



## CCI Fire advances: global Sentinel-2 burned area product, harmonised MODIS - Sentinel-3 dataset, and extreme fires events database

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As part of the ESA Climate Change Initiative (CCI), two projects – FireCCI and XFires – have developed during the past year several datasets that will significantly contribute to the understanding of the fire phenomenon and the analysis of extreme fires and their climatic consequences.

In FireCCI, we have developed the first global Sentinel-2 burned area (BA) dataset at 20-m spatial resolution (FireCCIS2.v1), achieving a level of detection of small fire patches not possible with coarse resolution sensors, and thus increasing the BA detection to more than 8 Mkm<sup>2</sup> for the year 2023. This means more than double the BA detected by other existing global products such as MCD64A1 and VNP64A1, and >60% more than the Sentinel-3 based dataset FireCCIS311. This new generation of medium resolution datasets is expected to significantly improve the calculation of fire emissions, and contribute to fire ecology, land use change, and other fire related research.

Complementary, we have also produced a harmonised global burned area dataset that extends the ESA FireCCI record from 2003 to 2024 (to be extended to the future), with monthly temporal resolution on a 0.25° grid. The product, named FireCCI60, ensures continuity between the historical FireCCI51 product (based on MODIS) and the more recent FireCCIS311 product (based on Sentinel-3), addressing the challenge posed by the forthcoming end of the MODIS mission for long-term fire monitoring and its climate-related applications. This dataset harmonises de FireCCI51 BA detections to resemble as close as possible FireCCIS311, which has a better detection capability, in order to obtain a dataset that is consistent through the time series and can be directly used for time series analysis and extreme fire research. This harmonisation adds around of 1 Mkm<sup>2</sup> of BA per year to the FireCCI51 detection, with mean yearly BA values of ~5.6 Mkm<sup>2</sup>.

Finally, as part of the XFires project, we have developed an extreme fire events (EFE) dataset, based on FireCCI51 BA and MODIS active fires products, and identified both extreme and non-

extreme fire events over the past two decades on a 0.25° grid. The identification of EFEs is performed using a statistical approach on a per-region basis that aims to tackle the fact that different parts of the world present different typical patterns of fire – one of the main challenges to defining EFEs globally. This dataset is currently being updated to integrate the harmonised FireCCI60 one, to obtain a consistent EFE database spanning to the present that can be used to explore trends, causes and consequences of extreme fire occurrence during the past decades.