Light Pollution Spanish REECL SQM Network

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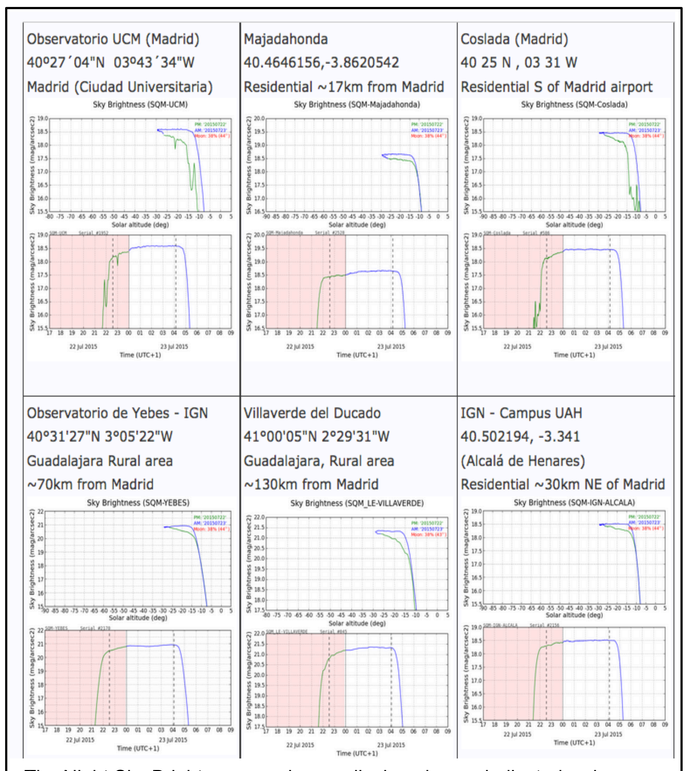
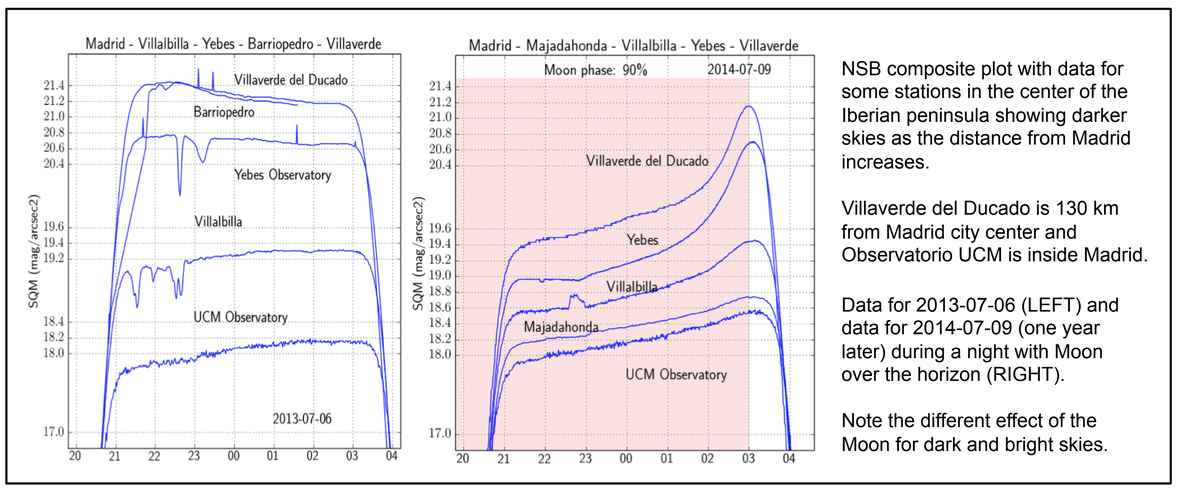


The Night Sky Brightness graphs are displayed on a dedicated webpage on real time https://guaix.fis.ucm.es/splpr/SQM-REECL

Record of three REECL-SQM stations. The graphs show color coded Night Sky Brightness data (NPS scale, Duriscoe et al. 2007) along the time. Each column represents one night, whose length varies along the year.
(1) Observatorio UCM. Madrid has bright polluted night skies.
(2) Villaverde del Ducado. Dark skies; it is easy to see the lunar months.
(3) Observatorio La Vara (Asturias). One year, apparent lunation cycles.

