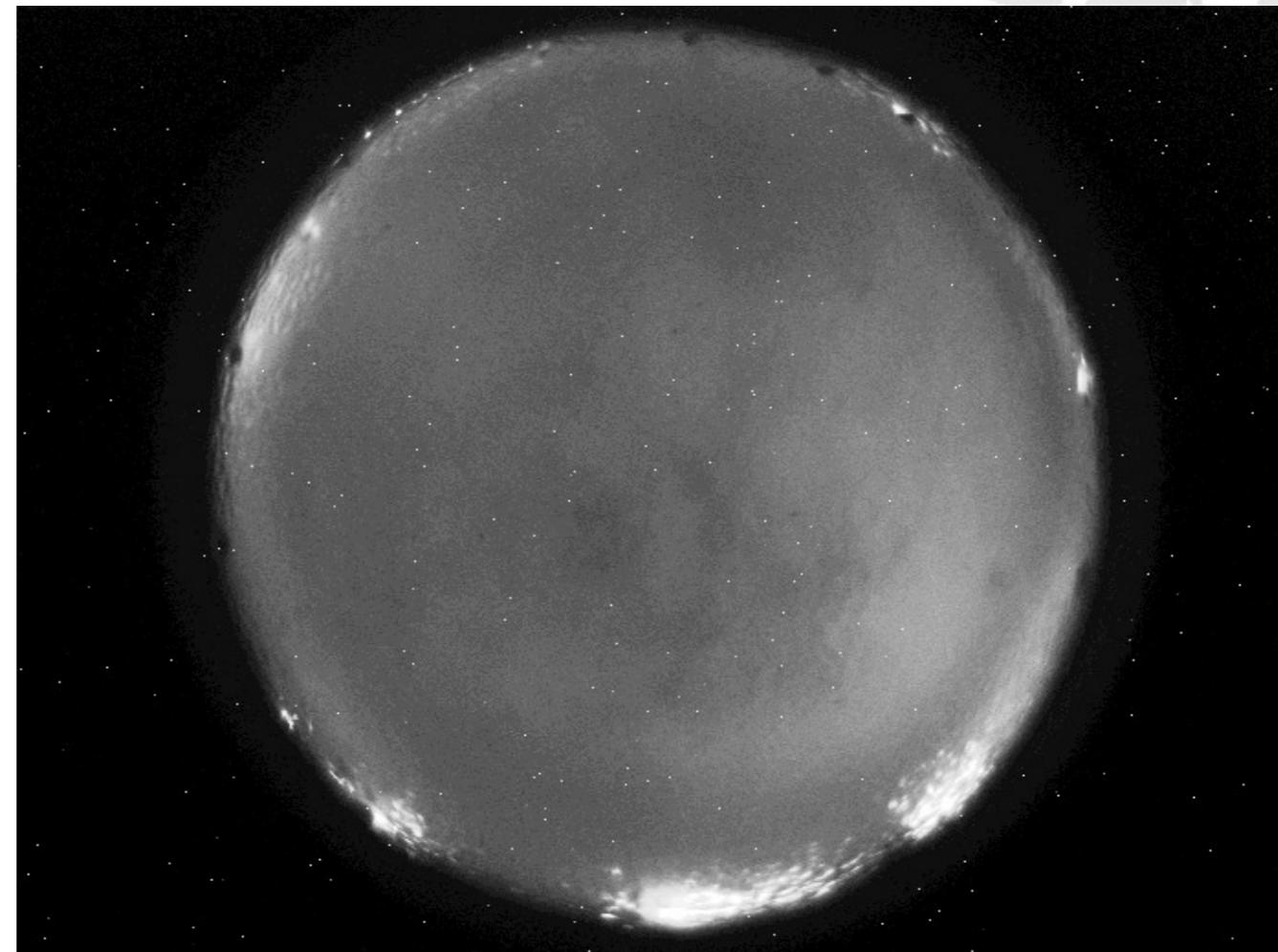
# GNSS Network for determinations of TEC Net: TLALOCNet-Mexico and COCONet-Central America

- The network is now being extended to whole Latin America including these two Networks.
- The gaps can be seen in the TEC maps.



