22/03/18

Session 9: Space Weather

Monitoring Ionospheric Perturbations During Solar Energetic Events Using GNSS data

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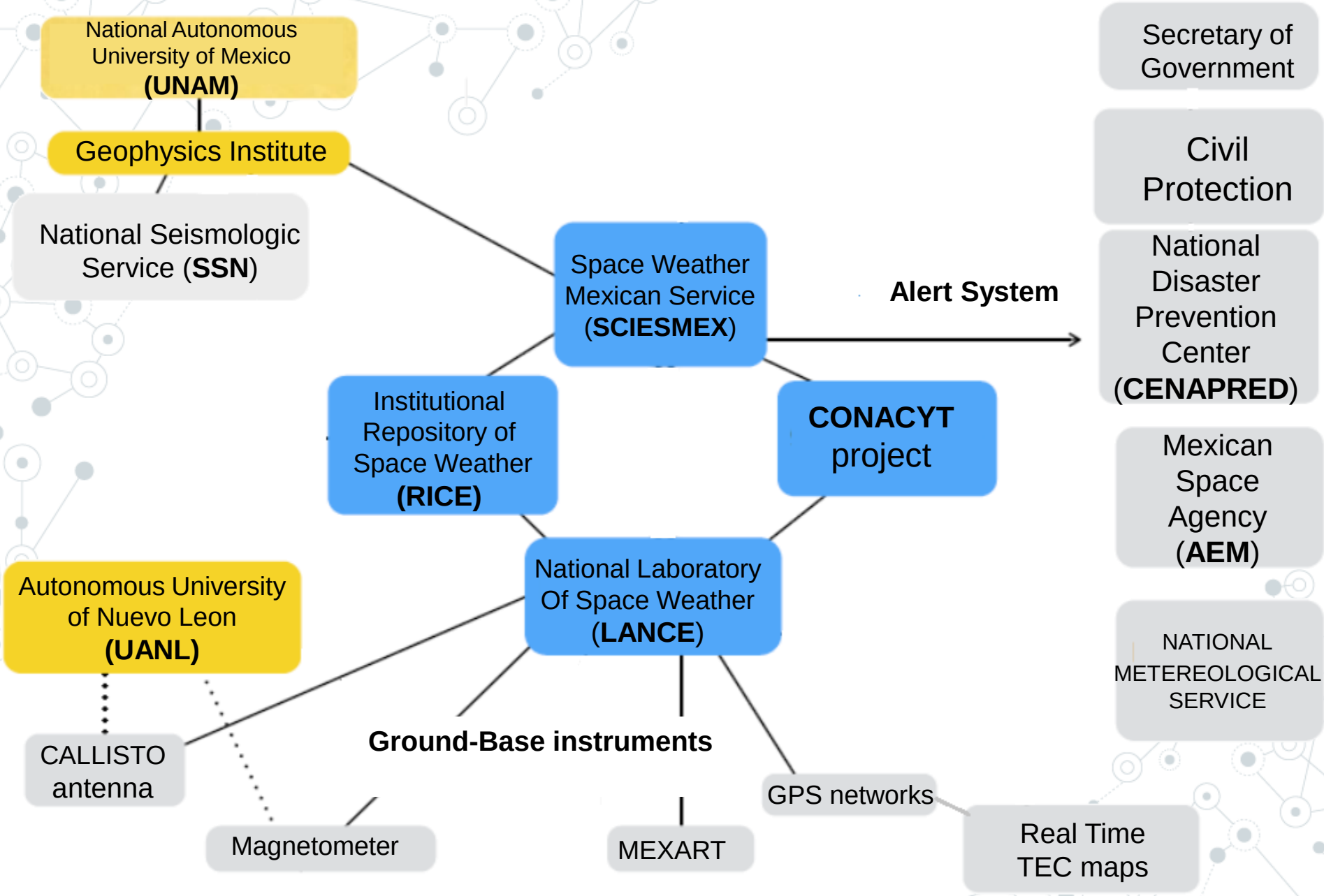
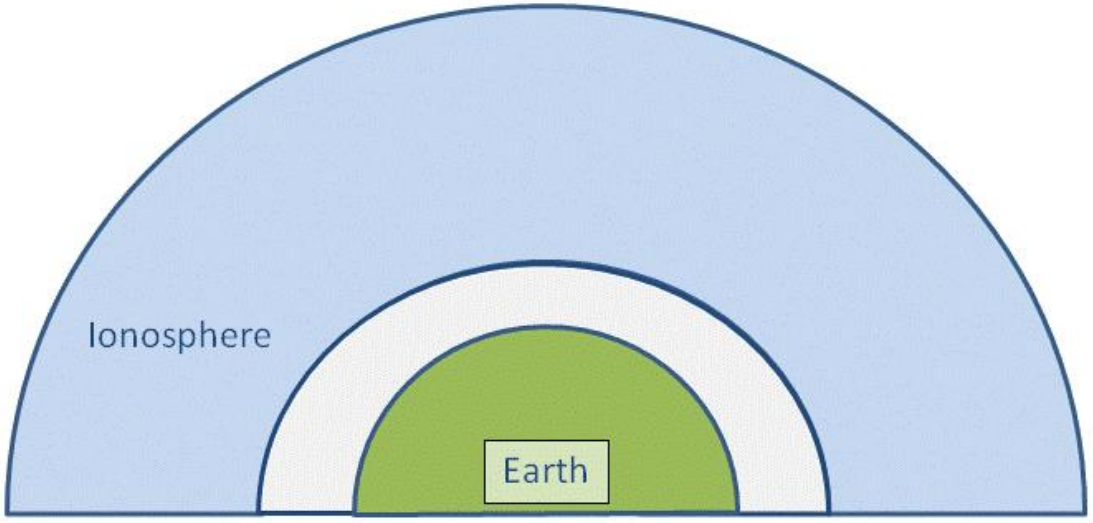
Outline

- TEC maps over Mexican territory.
- Distribution of GPSs stations over Mexican territory.
- TEC behavior during solar events producing intense Geomagnetic Storms.
- Current and future vision using GNSS data.