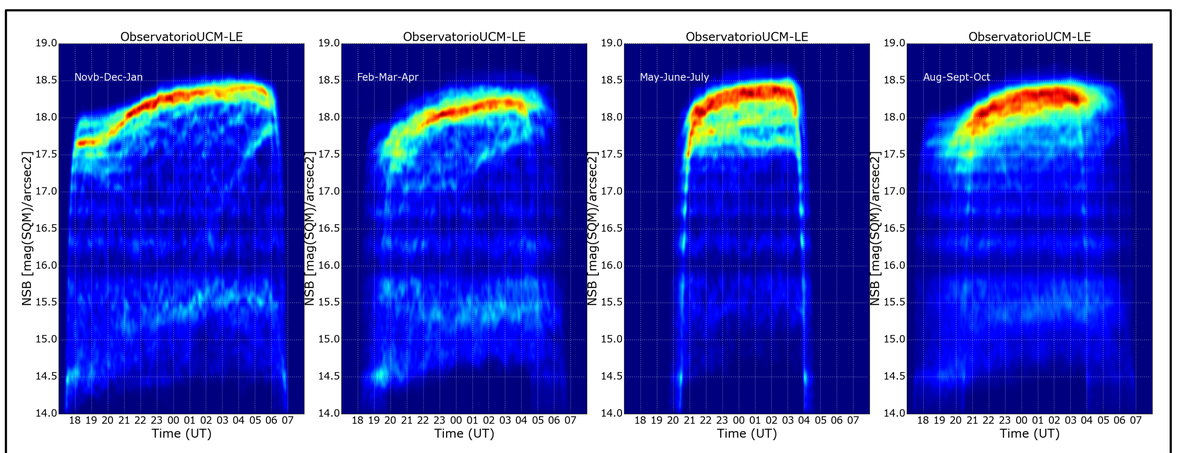


NSB composite plot with data for some stations in the center of the Iberian peninsula showing darker skies as the distance from Madrid increases.

Villaverde del Ducado is 130 km from Madrid city center and Observatorio UCM is inside Madrid.

Data for 2013-07-06 (LEFT) and data for 2014-07-09 (one year later) during a night with Moon over the horizon (RIGHT).

Note the different effect of the Moon for dark and bright skies.



(TOP) Scotograph (density graphs of night sky brightness) for the last 3 years at Observatorio UCM (inside Madrid). Each plot covers a quarter of the year.

The night sky of Madrid (as other big cities) is darker at the second part of the night. "Worldwide variations in artificial skyglow" Kyba et al. 2015 & A. Sánchez de Miguel (2015) PhD UCM

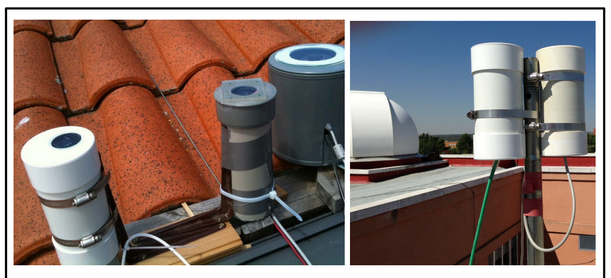
The SQM network of the Spanish Light Pollution Research collaboration (http://guaix.fis.ucm.es/splpr/SQM-REECL) is growing with the help of amateur astronomers and interested citizens. Up to now there are 18 stations.

SQM photometers provide measures of the night sky brightness every night using the PySQM software. The analysis of the data provided by the photometers allows the researchers to monitor the nightly, monthly and yearly evolution of the NSB and the relationship with sources of light pollution in intensity and distance. The photometers that are measuring in protected areas will alarm the researchers about eventual increasing of light pollution that could affect the environment.

