

Satellite Data to Understand Changes in Carbon Dioxide for Surface Mining and Green Zone

Authors : Carla Palencia-Aguilar

Abstract : In order to attain the 2050's zero emissions goal, it is necessary to know the carbon dioxide changes over time either from pollution to attenuations in the mining industry versus at green zones to establish real goals and redirect efforts to reduce greenhouse effects. Two methods were used to compute the amount of CO₂ tons in specific mining zones in Colombia. The former by means of NPP with MODIS MOD17A3HGF from years 2000 to 2021. The latter by using MODIS MYD021KM bands 33 to 36 with maximum values of 644 data points distributed in 7 sites corresponding to surface mineral mining of: coal, nickel, iron and limestone. The green zones selected were located at the proximities of the studied sites, but further than 1 km to avoid information overlapping. Year 2012 was selected for method 2 to compare the results with data provided by the Colombian government to determine range of values. Some data was compared with 2022 MODIS energy values and converted to kton of CO₂ by using the Greenhouse Gas Equivalencies Calculator by EPA. The results showed that Nickel mining was the least pollutant with 81 kton of CO₂ e.q on average and maximum of 102 kton of CO₂ e.q. per year, with green zones attenuating carbon dioxide in 103 kton of CO₂ on average and 125 kton maximum per year in the last 22 years. Following Nickel, there was Coal with average kton of CO₂ per year of 152 and maximum of 188, values very similar to the subjacent green zones with average and maximum kton of CO₂ of 157 and 190 respectively. Iron had similar results with respect to 3 Limestone sites with average values of 287 kton of CO₂ for mining and 310 kton for green zones, and maximum values of 310 kton for iron mining and 356 kton for green zones. One of the limestone sites exceeded the other sites with an average value of 441 kton per year and maximum of 490 kton per year, eventhough it had higher attenuation by green zones than a close Limestone site (3.5 Km apart): 371 kton versus 281 kton on average and maximum 416 kton versus 323 kton, such vegetation contribution is not enough, meaning that manufacturing process should be improved for the most pollutant site. By comparing bands 33 to 36 for years 2012 and 2022 from January to August, it can be seen that on average the kton of CO₂ were similar for mining sites and green zones; showing an average yearly balance of carbon dioxide emissions and attenuation. However, efforts on improving manufacturing process are needed to overcome the carbon dioxide effects specially during emissions' peaks because surrounding vegetation cannot fully attenuate it.

Keywords : carbon dioxide, MODIS, surface mining, vegetation

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