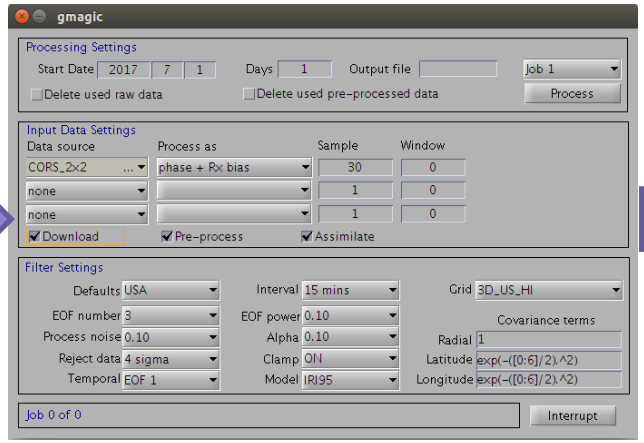

National Autonomous University of Mexico (UNAM)
Geophysics Institute
National Seismologic Service (SSN)
Space Weather Mexican Service (SCIESMEX)
Alert System
Secretary of Government
Civil Protection
National Disaster Prevention Center (CENAPRED)
Institutional Repository of Space Weather (RICE)
CONACYT project
Mexican Space Agency (AEM)
National Laboratory Of Space Weather (LANCE)
Autonomous University of Nuevo Leon (UANL)
NATIONAL METEREOLOGICAL SERVICE
Ground-Base instruments
CALLISTO antenna
Magnetometer
MEXART
GPS networks
Real Time TEC maps

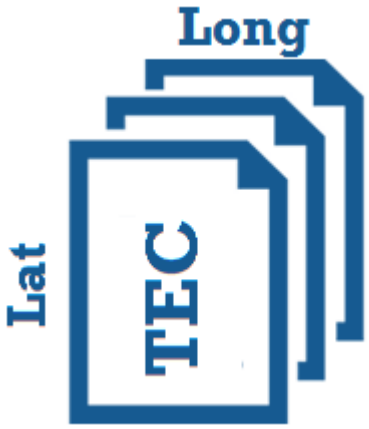


Total Electron Content estimated at each Ionospheric Pierce Point using GNSS constellations.

USTEC

GMAGIC INTERFACE





DOWNLOAD

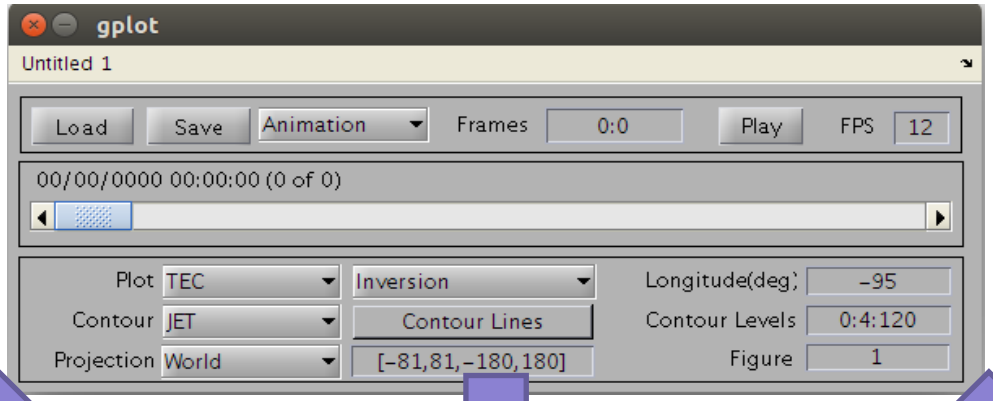
PRE-PROCESS

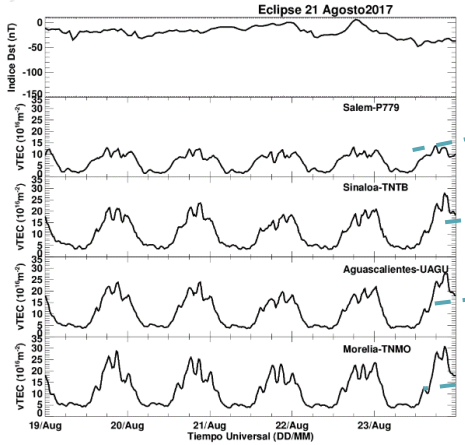
ASSIMILATE

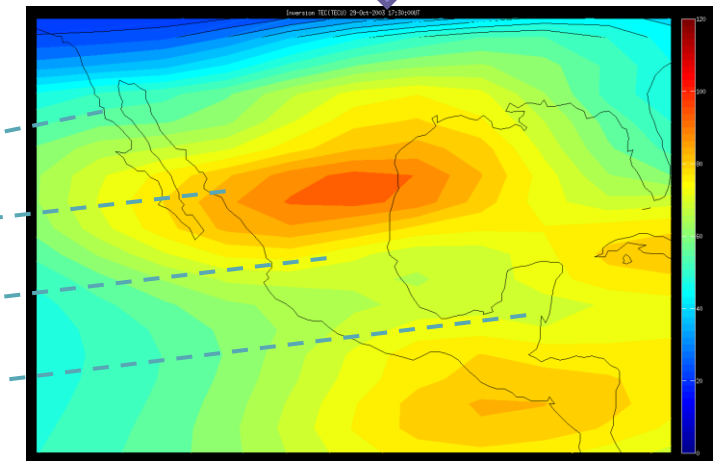
The USTEC code was implemented by Dominic Fuller at the NOOA institute.