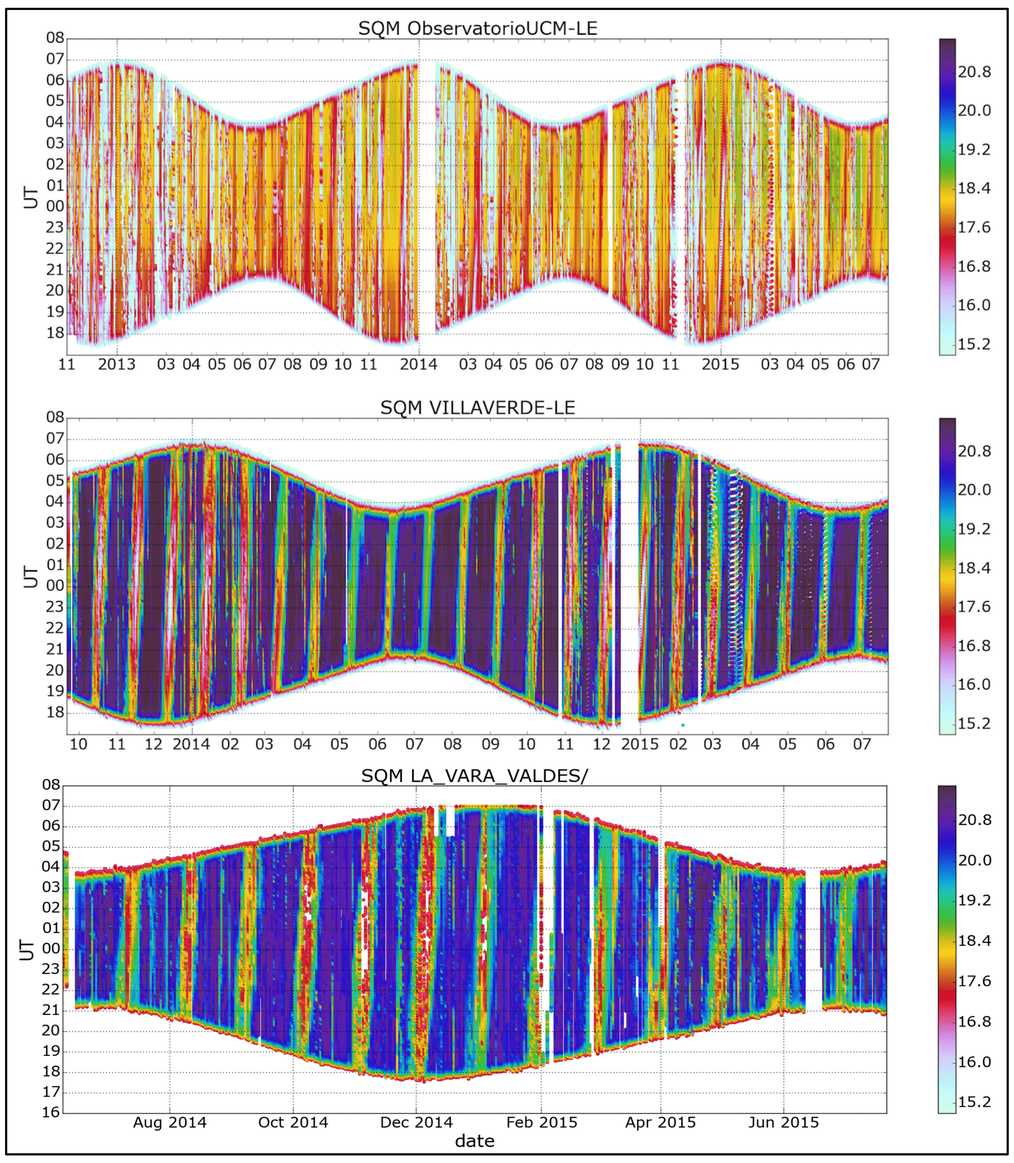
Using models of light dispersion on the atmosphere one can determine which light pollution sources are increasing the sky brightness at different places and in which extension.

