REQUEST FOR ADDITIONAL RESOURCES IN THE CURRENT YEAR FOR AN EXISTING SPECIAL PROJECT

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MEMBER STATE: CROATIA (HR)

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Address: Bijenička cesta 54, 10000 Zagreb, Croatia

Project title: Exploring the potential of uncertainty quantification and machine learning techniques to forecast rare extreme events

Project account: **SPCRDENA**

Additional computing resources requested for year		2025
High Performance Computing Facility	[SBU]	20,000,000
Total DHS Data storage capacity	[GB]	
EWC resources		
Number of vCPUs	[#]	
Total memory	[GB]	
Storage	[GB]	
Number of vGPUs[3]	[#]	

Continue overleaf

[1] The Principal Investigator is the contact person for this Special Project

Technical reasons and scientific justifications why additional resources are needed

Despite the extensive literature existing on the atmospheric tsunami generated by acoustic-gravity waves (i.e., meteotsunamis) during the Hunga Tonga-Hunga Ha'Apai event (HTHH), little is still known about this recently rediscovered ocean hazard.

In order to both have a more comprehensive idea of the atmosphere-ocean dynamics and better assess the impact of these kind of events, we want to create emulators (with tenth of thousands of simulations) for 7 different volcanoes around the globe: Cotopaxi, Cumbre Vieja, HTHH, Katla, Popocatepetl, Vesuvius and Yellowstone.

To simplify the problem (and limit the numerical cost), synthetic atmospheric disturbances are used with four different stochastic parameters: amplitude of the disturbance (in Pa), wave length of the disturbance (in km), speed of the disturbance (in m/s) and attenuation in time of the disturbance (in days). The same surrogates are built for the 7 volcanoes in terms of the atmospheric disturbance parameters, with only the origin of the eruption varying (depending on the location of each volcano).

For now, the surrogates are based on Generalized Polynomial Chaos Expansions and, as a start, the polynomial degree chosen is 6 (with the hope to reach even higher orders if needed). This represents 641 simulations per volcano using 400 CPUs each and lasting between 1h and 1h30 for the least intensive atmospheric disturbances. However, for the strongest disturbances, the time step of the simulations had to be greatly decreased and the simulations last between 12h and 48h. For the moment, the full set of simulations has been implemented for 4 volcanoes after spending all the resources of my special project for 2025 (20M SBUs) in the first weeks of January. The remaining simulations are the most intense and will require a longer computational time.

In order to be able to keep working on this part of the special project and to present this work as a solicited talk at EGU25 NH5.1 with the same number of volcanos and the same polynomial order, the **additional resources that I need are 20M SBUs**.

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