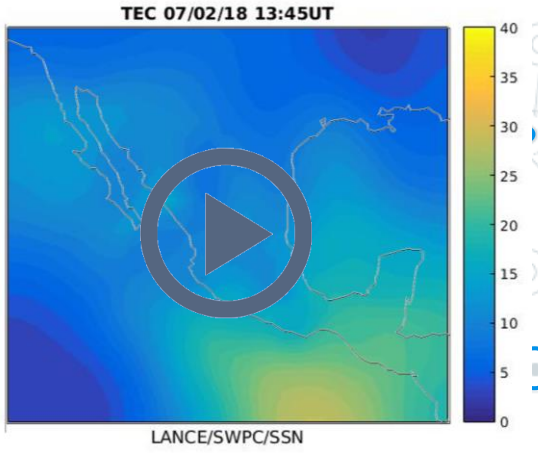
USTEC

GPLOT INTERFACE









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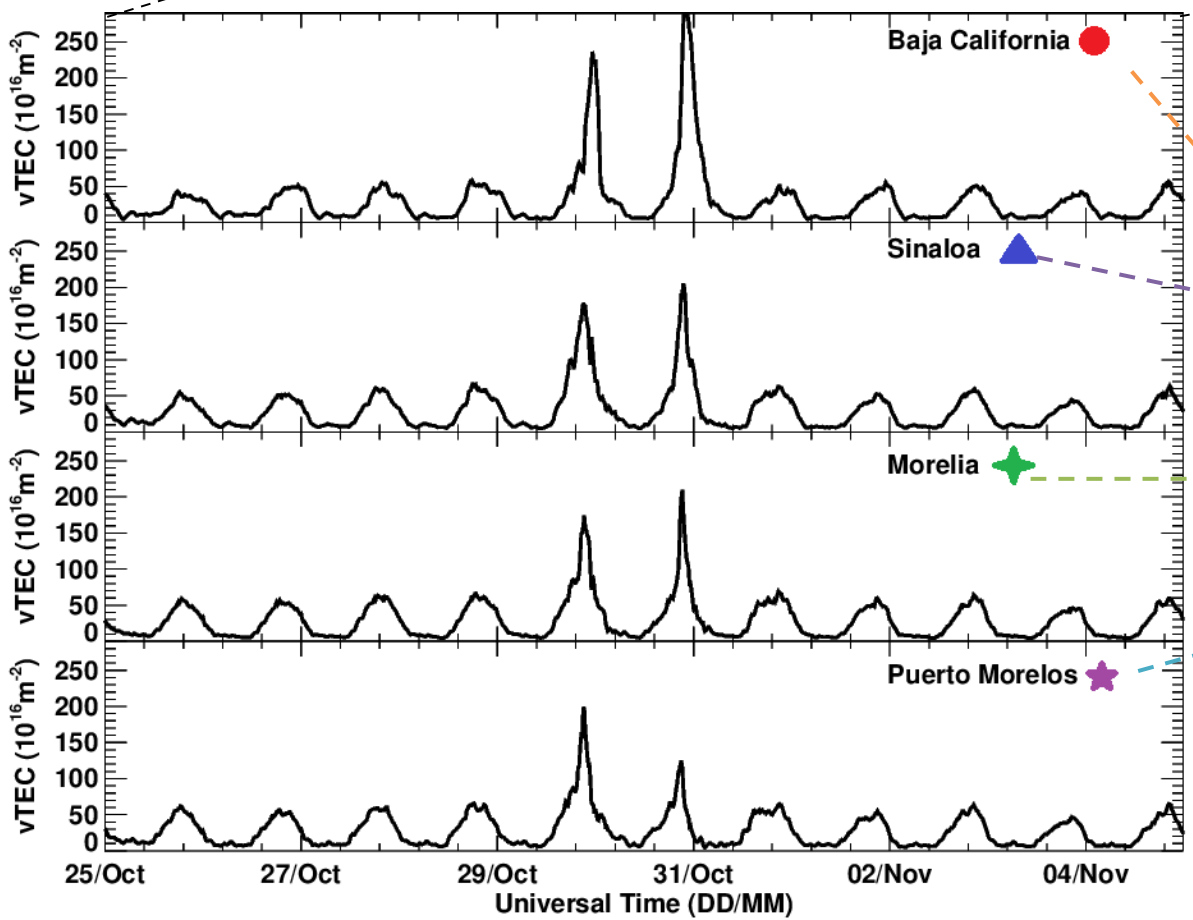