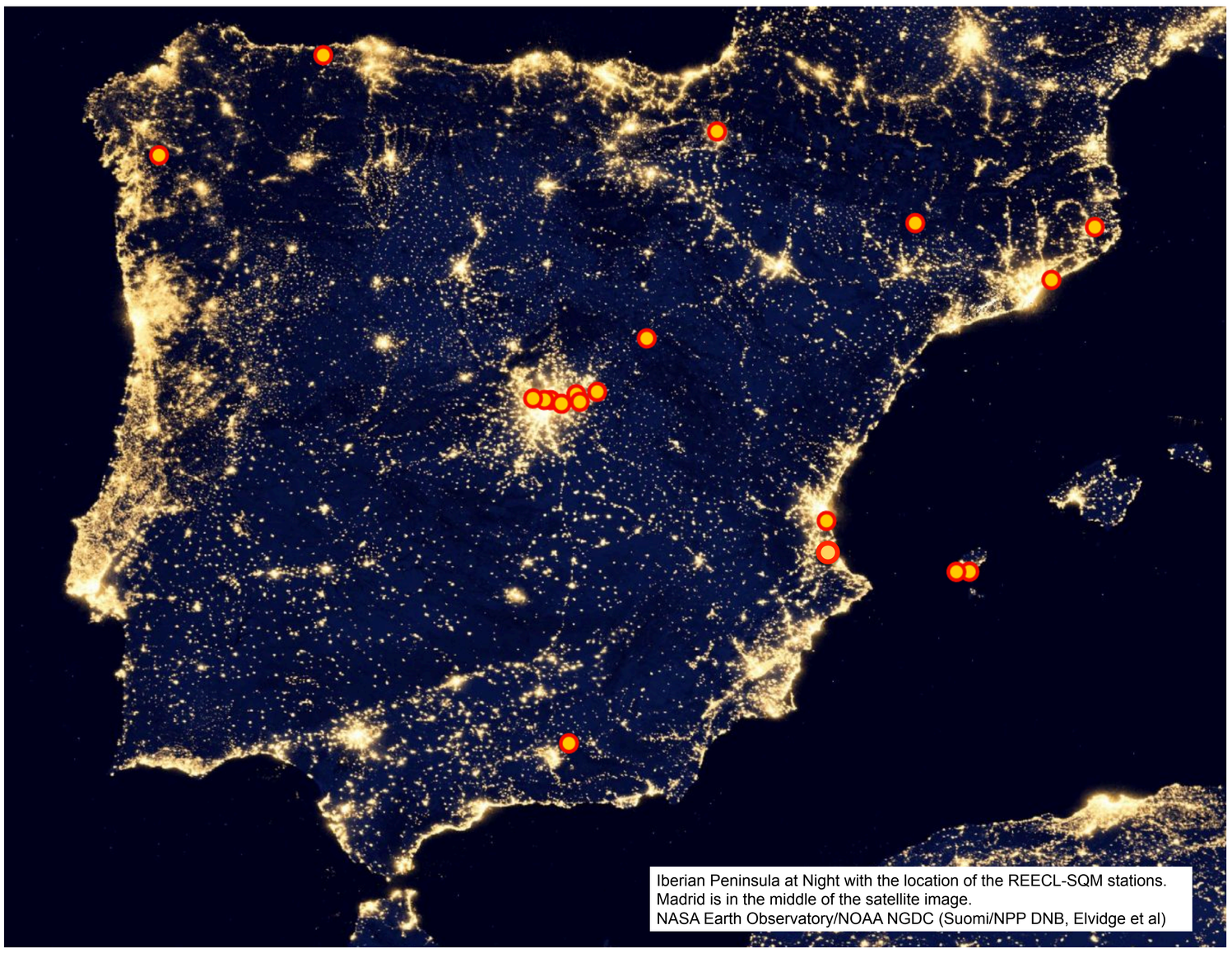
Networks of fixed photometers acquiring data every night are one of the main inputs to test these models.

The collaborative effort of many people (citizen science) provides the necessary data to derive scientific results.



REECL-SQM stations at Villaverde del Ducado and Observatorio UCM with the SQM photometers inside weather enclosures.





