REQUEST FOR ADDITIONAL RESOURCES IN THE CURRENT YEAR FOR AN EXISTING EMI R&D PROJECT

Please submit the completed form via https://www.ecmwf.int/en/support (choose *Software and Computing*, then *Gain access to computing resources (create ticket)*) or send to special_projects@ecmwf.int

Country/Organisation: ……University of Copenhagen, Denmark……..……...…

Principal Investigator[1]: ……Jing Tang……..……

Affiliation: …Department of Biology, University of Copenhagen, Denmark ……..……

Address: ……..…… Universitetsparken 15, DK-2100 Copenhagen ……..……

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Project title: …… Quantifying biosphere-atmosphere interactions: the impacts from vegetation volatile emissions, plant phenology and lake greenhouse gas emission ……..……

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Project account: **SP_ dktang _ _ _ _ _**

Additional computing resources requested for year		**2026**
High Performance Computing Facility	[SBU]	50,000,000
Graphics Processing Unit Cluster - A	[GBU]	
Graphics Processing Unit Cluster - B	[GBU]	
Total DHS Data storage capacity	[GB]	
EWC resources		
Number of vCPUs	[#]	
Total memory	[GB]	
Storage	[GB]	

[1] The Principal Investigator is the contact person for this EMI R&D Project

Number of vGPUs[3]	[#]	

Continue overleaf

Technical reasons and scientific justifications why additional resources are needed

The additional resources are needed because the model has not yet reached a sufficiently stable state, and further tuning, spin-up and sensitivity simulations are required before the final production runs can be completed. The current resource use has therefore exceeded the original estimate.

The project focuses on interactive BVOC emissions and their coupling with the climate system in EC-Earth3-AerChem. In this configuration, BVOC emissions are calculated interactively from vegetation and climate conditions, rather than prescribed from a fixed offline inventory. This is essential for the scientific objectives of the project, because BVOC emissions such as isoprene and monoterpenes are sensitive to vegetation type, temperature, radiation and other environmental conditions. The interactive setup allows us to investigate how vegetation-driven BVOC changes influence secondary organic aerosol formation, atmospheric composition, cloud-radiative effects and regional climate responses.

The computational cost has been higher than anticipated for two main technical reasons. First, EC-Earth3-AerChem with the TM5 component is computationally expensive because the emitted BVOCs need to be transported and chemically processed, and their effects on aerosols and atmospheric composition need to be diagnosed. EC-Earth3-AerChem is documented as a configuration with interactive aerosols and atmospheric chemistry, which makes it more demanding than configurations without these processes. Second, the interactive BVOC configuration requires additional tuning to reach a stable climate state. Several simulations have been necessary to evaluate the top-of-atmosphere radiation balance, surface temperature drift, BVOC emissions, secondary organic aerosol formation and related climate responses.

The additional simulations are scientifically necessary because final production experiments should only be carried out once the model is sufficiently stable and the key BVOC-related sensitivities are understood. Without additional resources, the project would risk relying on simulations affected by model drift or incomplete tuning, which would weaken the interpretation of BVOC climate feedbacks.

The requested additional SBUs will be used to complete the remaining tuning and spin-up simulations, perform the required BVOC sensitivity tests, and then carry out the planned production simulations.