

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

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Address: Via Gobetti 101, 40129 Bologna, Italy

Project title: Hydrogen Emission Scenarios to drive climate Projections for Enviromental and RiSk Assessment (HESPERIA)

Project account: SPITBEAL

Additional computing resources requested for year		2026
High Performance Computing Facility	[SBU]	5 Million
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

The main reason for requesting additional resources is the continuous development of the EC-Earth4 (ece4) model. We decided to use a more recent model version, which uses OpenIFS 48r1 instead of 43r1 and implements a new XIOS version for I/O. Additionally, at the time of the original request, no evaluation of the real cost of one year of simulation of the ece4 model in AMIP configuration was available, the estimation of 9500 SBU/model year was derived from the previous version of the model (EC-Earth3) and this resulted in an underestimation of about 30% of the real SBU/model year. With the chosen version of the model, the actual value is about 13500 SBU/model year.

Moreover, several additional AMIP experiment were necessary for the estimation of the Effective Radiative forcing of Hydrogen, for two reasons:

- different O₃, CH₄ and water vapour forcings coming from the CTM model associated with different photochemistry were necessary to have a better representation of the lifetime of CH₄
- To better compare HESPERIA results to literature, we need another set of experiments run in emission-driven mode, following the setup of Paulot et al (2021).

For the reasons above, we are requesting additional 5million SBU for this year (2026) to perform the experiments below:

- New emission-driven AMIP experiments – 3 experiments (baseline, O₃+CH₄ forcing, O₃+CH₄+water vapour) * 100 years * 13500 SBU/model year = 4.05 million SBU.
- Complete abrupt emissions with new photochemistry – we managed to perform only 80 years of simulation for the 3 abrupt experiments (baseline, O₃+CH₄ forcing, O₃+CH₄+water vapour). To complete the set, we need additional 20 years of simulation for each experiment. 3 experiments * 20 years * 13500 SBU/model year = 0.81 million SBU.

The total additional request is 4.86 million SBU, for safety reasons, we prefer to round up to 5 million SBU.

Reference:

Paulot, F., Paynter, D., Naik, V., Malyshev, S., Menzel, R., and Horowitz, L. W.: *Global modeling of hydrogen using GFDL-AM4.1: Sensitivity of soil removal and radiative forcing*, International Journal of Hydrogen Energy, 46(24), 13446–13460, 2021.