



UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH

Escola Superior d'Enginyeries Industrial,
Aeroespacial i Audiovisual de Terrassa

Budget

for

STUDY: NUMERICAL IMPLEMENTATION OF A
MULTILAYER SHALLOW WATER ATMOSPHERIC MODEL

by

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Budget and Environmental Impact

This attachment to the Degree Thesis Report *Study: Numerical implementation of a multilayer Shallow Water atmospheric model* summarizes the costs and environmental impact of the research conducted.

Being mostly theoretical and with an important numerical code development component, most of the the costs stem from the supposed salary of the author. This has considered to be the the salary of a junior researcher with little experience, working 8 hours per working day from Februrary to June 2021, although some previous work that has been used for the project had already been done before this thesis.

The only other cost that this project incurred is the power consumption of the PCs that have been used in the extensive simulations that have been performed. This includes the 10 simulations that have been included in the report and the many other trials that have served to develop the final models presented. The simulation time, gathering metadata from the up to 3 computers that have been running the models, amounts to 1230h of intensive CPU and graphic card usage. The wattage for each computer has been obtained from the specifications on the PSU unit of each one. This is detailed in the table below.

Electricity price has been considered to be the average from February to June 2021. Since the typical running times for the simulations have been around 5 continuous real days, there is no need to consider the price fluctuations during the different intervals of the day.

Concept	Resources used	Power consumption	Cost	Total
HP Omer	425 h	125W	0.1395€/kWh	7.4 €
MacBook Pro	251 h	68W		2.38 €
Toshiba Protégé	554 h	80W		6.18 €
Reserch work	760 h		11€/h	8.360 €
Total				8.376 €

From the table, the total power consumption has been $114.5kWh$. Using the latest data from the the European Environment Agency [1], 210 grams of CO_2 are produced per kWh generated in Spain. This means that this project has produced 24.05 kg of CO_2 .

Bibliography

- [1] European Environment Agency. *Greenhouse gas emission intensity of electricity generation*. 2021. URL: <https://tinyurl.com/EEA-co2-emission-intensity>.