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Using remote sensing data for exploitation of integrated renewable energy at coastal site in South Italy

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Renewable energy sources are major components of the strategy to reduce harmful emissions and to replace depleting fossil energy resources. Data from Remote Sensing can provide detailed information for analysis for sources of renewable energy and to determine the potential energy and socially acceptability of suggested location. Coastal sites of Southern Italy have the advantage of favorable climatic conditions to use renewable energy, such us cloud free days and local breeze phenomena. Many ports are located where they have opportunities for exploitation of renewable energy, by using existing port area and by taking advantage of their coastal locations. Policies of European-Committee and Global-Navigation-PIANC for a better use of energy and an efficient supply from renewable sources are also focused on the construction of port facilities in zero emissions.
Using data from Remote Sensing, can reduce the financial resources currently required for finding and assessing suitable areas, we defined an integrated methodology for potential wind and solar energy in harbor areas.
In this study we compared the hourly solar power energy using MSG-SEVIRI (Meteosat Second Generation Spinning Enhanced Visible and Infrared) data products DSSF (Down-welling Surface Short-wave-Flux), and PV-Plant measurements with Nominal Power Peak of 19,85 kWp. The PV Plant is situated at a coastal site in Calabrian region, located near Vibo Valentia harbor area. We estimate potential energy by using input solar radiation of Satellite data, with same characteristics of the PV–plant. The RMSE and BIAS for hourly averaged solar electrical reproducibility are estimated including clear and sky conditions. Comparison between energy reproducibility by using DSSF product and PV-plant measurements, made over the period October 2013-June 2014, showed a good agreement in our costal site and generally overestimate (RMSE(35W/m2) and BIAS(4W/m2)) electrical reproducibility from a PV-plant.
For wind resource estimation we used Synthetic-Aperture-Radar (SAR) images from March 2002 to April 2012 for a total of 3269 ENVISAT-ASAR scenes acquired in Wide-Swath-Mode (WSM). Wind speed in the Mediterranean is retrieved using the Johns Hopkins University, Applied Physics Laboratory (JHU-APL) software APL-NOAA-SAR Wind Retrieval System. The ASAR is a C-band VV and HH instrument with a 405 km swath with 150 m and 1 km resolution in wide-swath mode. With a 35-day repeat orbit the revisit frequency will give daily coverage near the poles and weekly at the equator. We performed statistical analyses for wind parameters. The SAR-based wind results at the location test near Vibo Valentia show that the average of wind speed is U= 5.63 ms-1, the Weibull parameters are A=6.3 ms-1 and k=1.70. The power density of the wind is E=245 Wm-2.The high spatial resolution of the gridded SAR data is particularly relevant to study coastal sites, where most part of human activities is located.
In order to create a zero emissions' harbor area, remote sensing satellite data, can be used for smart grid which employed renewable energies.