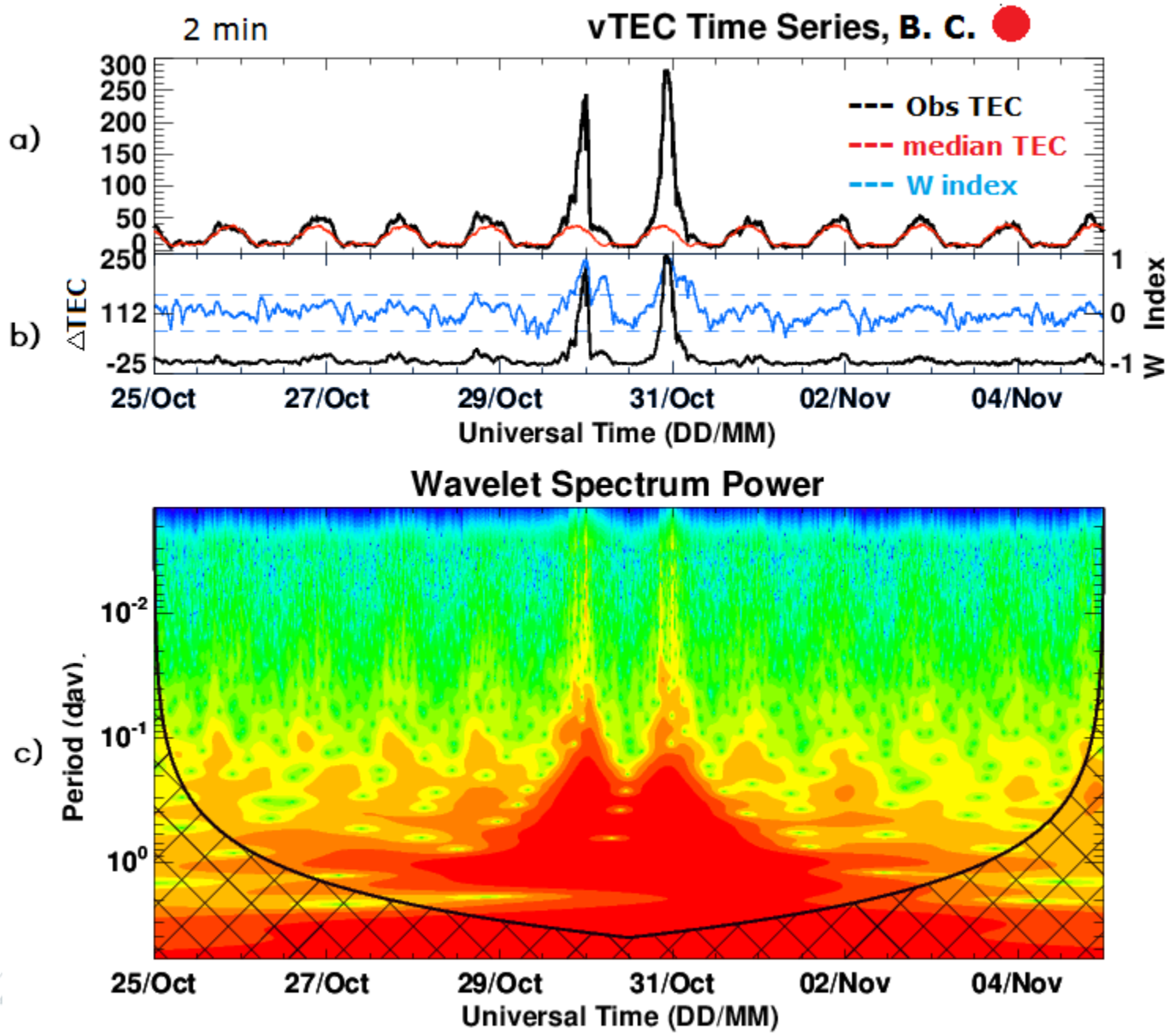
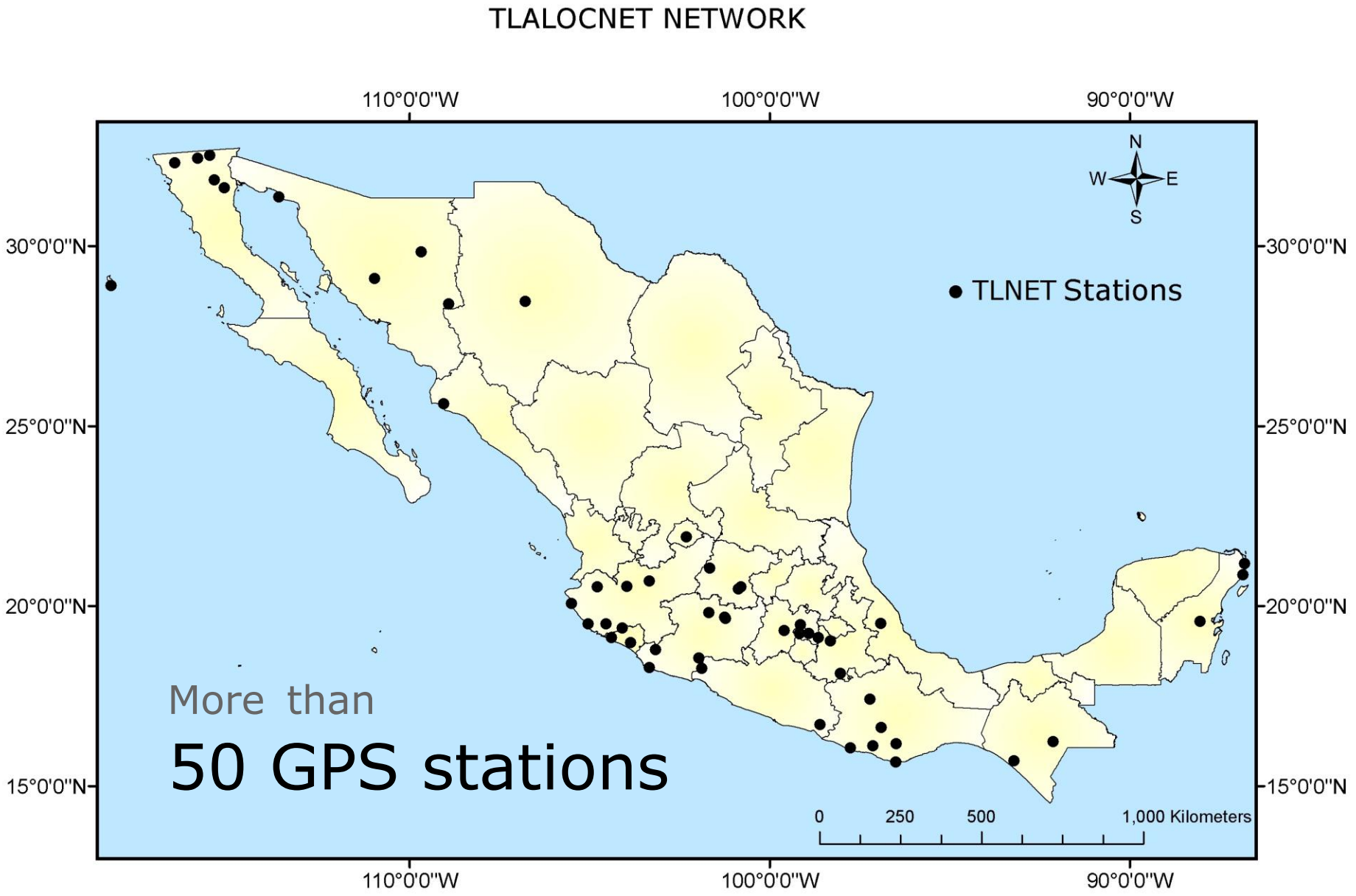
Geomagnetic Equatorial Index: http://wdc.kugi.kyoto-u.ac.jp



