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Editorial: Forest fire emissions and their impact on global climate change

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Editorial on the Research Topic
Forest fire emissions and their impact on global climate change

The ever-increasing problem of forest fire risks has intrigued researchers globally to find a mechanism that can provide an early warning of forest fire incidents as well as assess the extent of spatial-temporal damage caused by them. Further information and data on its impacts would help in mitigating the disaster through advanced planning and management. The effects of forest fire have been known for a long time, but due to limited data, mitigation measures were always hampered. With the advancement of technology in the recent past with respect to high-resolution satellite data, a programming interface, and the development of mobile applications to a certain extent, it is now possible to predict forest fires and to study the impacts at local, regional, and global levels. Several open satellite data sets available from NASA, NOAA, and COPERNICUS have facilitated the quantification of various variables in near real time. Further the easy access to open-source data facilitated in the development of user-friendly web interfaces and APPS to continuously monitor the spatio-temporal changes caused as a result of forest fires on the ecosystem and on climate.

In the above context, this Research Topic was brought forth to address *Forest fire emissions and their impact on global climate change* using remote sensing satellite data of various resolutions. The research articles submitted under this special call have addressed a variety of thoughts and opinions across various geographies using multiple techniques, data, and models. The study by Covey et al., focused on the large-scale uncertainty in flux magnitude and highlighted how it influences the regional and global climate systems either directly or indirectly. This research concludes that the current warming in the Amazon basin due to non-CO_2 agents (especially CH_4 and N_2O) largely offsets and most likely exceeds the climate service provided by atmospheric CO_2 uptake.

The research of Kale et al., forecasted the number of monthly fires in different forest types in India. They used "Autoregressive Integrated Moving Average" time series models (both univariate and with regressors) at 25 km × 25 km spatial resolution (grid) and developed the fire susceptibility maps for the Geographic Information System domain. The study favored the advantages of using time series forecasting approach in the light of the different variables

and the flexibility to investigate both univariate and multivariate time series. Chandel et al., addressed the advantage of using high- to moderate-resolution satellite data like Landsat for identifying burned areas in Central India. It also compared various classification algorithms, like Random Forest (RF) and Support Vector Machines (SVM), and the use of spectral indices for better accuracy. They concluded that machine learning algorithms were best suited to delineate burned areas in a short time and yield consistent results when compared with other techniques.

The review article by Singh recommends that the assessment of forest fires aids in calculating the frequency of fires, the overall burned area, and the ecological and socioeconomic repercussions. Evaluation of fire efficacy capability aids scenario-level management. Furthermore, the author emphasizes the importance of a more remote sensing-based approach at the community level to raise awareness about forest fire management. It provides a critical assessment of the current level of knowledge regarding global climate change as well as an examination of the elements that contribute to forest fires, including a brief discussion of the triangle relationship between fire, land degradation, and climate change, the use of remote sensing and geographic information systems (GIS), and machine learning (ML) techniques.

As observed, overall, the articles submitted are on varied dimensions of forest fire speculation, impact, and mitigation measures in conjunction with the utility of remote sensing satellite imagery, GIS, and machine learning approaches. For a reader, these articles provide a basic understanding of the data and approach to be adopted to study forest fires in an ecosystem.

Author contributions

LG prepared the draft of the manuscript. RP corrected the draft. KS contributed some paragraphs in the manuscript. HT provided critical comments. All authors contributed to the article and approved the submitted version.

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Conflict of interest

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The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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