Colocation Day 1 - XFires

S. Sitch, C. Albergel, S. Bowring, E. Chuvieco, P. Ciais, P. Defourny, W. Dorigo, T. Eames, D. Ghent, J. Haywood, D. Hubert, B. Johnson, S. Kildegaard Rose, C. Lamarche, M.F. Langsdale, P. Oliva Pavón, M. L. Pettinari, M. Pinardi, L. Quaye, L. Sandberg Sørensen, C. Segura-Garcia, E. C. Solano-Romero, D. Stroppiana, R. Vernooij, G. van der Werf, Y. Xu

24/03/2026

Project Objectives

- **ITT**: Climate Space – Theme II: Cross-ECV activities

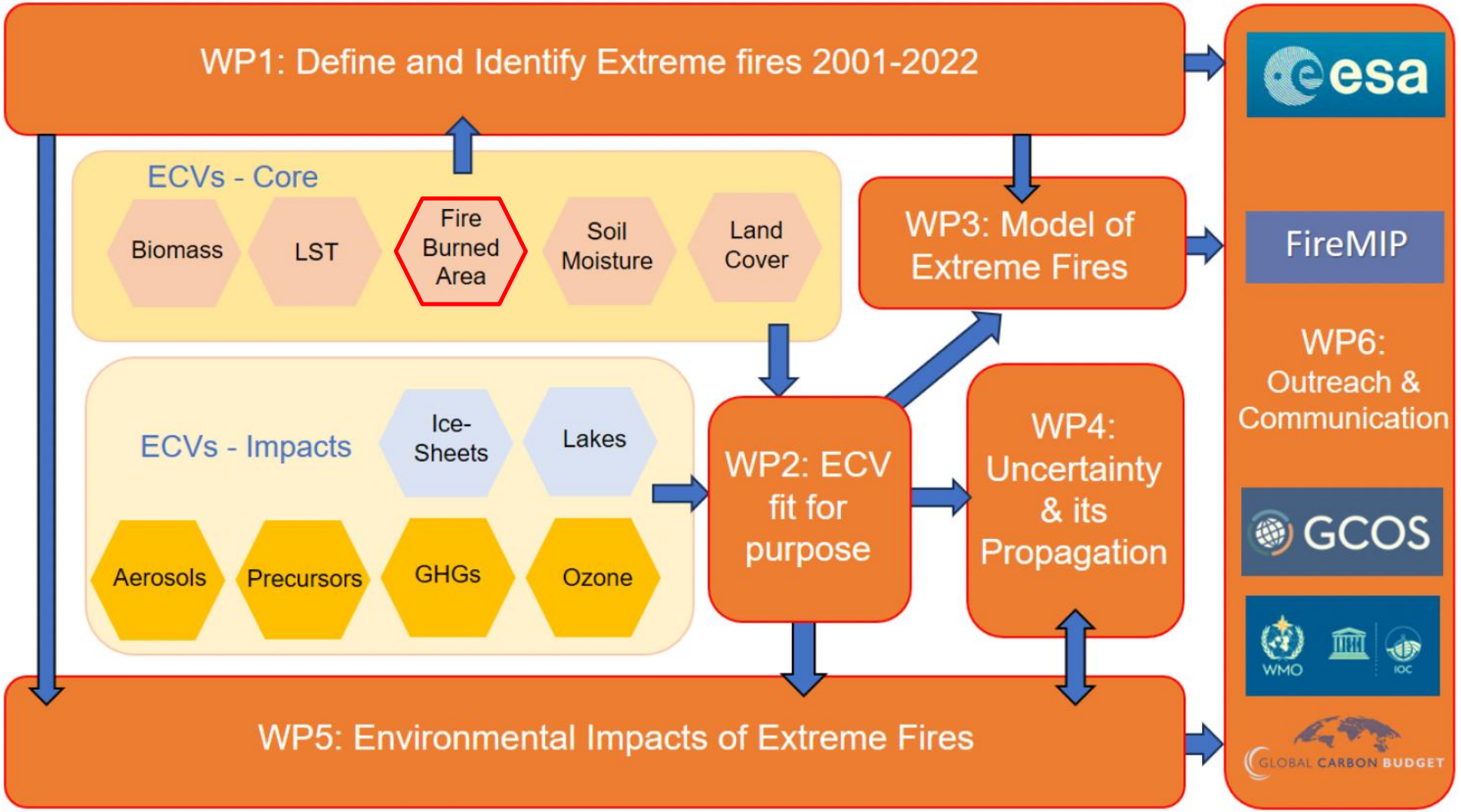
- **Goals of project**:

  To gain a holistic understanding of extreme fires and their impact in the Earth system.

