Using Satellite Information in Energy Applications in Costa Rica

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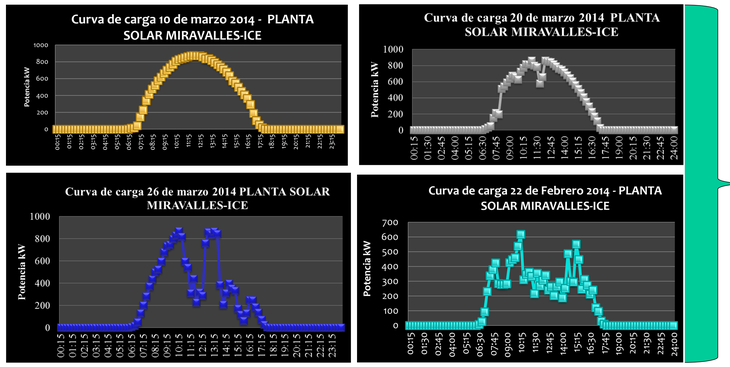
Abstract

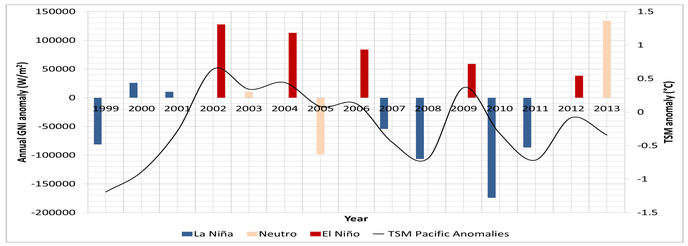
Working:

Evaluation of Solar Radiation data using satellite information: As in many other countries, the demand for solar energy in Costa Rica has increased. Costa Rica has been measuring Global Horizontal Solar Radiation (GNI) for over 20 years, but this measurement has been the low-quality. With our dense network of radiometric measurements, we set out to identify regions with adequate levels of average daily sunlight to optimally place solar engineering applications. When the solar map was prepared (by ICE) limitations were identified in extrapolating the measurements to remote areas that were at different elevations and climate environments where no measurements existed. The approach taken to address the limitations relies on using a satellite-based solar resource model validated with high-quality ground data. The use of high resolution (visible channel) data from GOES has been essential in extrapolating and generating a time series of irradiation data for any site in the territory. A climatological characterization of the solar resource is now possible with the production of solar potential maps. An hourly time resolution allows the proper modeling of the different solar radiation components relevant to solar energy applications. This represents a significant improvement in the amount and quality of solar information that is available for solar engineering applications in Costa Rica. This methodology is in process to use in Costa Rica now, and will be shared and made available to the Central American region through University of Costa Rica (UCR) for its development in next years. We look forward to utilizing the increased spatial and spectral resolution of GOES-R.

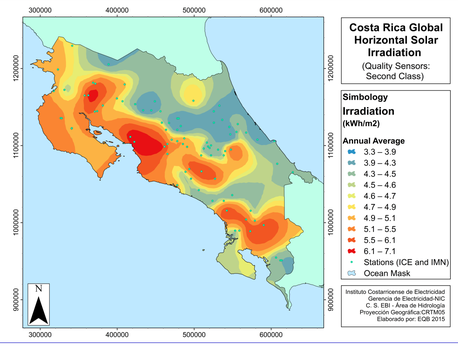
Key words: quality control, solar data, GOES, irradiance, radiation, solar energy, solar potential maps, Central America



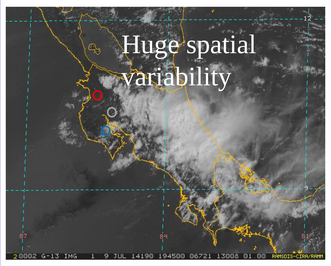
Production Energy Curves at Photovoltaic Solar Plant in Costa Rica: Showed high dependence of a variation on cloudiness. Recognize panthers are very important for planned, because this high and quickly changes affect the energy matrix and decrease the interest to use solar energy.



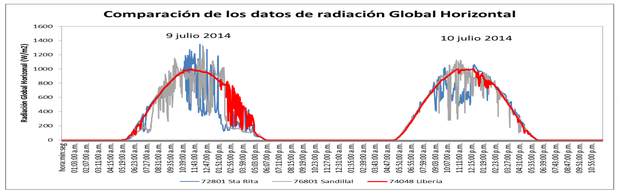
Comparison ENOS, TSM anomalies Pacific (El Niño, La Niña and Neutral), with Solar Global Horizontal Radiation Global annual of Sat Data Series. Period 1999-2013.

