

Environmental Impact Assessment in Mining Regions with Remote Sensing

Authors : Carla Palencia-Aguilar

Abstract : Calculations of Net Carbon Balance can be obtained by means of Net Biome Productivity (NBP), Net Ecosystem Productivity (NEP), and Net Primary Production (NPP). The latter is an important component of the biosphere carbon cycle and is easily obtained data from MODIS MOD17A3HGF; however, the results are only available yearly. To overcome data availability, bands 33 to 36 from MODIS MYD021KM (obtained on a daily basis) were analyzed and compared with NPP data from the years 2000 to 2021 in 7 sites where surface mining takes place in the Colombian territory. Coal, Gold, Iron, and Limestone were the minerals of interest. Scales and Units as well as thermal anomalies, were considered for net carbon balance per location. The NPP time series from the satellite images were filtered by using two Matlab filters: First order and Discrete Transfer. After filtering the NPP time series, comparing the graph results from the satellite's image value, and running a linear regression, the results showed R2 from 0,72 to 0,85. To establish comparable units among NPP and bands 33 to 36, the Greenhouse Gas Equivalencies Calculator by EPA was used. The comparison was established in two ways: one by the sum of all the data per point per year and the other by the average of 46 weeks and finding the percentage that the value represented with respect to NPP. The former underestimated the total CO2 emissions. The results also showed that coal and gold mining in the last 22 years had less CO2 emissions than limestone, with an average per year of 143 kton CO2 eq for gold, 152 kton CO2 eq for coal, and 287 kton CO2 eq for iron. Limestone emissions varied from 206 to 441 kton CO2 eq. The maximum emission values from unfiltered data correspond to 165 kton CO2 eq. for gold, 188 kton CO2 eq. for coal, and 310 kton CO2 eq. for iron and limestone, varying from 231 to 490 kton CO2 eq. If the most pollutant limestone site improves its production technology, limestone could count with a maximum of 318 kton CO2 eq emissions per year, a value very similar respect to iron. The importance of gathering data is to establish benchmarks in order to attain 2050's zero emissions goal.

Keywords : carbon dioxide, NPP, MODIS, MINING

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