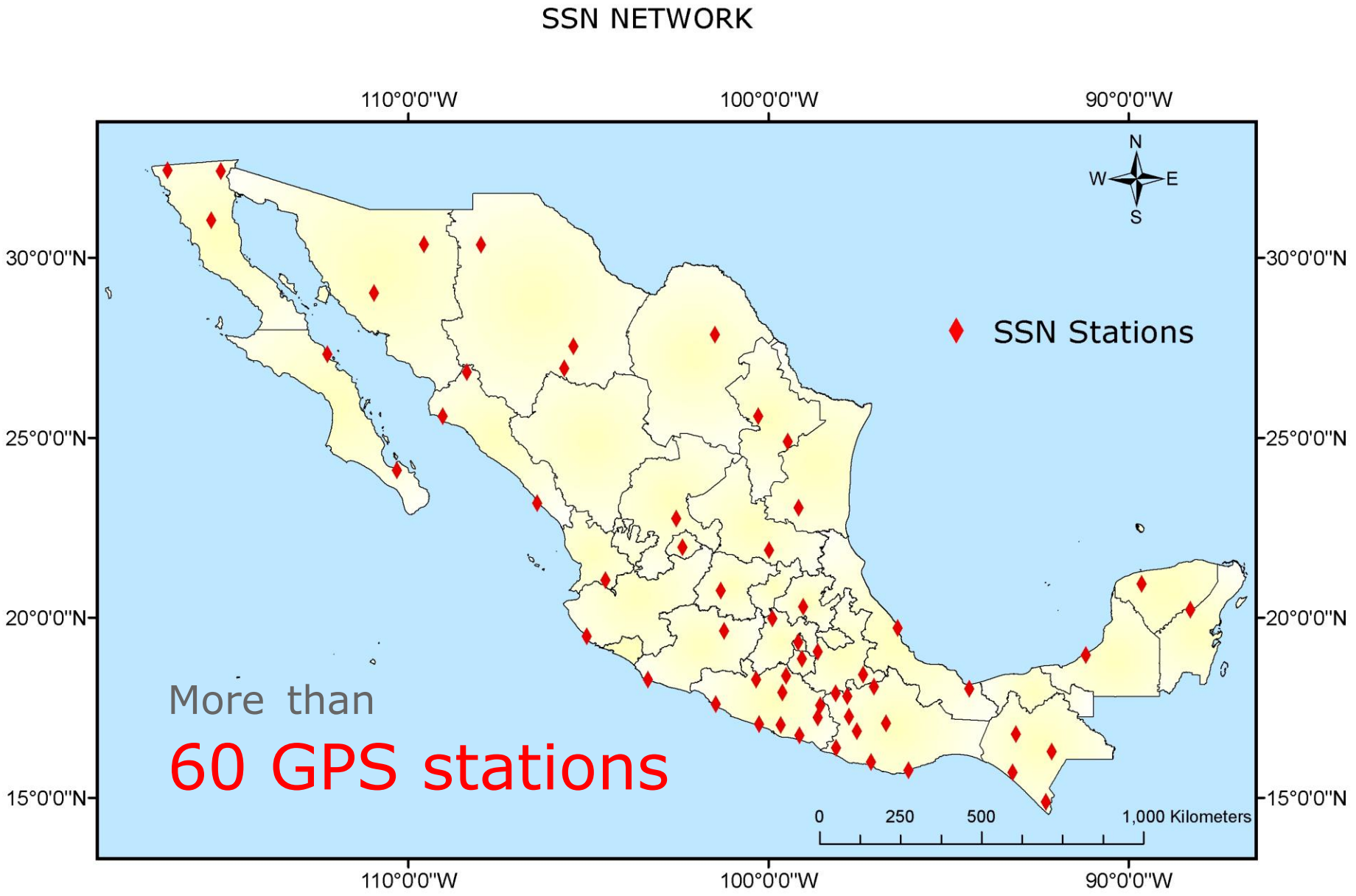
vTEC series over Mexican latitudes during the Halloween Storm of 2003.



Median vTEC values, W index and Wavelet analysis of the Halloween storm of 2003.