  - ✓ What is an extreme fire (what are the defining variables)?
  - ✓ Have extreme fires increased in recent years? Where and why?
  - ✓ Can they be predicted?
  - ✓ What are the main impacts of extreme fires on the atmosphere and climate, vegetation, lakes, the cryosphere and on human health?

- **Timeframe**: Sep. 2024 to Aug. 2027

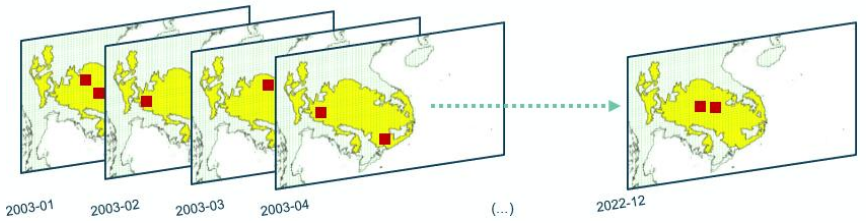
Skeleton overview of the approach – ECVs being used

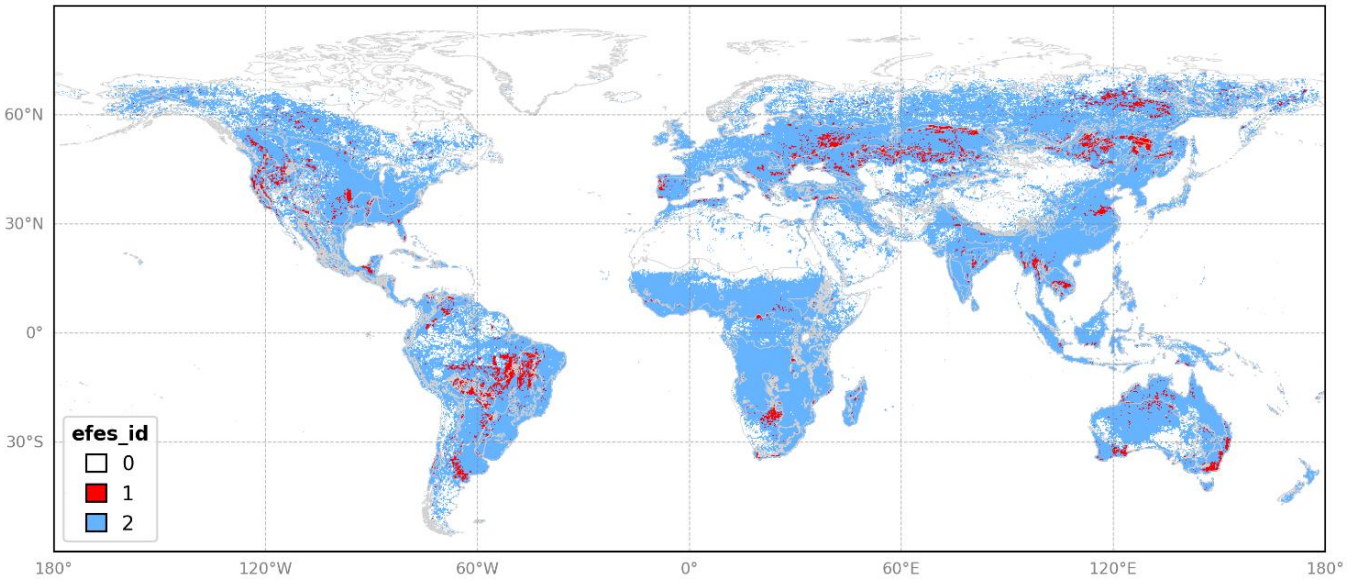


Results & relevance to the CCI community – EFEs database

Extreme Fire Events (EFEs) database: currently 2003-2022

- ✓ Unit of analysis: 0.25º grid cells per month
- ✓ Ancillary data extracted from fire polygons database FRY 2.0 to indicate extremes by other variables (see table below)
- ✓ A set of **NetCDF files**, one per month (so 12 months x 20 years)





