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Evaluating the potential of MODIS-LST for monitoring ground surface temperatures in the Maritime Antarctic (Barton Peninsula, King George Island, Antarctic).

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Land surface temperature is an important factor for permafrost modelling as well as for understanding the dynamics of Antarctic terrestrial ecosystems (Bockheim et al. 2008). In the South Shetland Islands the distribution of permafrost is complex (Vieira et al. 2010) and the use of remote sensing data is essential since the installation and maintenance of an extensive network of ground-based stations are impossible. Therefore, it is important to evaluate the applicability of satellites and sensors by comparing data with in-situ observations. In this work, we present the results from the analysis of land surface temperatures from Barton Peninsula, an ice-free area in King George Island (South Shetlands). We have studied the period from March 1, 2019 to January 31, 2020 using data from the Moderate Resolution Imaging Spectroradiometer (MODIS) Land Surface Temperature (LST) and in-situ data from 6 ground temperature loggers. MOD11A1 and MYD11A1 products, from TERRA and AQUA satellites, respectively, were used, following the application of MODIS quality filters. Given the scarce number of high-quality data as defined by MODIS, all average LST with error $\leq 2\text{K}$ were included. Dates with surface temperature below -20°C , which are rare in the study area, and dates when the difference between MODIS and in-situ data exceeded 10°C were also examined. In both cases, those days on which MOD09GA/MYD09GA products showed cloud cover were eliminated. Eight in-situ ground temperature measurements per day were available, from which the one nearest to the time of satellite overpass was selected for comparison with MODIS-LST. The results obtained show a better correlation with daytime data than with nighttime data. Specifically, the best results are obtained with daytime data from AQUA (R^2 between 0.55 and 0.81). With daytime data, correlation between MODIS-LST and in-situ data was verified with relative humidity (RH) values provided by King Sejong weather station, located in the study area. When RH is lower, the correlation between LST and in-situ data improves: we obtained correlation coefficients between 0.6 - 0.7 for TERRA data and 0.8 - 0.9 for AQUA data with RH values lower than 80%. The results suggest that MODIS can be used for temperature estimation in the ice-free areas of the Maritime Antarctic.

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