## All-sky camera

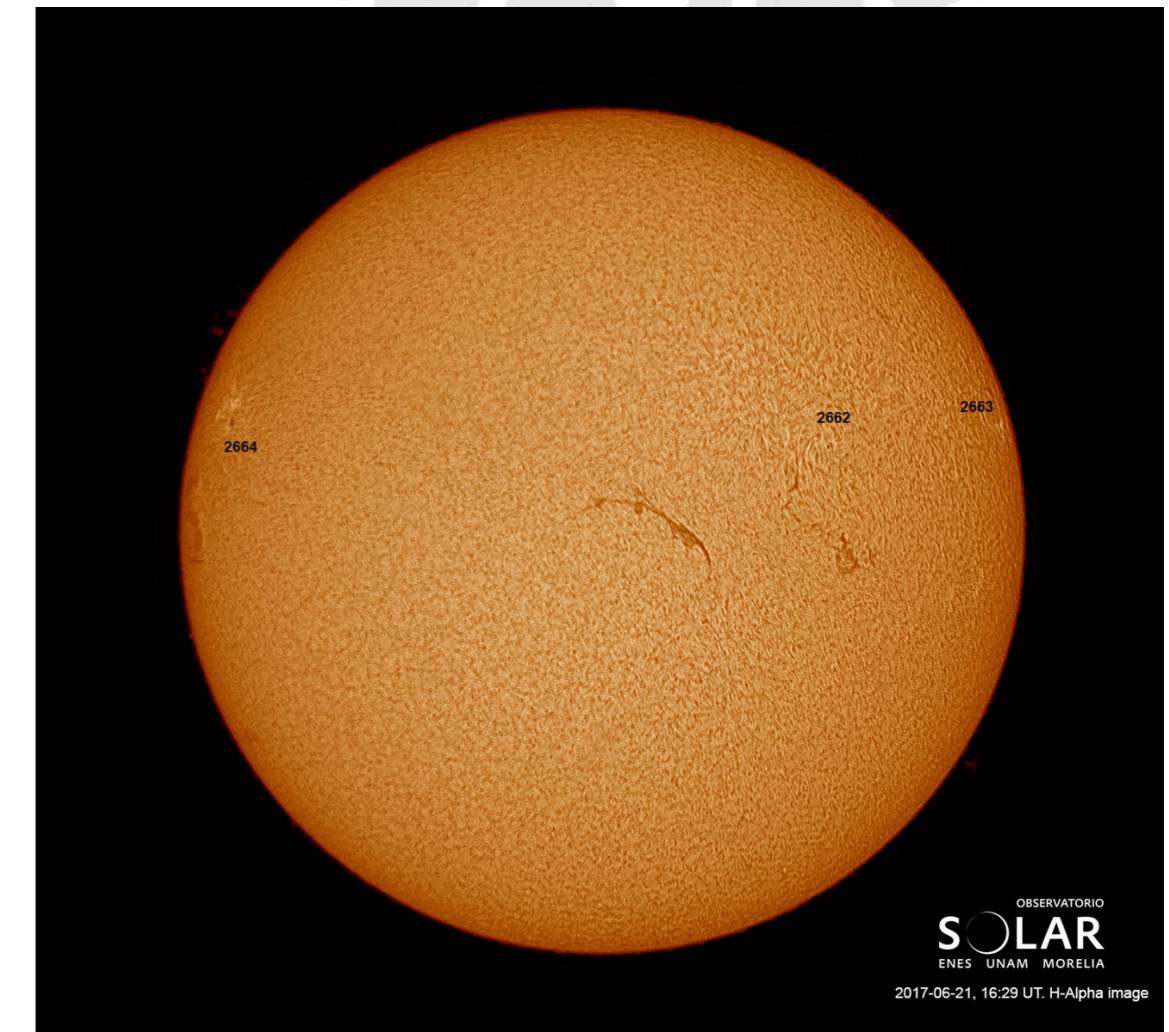
- Artemis CCD Camera/All-sky lens
  - Ionospheric bubbles (In collaboration with WPI/MANGO group)