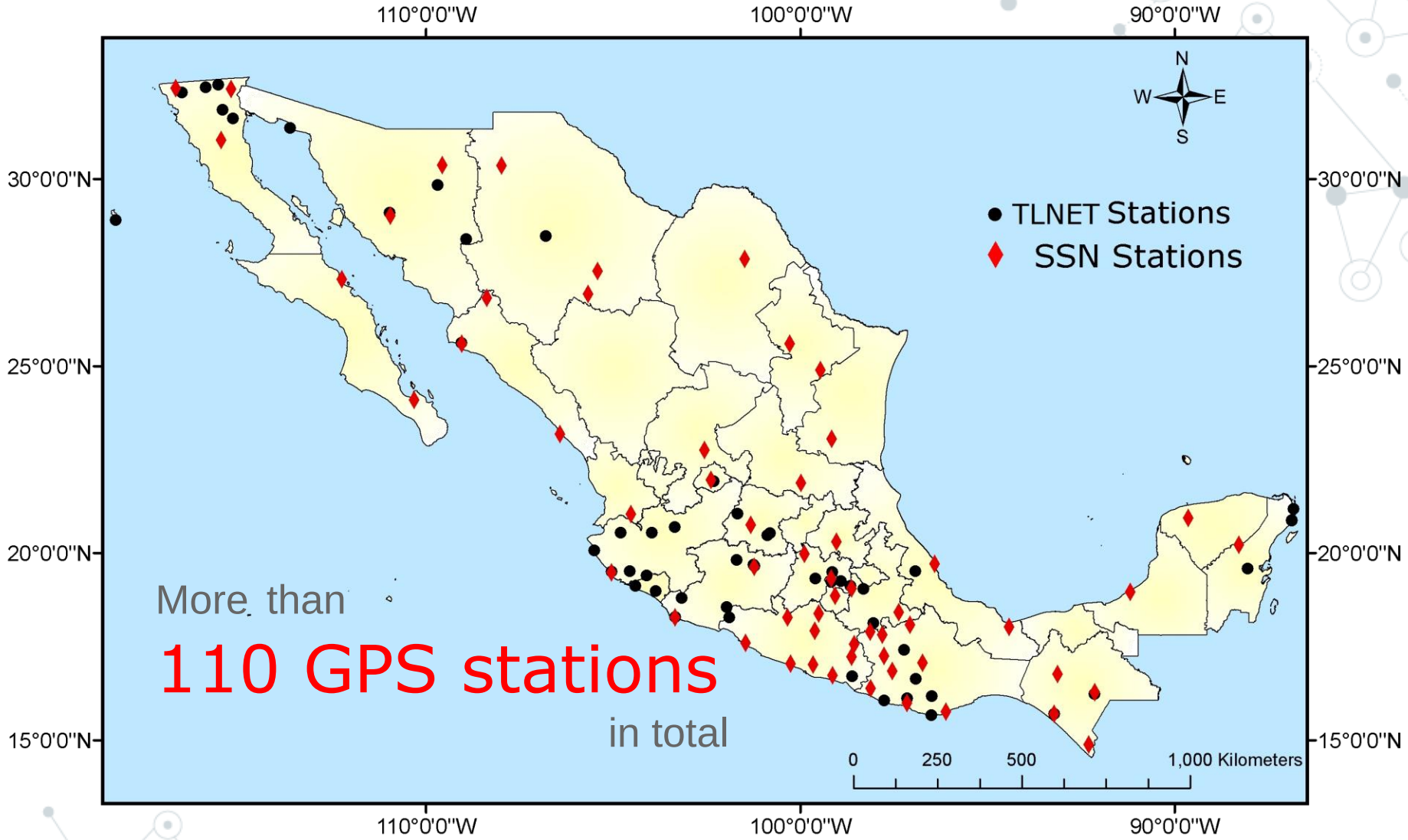


TLALOCNET GPS network distribution over Mexican territory.
Source: http://cardi.geofisica.unam.mx