Layer name	Values
efes_id	0 (gBA = 0 & gsumFRP = 0) **1 (EFE by gBA+gsumFRP criterion)** 2 (not EFE by criterion, but there was fire activity)
efes_gBA	0/1
efes_sumFRP	0/1
efes_FRYsize	0/1
efes_FRYmedfrp	0/1
efes_FRYros	0/1
efes_FRYseverity	0/1
efes_FRYduration	0/1
burned_area	gBA value (directly from FireCCI51 grid product)
sum_frp	gsumFRP (after filtering MCD14ML FRP and adding up)
region_ID	0-55 [ID for modified continental biome]

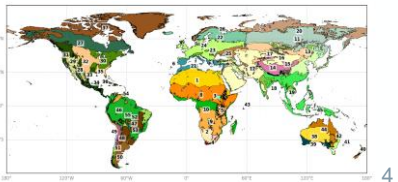
Indicating whether cell-month was identified as extreme by the specific variable

Analysis: stratified per biomes divided by continents (continental biomes)

Extremes: fire events at least 2 STD higher from the mean (after logarithm transformation) for both Burned Area (gBA) and the sum of FRP (gsumFRP) in each of the continental biomes.

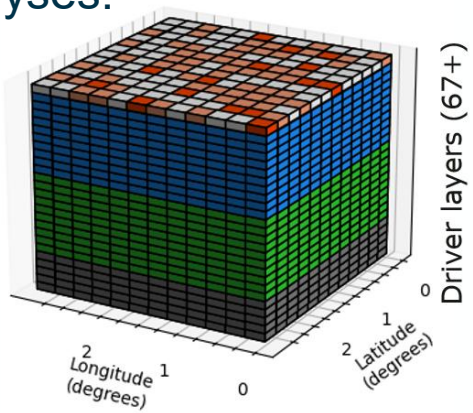
19,951 EFEs identified.

Database being updated to include 2023-2025.



Results & relevance to the CCI community – Examples of analysis

Community Database: all data together to perform analyses.



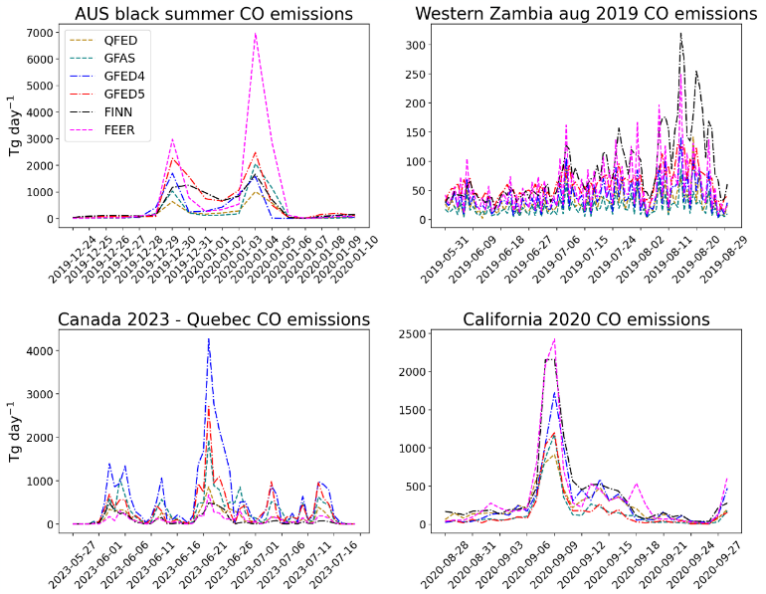
0.25° EFEs Database

Fire meteorology e.g.
Vapour pressure deficit
Land surface temperature
Soil moisture
Surface temperature

Vegetation e.g.
Fraction Tree cover
Fraction PFT cover
Build up index

Grid/population density etc.

Use of EFEs to evaluate other parameters: EFEs used to evaluate the performance of different emissions' inventories.



Analysis of impacts of EFEs vs. "normal" fires on different ECVs.