**European mapping of Forest Disturbances and Vulnerability: First results of the FORWARDS project**

Climate change and environmental stressors negatively affect forest ecosystems and biodiversity. The limited availability of data hinders understanding of how forests adapt to climate change and the impacts of forest management. Thus, standardized monitoring initiatives across Europe is crucial for effective planning and mitigation. The EU Forestry Strategy prioritizes indeed sustainable management for biodiversity and climate resilience and recognizes climate-smart forestry and restoration as global solutions.

In this context, the FORWARDS project aims to bridge the current separation in the EU between ground and satellite forest information and to develop the ForestWard Observatory - a European observatory for forest climate change impacts. Within this framework and relying on the Google Earth Engine cloud computing capabilities, we processed approximately two hundred thousand Landsat images to provide four decades (1984-2023) of Europe-wide disturbance mapping and characterization. More in detail, for each detected forest change we predicted several parameters including the severity of the disturbance, the persistence, and the number of years the forest needed to recover. Based on this detailed disturbance characterization, we estimated, for each disturbed pixel, the vulnerability of the forest to that forest disturbance. As a result of these calculations, we obtained a forest disturbance data cube that contains comprehensive and exhaustive information on European forest disturbances. On the other hand, analyzing and understanding a so large dataset may be challenging. Indeed, aiming to implement a European forest observatory, it can be challenging to extract meaningful information depending on the many analyses of interest.

To overcome this issue, we developed a Google Earth Engine application that allows visualizing, filtering, and downloading each parameter of detected forest disturbances. Indeed, while we are constructing a forest disturbance map for each analyzed year, and while for each pixel we predict multiple disturbances that occurred over time, using our application users can visualize for each pixel the most severe or the most recent disturbance, but also, for example, the disturbance that led to the fastest photosynthetic activity recover. Similarly, users can filter out changes depending on the year, the disturbance severity, the persistence, or the recovery rate. All of this information will play a key role in understanding European disturbances and will constitute the basis for wall-to-wall mapping of European forests' vulnerability and resilience.