Iberian Peninsula at Night with the location of the REECL-SQM stations. Madrid is in the middle of the satellite image. NASA Earth Observatory/NOAA NGDC (Suomi/NPP DNB, Elvidge et al)

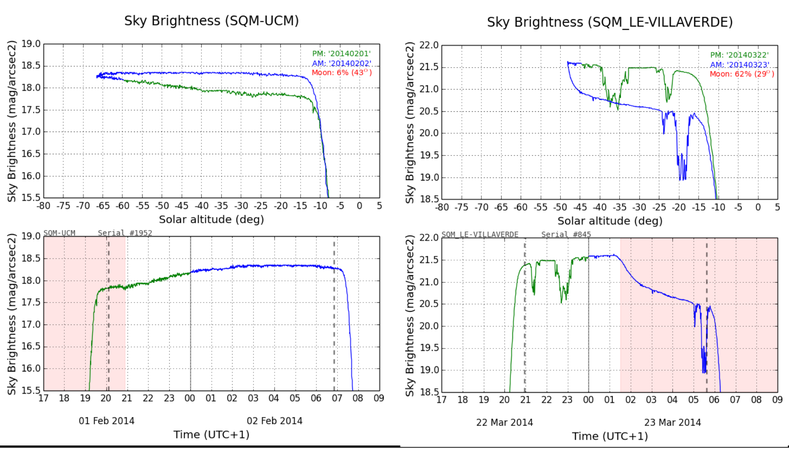
PySQM software

Plot of one night for the SQM located at Observatorio UCM. Night sky brightness in mag/arcsec2 vs time and versus solar altitude (upper panel). During a typical night the sky of Madrid is darker in the second part of the night when the human activity is lower and some ornamental lights are switched off. (LEFT)

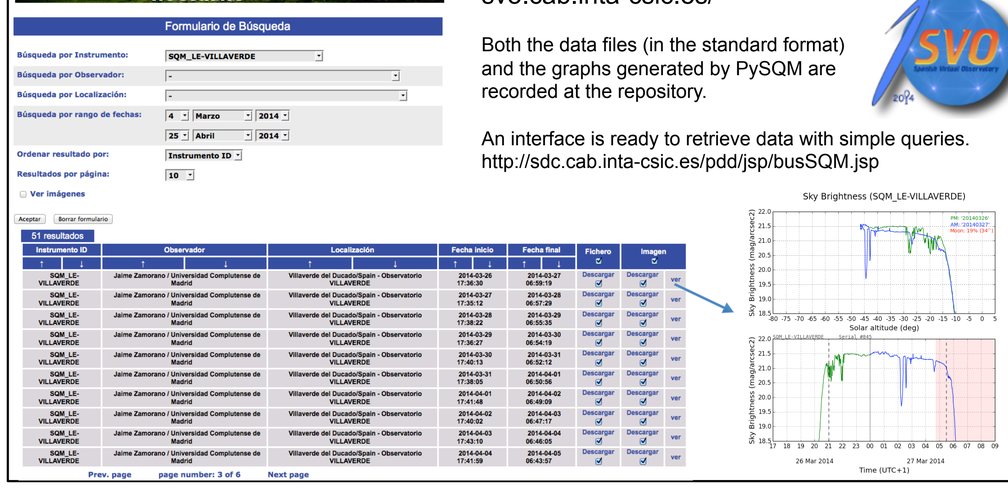
Plot of SQM located at Villaverde del Ducado (small village, rural area). The night sky is dark. Some episodes of clouds clearly marked as a brightening of the sky. (RIGHT)
Dashed vertical lines correspond to the astronomical twilight. The pink shadow indicates that the Moon is over the horizon.

"PySQM the UCM open source software to read, plot and store data from SQM photometers"
Nievas Rosillo, Miguel and Zamorano, Jaime (2014)
http://eprints.ucm.es/25900/

The REECL-SQM network is using PySQM, a multi-platform, open-source software designed to read and plot data (in real time) from SQM photometers, giving as an output files with the International Dark Sky Association (IDA) NSBM Community Standards for Reporting Skyglow Observations. http://guaix.fis.ucm.es/PySQM



The data gathered by the REECL-SQM network is being archived at the Spanish Virtual Observatory (SVO)
svo.cab.inta-csic.es/

Both the data files (in the standard format) and the graphs generated by PySQM are recorded at the repository.

An interface is ready to retrieve data with simple queries.
http://sdc.cab.inta-csic.es/pdd/jsp/busSQM.jsp