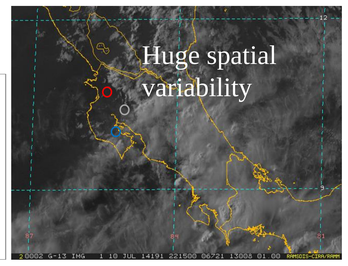


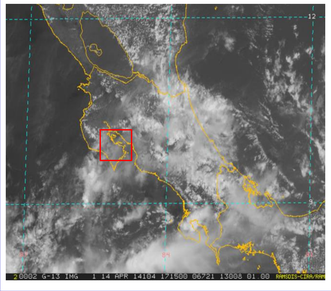
Solar Map. Quality Sensors: Second Class ISO6090 classification.



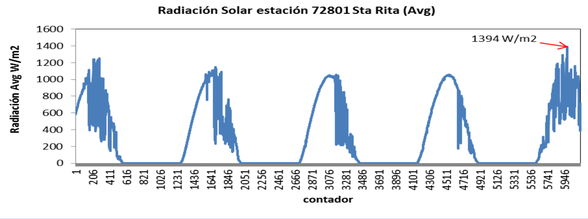
Spatial Consistency Test and Daily Quality Control: Monitoring with Sat images

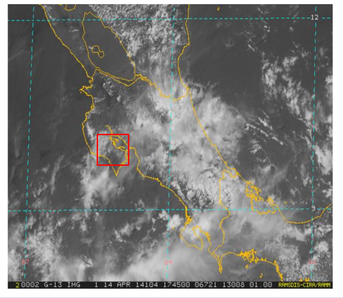




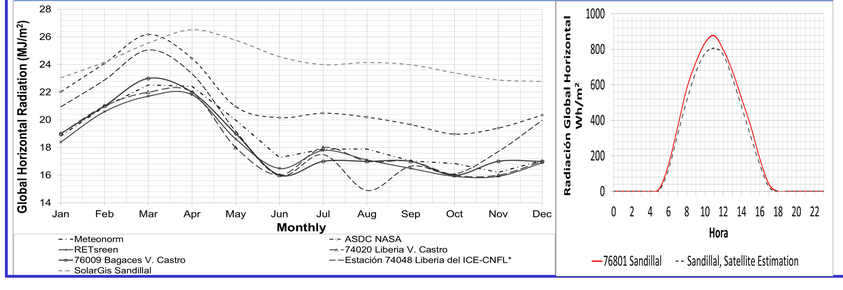


Physical Limits control: solar constant vs cirrus (magnifying glass effect)

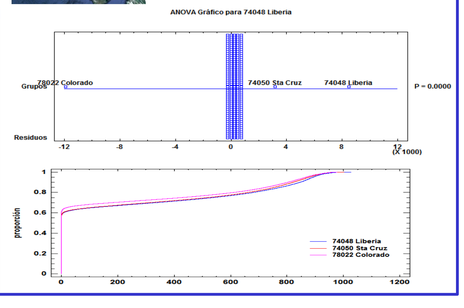




Comparison Irradiation Data Series Station Data and Satellite Estimation



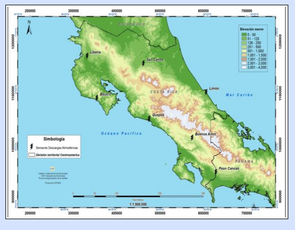
Comparison Irradiation Data Series 3 near stations



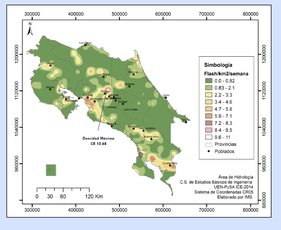
Future work:

•Comparison of results of Geostationary Lightning Mapper (GLM) from GOES-R and Lightning net of LS7001 LF sensors from Costa Rica: Costa Rica looks forward to the benefits of the new Geostationary Lightning Mapper on GOES-R. The Costa Rican Electricity Institute has a high resolution network with 7 LS7001 LF sensors. After the launch of GOES-R we plan to compare the GLM data with that from our local sensors. Some differences are anticipated because the resolution will be different, but in areal density of discharges and tendencies we expect to obtain a good correlation. These results will be shared with the rest of Central America to prepare them in the optimal use of the GLM data in the near future. These efforts will help ensure safe transport and adequate supply of the electricity for the region.

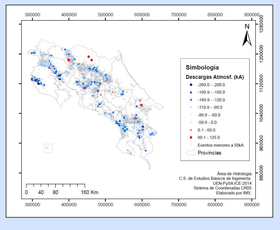
Key word: GLM, lightning, satellite, GOES-R, Central America, energy transport



Sensors Position



Discharges Density



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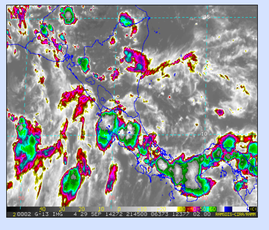

Reference Image

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