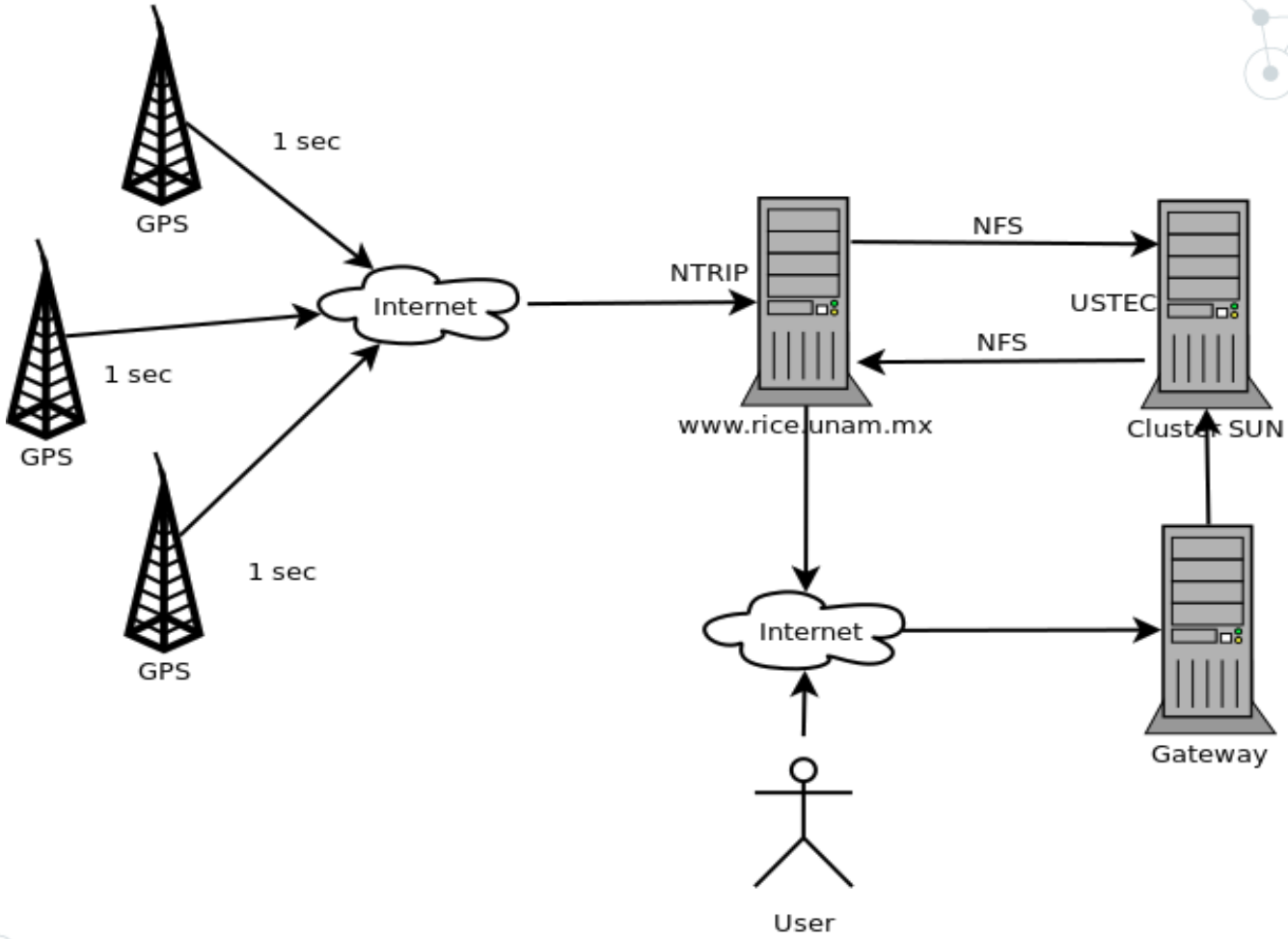
National Seismologic Service (SSN) GPS network distribution over Mexican territory.
Source: http://www.ssn.unam.mx/

TLALOCNET AND SSN NETWORK

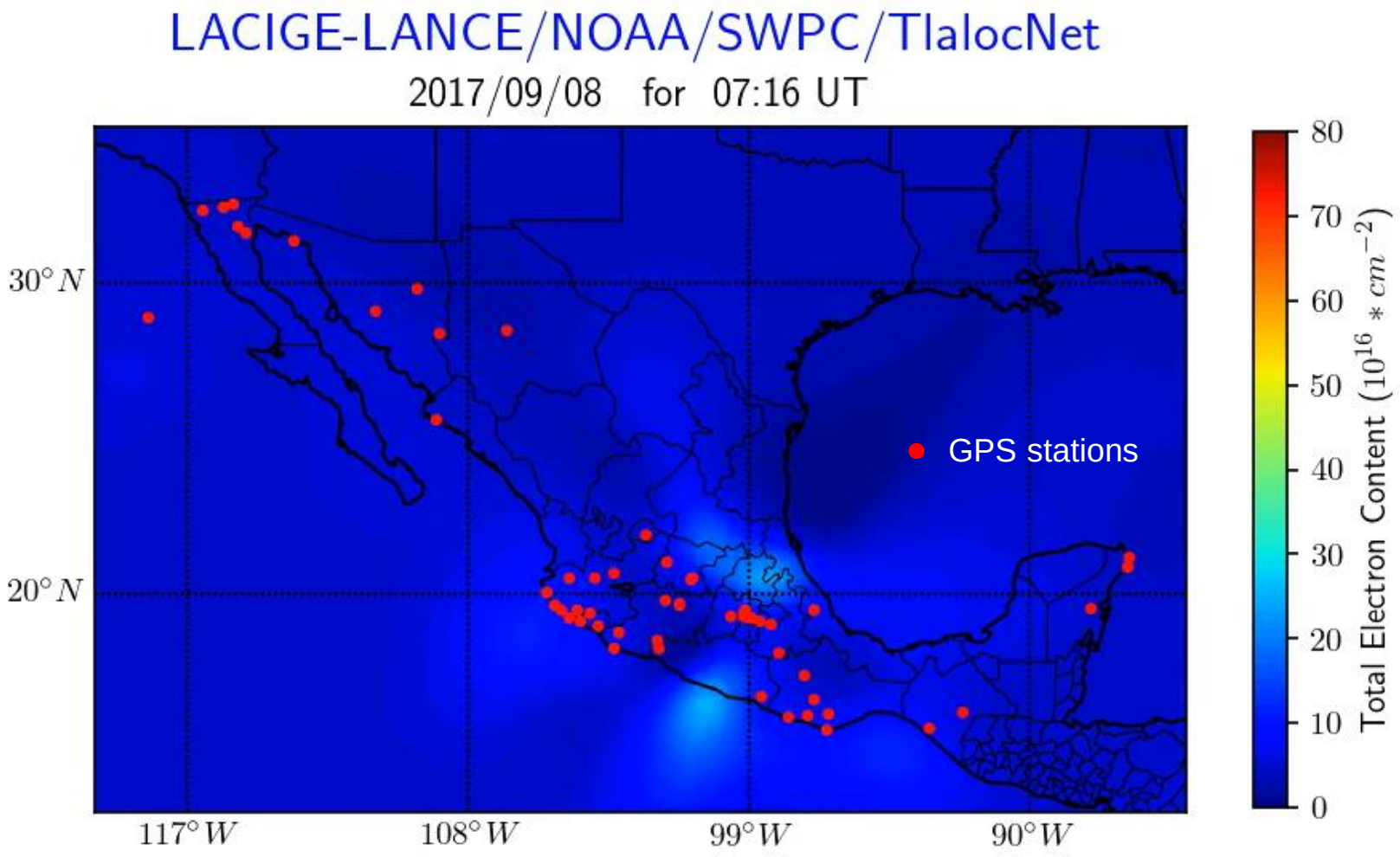


Map of all the GPS stations (SSN + Tlalocnet) available for TEC maps.
Source: http://www.ssn.unam.mx/

