Investigating the relationship between Seismic Events and Air Quality: A Case Study of the Türkiye earthquake 2023

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ABSTRACT

On February 6th, 2023, Türkiye experienced the devastating impact of two powerful earthquakes measuring 7.5 and 7.8 on the Richter scale, resulting in widespread chaos and tragedy. This study was designed to investigate the relationship between earthquakes and remotely sensed atmospheric parameters obtained by the Sentinel 5P TROPOMI instrument. This comprehensive analysis was done by comparing the monthly measurements from February to June of certain air pollutants such as the UV Aerosol Index, SO_2, NO_2, O_3, CO, HCHO, and CH_4 in 2023 and the average monthly measurements of the previous years. The Sentinel 5P satellite data was obtained through the Google Earth Engine platform and analyzed by GIS software. The results indicate that the earthquake triggered significant aerosol emissions into the atmosphere; this increase is attributed to the collapse of numerous buildings caused by the earthquake and the subsequent rubble removal efforts, which lasted several months. In addition, the levels of CO, SO_2, and NO_2 decreased, especially in February and March, which may be linked to a downturn in human and industrial activities in the region. However, the levels of CH_4 have significantly increased in the entire earthquake area since February. While earthquakes can lead to the release of methane, the substantial mortality rate may also play a key role in contributing to this rise. Moreover, the air and soil temperatures of the ERA5-Land data from the Copernicus Data Store were utilized to assess the variations in monthly temperatures throughout the last years to check whether there is any potential relationship between the increasing air quality levels and temperature.

Keywords: Google Earth Engine, TROPOMI, Remote Sensing, Air Pollution, Earthquake