

# SPECIAL PROJECT PROGRESS REPORT

All the following mandatory information needs to be provided. The length should *reflect the complexity and duration* of the project.

**Reporting year**

June 2024 - June 2025.....

**Project Title:**

Adriatic Sea Climate: towards kilometre-scale  
biogeochemical modelling.....

**Computer Project Account:**

spertojc.....

**Principal Investigator(s):**

Iva Vrdoljak (Tojcic).....

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**Affiliation:**

Ruđer Bošković Institute, Zagreb, Croatia;  
Faculty of Science, University of Split, Croatia.....

**Name of ECMWF scientist(s)  
collaborating to the project  
(if applicable)**

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**Start date of the project:**

January 1<sup>st</sup> 2024.....

**Expected end date:**

December 31<sup>st</sup> 2026.....

**Computer resources allocated/used for the current year and the previous one  
(if applicable)**

Please answer for all project resources

		Previous year		Current year	
		Allocated	Used	Allocated	Used
<b>High Performance Computing Facility</b>	(units)	20,000,000	861.423	20,000,000	0
<b>Data storage capacity</b>	(Gbytes)	25,000	988560MB	50,000	0

## Summary of project objectives (10 lines max)

The project aims to couple various biogeochemical models with the AdriSC model to evaluate their performance in terms of accuracy and computational efficiency under different configurations. Key objectives include understanding the significance of kilometre-scale biogeochemical modelling for hazard assessments in the Adriatic Sea, examining the impact of extreme events on primary production both historically and under future climate warming scenarios (RCP 8.5), and assessing the long-term changes in biogeochemical hazards and their effects on coastal communities. The feasibility of producing high-resolution coupled atmosphere-ocean-wave-biogeochemical results at a climate scale using ECMWF resources is also planned to be tested.

## Summary of problems encountered (10 lines max)

The primary issue encountered was the difficulty in restarting the coupled AdriSC and Selma models during test runs exceeding one week. This challenge disrupted the continuity and stability of the simulations, hindering the evaluation of the model's performance over extended periods. Resolving this problem is crucial for achieving the project's objectives of producing reliable kilometre-scale coupled atmosphere-ocean-wave-biogeochemical results and assessing long-term biogeochemical hazards and their impacts on the Adriatic Sea and its coastal communities. An additional challenge arose because the principal investigator moved to a new institution and became heavily engaged in teaching and newly assigned projects, which temporarily limited the time available for debugging and optimisation of the coupled system. The plan is to dedicate the summer of 2025 to revisiting the restart procedures and finally eliminating the issue.

## Summary of plans for the continuation of the project (10 lines max)

The next steps of the project involve first resolving the restart problem with the coupled AdriSC and SELMA models to ensure stable and continuous long-term simulations. Following this, the focus will shift to integrating and coupling other biogeochemical models such as ERSEM, BFM, and PISCES with the AdriSC suite. Depending on the performance of these models and their configurations, two biogeochemical setups will be selected: (1) a simpler configuration for studying primary production under extreme events, and (2) a more complex configuration for examining the Adriatic Sea ecosystem under long-term climate changes. Finally, the impact of both past and future extreme events on the Adriatic Sea ecosystem will be comprehensively studied using these selected configurations.

As part of these efforts, a research visit to the Plymouth Marine Laboratory is also planned, where I will continue working on this problem in collaboration with PML colleagues who are experts in the field of primary production. I have received internal project funding from the University of Split to support this visit and enable me to re-engage with this work, which was temporarily paused due to the institutional transition.

## List of publications/reports from the project with complete references

There are still no publications from this project, due to reasons explained above.

## Summary of results

If submitted **during the first project year**, please summarise the results achieved during the period from the project start to June of the current year. A few paragraphs might be sufficient. If submitted **during the second project year**, this summary should be more detailed and cover the period from the project start. The length, at most 8 pages, should reflect the complexity of the project. Alternatively, it could be replaced by a short summary plus an existing scientific report on the project attached to this document. If submitted **during the third project year**, please summarise the results achieved during the period from July of the previous year to June of the current year. A few paragraphs might be sufficient.

During the first half of the project, significant efforts were invested in successfully coupling the AdriSC model with the biogeochemical model SELMA. This process required a detailed evaluation of SELMA in terms of its complexity, modularity of the source code, coupling feasibility with AdriSC, and computational demands. Several configurations of SELMA were tested to identify the most appropriate setup offering a good compromise between model accuracy and computational efficiency. These preliminary results laid the groundwork for the future integration of additional biogeochemical modules into the AdriSC modelling suite.

Furthermore, the work conducted so far served as a basis for the development of the newly approved Institutional Project, which is fully aligned with the objectives of the current project. Within this framework, a collaboration has been initiated with researchers from the Plymouth Marine Laboratory (PML) and a research visit is set to be held within the next couple of months.

Although some progress was delayed in the previous reporting period due to administrative and logistical constraints, all key components for further development are now in place. With the technical foundation established, the additional support secured through the new project, and the expertise of the PML collaborators, all upcoming efforts will be focused on advancing the coupled modelling system. The primary goal remains the implementation, evaluation, and eventual operational use of a high-resolution biogeochemical component within AdriSC. We are confident that this renewed momentum will enable us to achieve the main project goals within the planned timeframe.