LANCE

# H-alpha Observatory

- Solar Observatory LAGEOS UNAM
  - Daily image of the Sun (In collaboration with the Laboratory of Geospace Sciences UNAM)



PI: Mario Rodriguez (Laboratory of Geospace Sciences)

**LANCE**

# Facilities (Showroom)



*G*



GACETA  
UNAM

ÓRGANO INFORMATIVO  
DE LA UNIVERSIDAD NACIONAL  
AUTÓNOMA DE MÉXICO

# Seguimiento al **Sol**

Servicio de clima espacial, en Geofísica,  
monitorea su actividad



front page Gaceta UNAM, January 2017

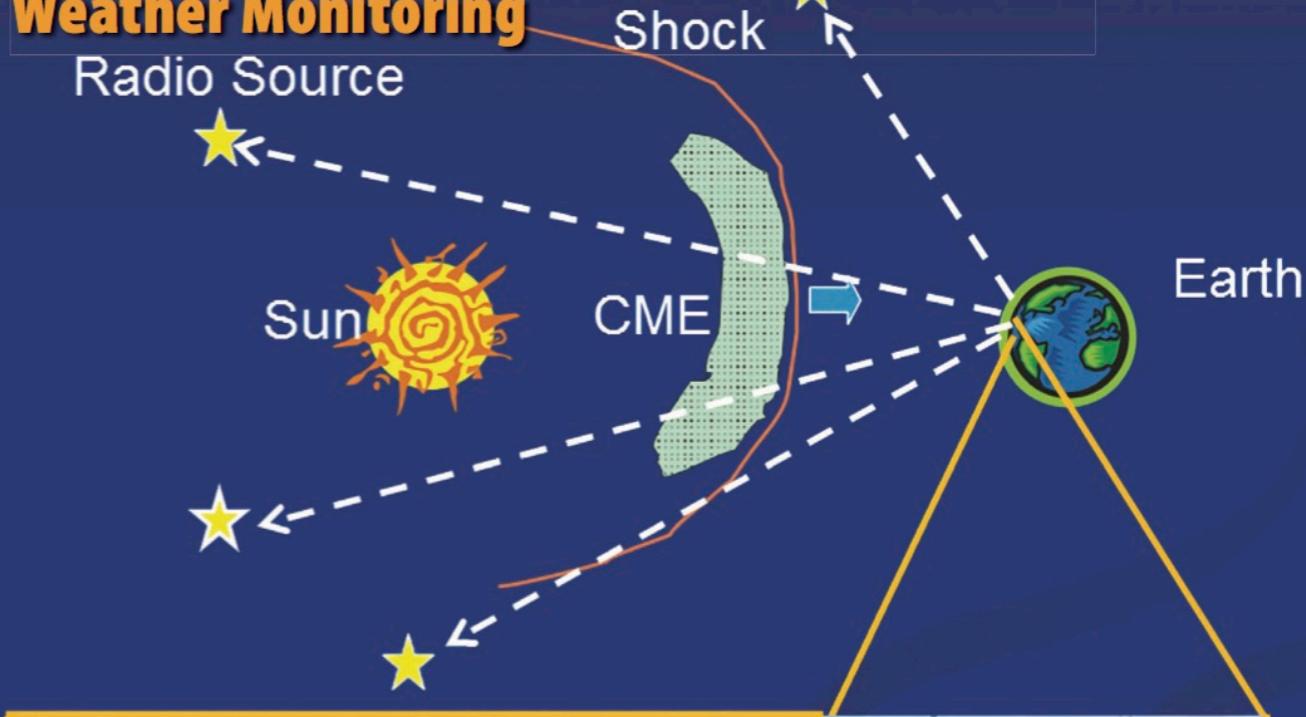
# Space Weather

QUARTERLY

Volume 14, Issue 1, 2017 [www.wileyonlinelibrary.com/journal/swq](http://www.wileyonlinelibrary.com/journal/swq)

