

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:Stockholm University, Sweden.....

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Project title: Transient simulations with EC-Earth model for centennial to millennial climate variability study

Project account: SPsezhan

Additional computing resources requested for year		2026
High Performance Computing Facility	[SBU]	45 000 000
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]	
Number of vGPUs ³	[#]	

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

Technical reasons and scientific justifications why additional resources are needed

This Special Project investigates centennial- to millennial-scale climate variability and abrupt climate transitions using long transient and ensemble simulations with the EC-Earth Earth system model. The main scientific applications include the Holocene and Last Interglacial, together with targeted sensitivity experiments addressing the roles of internal variability, external forcing, and ocean–atmosphere–vegetation feedbacks. Long production simulations are carried out using complementary ECMWF and Swedish national HPC resources.

During 2026, we have extended this work to EC-Earth4 in preparation for future long palaeoclimate integrations. This includes tuning the low-resolution EC-Earth4-ESM-2 configuration and testing fully coupled EC-Earth4-ESM-1 simulations with revised land-sea boundary conditions. Both activities require repeated coupled integrations to evaluate energy balance, temperature drift, ocean adjustment, sea-ice conditions, and overall model stability.

The computational requirements have been substantially larger than originally anticipated. Several EC-Earth4-ESM-2 parameter sensitivity experiments have already been completed, but further combinations of the most promising parameter settings and longer stability tests are required before a final configuration suitable for multi-century to millennial-scale integrations can be established. Similarly, the revised land-sea configuration must be evaluated in fully coupled simulations together with corresponding standard-configuration reference runs, because changes in coastlines and boundary conditions affect runoff, freshwater input, ocean circulation, and sea ice and cannot be adequately assessed through short technical tests.

These experiments have already resulted in an overspending of approximately 5.3 million SBU relative to the current 2026 allocation. The requested additional resources will cover this overspending and the remaining EC-Earth4 tuning, stability testing, revised-land-sea-mask experiments, and reference simulations planned for the remainder of 2026. We expect these requirements to exceed the maximum additional allocation of 45 million SBU available through this request and therefore request the full 45 million SBU. This work directly supports the original scientific objectives of the Special Project by establishing stable EC-Earth4 configurations for future investigations of centennial- to millennial-scale climate variability and abrupt climate transitions.