Project: **374**

Project title: **Evaluation of ICON-CLM new model versions**

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Report period: **2024-11-01 to 2025-10-31**

The resources granted for 2025 have been 33 000 Node hours (NH). The resource need was 90 NH per simulated year (NHY) in CORDEX-EU domain at 12 km grid resolution (CEU-12) 100 NHY in Central-Africa (CAF-12) domain and North-America (NAM-12) domain at 12 km grid resolution and 720 NHY in Mid-Europe domain at 3km grid resolution (MEU-3).
In 11.2024-10.2025 we conducted two MEU-3 short evaluation simulations 2002-2006 (2 x 3600 NH) for new model versions icon_20250113 and icon_20250612 using the optimized configuration for icon-2024.10 developed in the COPAT project (bg1155).
The optimised configuration for CEU-12 and icon-2024.07 model version was evaluated in central Africa domain (2000 NH).
In 2025 it is planned to evaluate

- CEU-12 configuration in NAM-12 domain (2000 NH) and
- MEU-3 for the new 2-moment microphysics scheme optimised configuration (7200 NH)

The 30y evaluation simulation of the optimised configuration for MEU-3 domain and icon_2024.10 model version was conducted using UDAG resources (bb1364).

In this project the evaluation of the new model versions icon_20250113 in MEU-3 domain exhibits same results as icon_202410. We found differences between the icon_20250612 and icon_2024.10 results, which are much higher than intrinsic uncertainty. The analysis of the reason for this difference is ongoing. For that reason, the recommended model version of the CLM-Community for ICON-CLM applications at convection permitting scales is icon_2024.10.
First results for key quantities in the region of Central Africa reveal very promising results. Figure 1 shows the length of the plant growth season (LGS) mainly determined by the rain period. The ICON-CLM result shows a significantly better agreement with the satellite observations than ERA5 used as initial and boundary conditions. This is a very promising result showing an added value of the downscaling in a region with different climate and not used for configuration optimization.
It is planned to evaluate ICON-CLM in different climates in order to assess the usability of the configuration developed for Europe in other regions of the world.

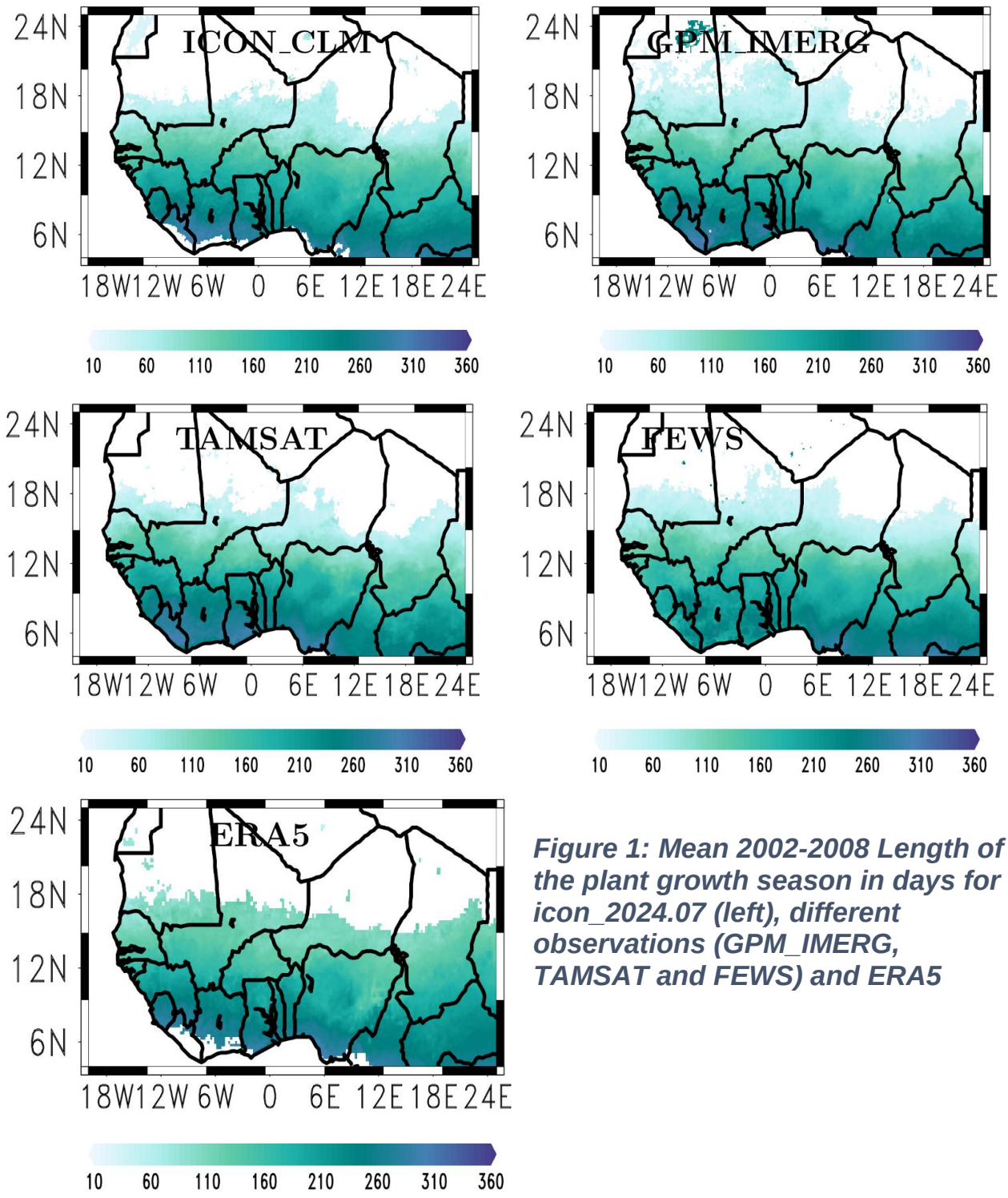

Figure 1: Mean 2002-2008 Length of the plant growth season in days for icon_2024.07 (left), different observations (GPM_IMERG, TAMSAT and FEWS) and ERA5

A first publication presenting the optimised configuration in CEU-12 domain is submitted (Geyer et al., 2025). The new method of configuration optimisation LiMMo is published in Petrov, Geyer and Will (2025). The publication presenting the MEU-3 optimised configuration (Will et al., 2025) is in preparation.