THE INTERNATIONAL JOURNAL OF RESEARCH AND APPLICATIONS

## Mexican Space Weather Service (SCiESMEX) Collaborates Internationally for Space Weather Monitoring



### Features:

- In Memoriam: Patrick Siler McIntosh, 1940–2016
- Mexican Space Weather Service (SCiESMEX)

### Research:

- Extreme geomagnetic storms: Probabilistic forecasts and their uncertainties



# Summary

- Modification to the General Civil Protection Law
  - Creation of the Mexican Space Weather Service (SCiESMEX)
  - Creation of the working group Space Weather in Mexico to promote a national strategy
  - Creation of the Space Weather National Laboratory (LANCE) to strength ground observational capabilities
  - Boosting international collaborations: UNCOPUOS, ISES, WMO, ISWI
- UNISPACE+50



# COLAGE XI - Eleventh Latin American Conference on Space Geophysics

16-20 April 2018, Buenos Aires, Argentina

<http://www.iafe.uba.ar/colage11/>

[Home](#)

[Invited Speakers](#)

[Important Dates](#)

[Pre-registration](#)

[Travel and Venue](#)

[Scientific Program](#)

[Proceedings](#)

[Organizing Committees](#)

Contact: [colage11@iafe.uba.ar](mailto:colage11@iafe.uba.ar)



[Asociación Latinoamericana de  
Geofísica Espacial](#)

## About COLAGE meetings

Space geophysics is a branch of science that encompasses the study of space around the Earth, the interplanetary medium, planetary and cometary atmospheres, the solar variability and its impact on Earth. This discipline has considerable relevance to the reliable operation of space systems and to a better understanding of the processes involved in Global Climate Change. Several research groups in Latin America have made significant contributions to space geophysics, complementing theoretical and experimental efforts, as well as collaborating in scientific campaigns as part of international programs.

The Latin American Association of Space Geophysics (Asociación Latinoamericana de Geofísica Espacial or ALAGE) was founded in 1988 and periodically organizes the Latin American Meeting of Space Geophysics (Congreso Latinoamericano de Geofísica Espacial or COLAGE). These events gather around two hundred researchers and PhD students from Latin American countries to exchange and debate original results from their research on different areas related to Space Geophysics which include:

- The Sun and Sun-Earth interactions
- The heliosphere and cosmic rays
- The magnetosphere
- Ionosphere and high atmosphere
- Space weather
- Solar and space plasma physics
- Nonlinear processes in space geophysics



## First Announcement

Dear ALAGE colleagues and friends,

Together with the members of the Local Organizing Committee, it gives us great pleasure to invite you to come to Argentina to attend our 11th COLAGE, that will take place between the 15th and 20th of April, 2018, at the Centro Cultural de la Ciencia in

# LANCE

Laboratorio Nacional  
de Clima Espacial

<http://www.sciesmex.unam.mx>



I S E S  
International Space  
Environment Service

AEM

AGENCIA  
ESPACIAL  
MEXICANA



Síguenos en



/sciesmex



@sciesmex

# Facebook: SCIESMEX

The screenshot shows the SCIESMEX Facebook page. The cover photo is a solar flare. The profile picture is the SCIESMEX logo. The page has 1,214 likes. A recent post from GalileoMobile (@galileomobile) is displayed:

Retweeted GalileoMobile (@galileomobile):  
Getting ready! RT@UNOOSA Schedule of work for today #STSC  
#COPUOS & general exchange of views + COSPAR Symposium on  
'Measuring the universe'

## Twitter @sciesmex

The screenshot shows the SCIESMEX Twitter profile. The bio reads: "SCIESMEX / UNAM MX Servicio de Clima Espacial-MX / Space Weather Service-MX / SCIESMEX, Instituto de Geofísica, Unidad Michoacán, Universidad Nacional Autónoma de México". The profile picture is the SCIESMEX logo. The stats are: 1,173 tweets, 158 following, 82 followers, and 47 favorites. A recent tweet from GalileoMobile (@galileomobile) is shown:

Getting ready! RT@UNOOSA Schedule of work for today #STSC  
#COPUOS & general exchange of views + COSPAR Symposium on  
'Measuring the universe'

[www.sciesmex.unam.mx](http://www.sciesmex.unam.mx)