TEC in real time



Simplified diagram showing how TEC maps are being downloaded, stored and processed in order to obtain TEC maps in near real time.



TEC video using GNSS data and Tlalocnet network for 08/09/2018.

LANCE

Servicio Clima Espacial

http://www.sciesmex.unam.mx

Reporte Semanal

Weekly Report

http://www.lance.unam.mx/

CONACYT
Consejo Nacional de Ciencia y Tecnología

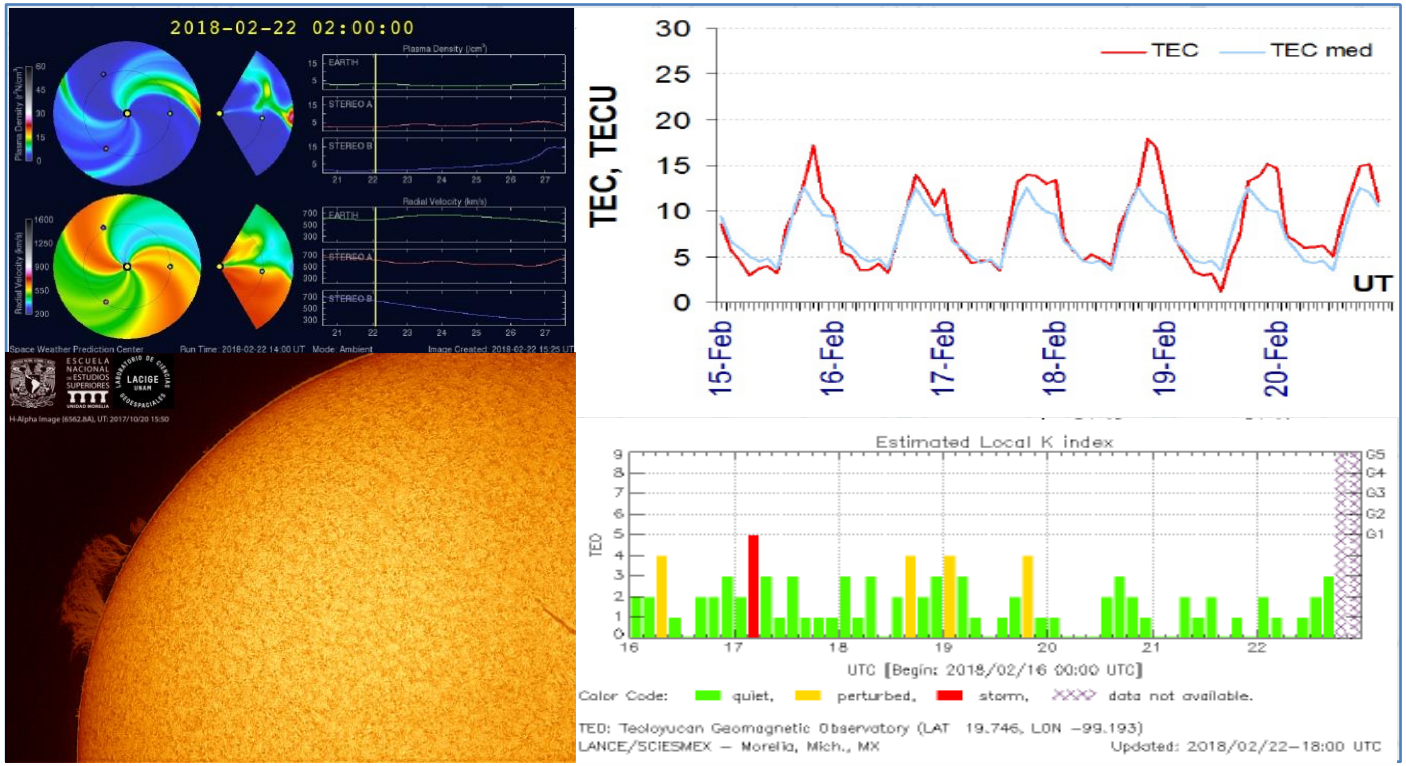
ISES
International Space Environment Service

CENAPRED
MÉXICO

AEM
AGENCIA ESPACIAL MEXICANA

Weekly report on Mexican space weather and some governmental institutes concerned.

www.sciesmex.unam.mx



Data, weekly reports, forecast on:

Local TEC, Kmex index, cosmic rays, daily solar disk photos, etc

Conclusion and future work

- Now we are **storing**, **processing** GNSS data and **creating** TEC maps in near real time
- Working on public TEC maps **every 15 min**
- It is necessary to improve tools to verify **quality** and **availability** of all the GNSS data used by the USTEC code.
- Parallelize processes and refine the vTEC **grid**.
- Stablish an appropiate **ionospheric index** to search and study disturbances.

Any questions?

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Thank you!

United Nations/Argentina Workshop
&
Co-sponsors and
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