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Projekttitel: Climate for Culture Ocean

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Climate for Culture: Damage risk assessment, macroeconomic impact and mitigation strategies for sustainable preservation of cultural heritage in the times of climate change

Project summary:

Climate Change is one of the most critical global challenges of our time. This factor, coupled with the increasing demand our society makes on energy and resources, has forced sustainable development to the top of the European political agenda. Scientific research shows that the preservation of the cultural heritage of Europe is particularly vulnerable to all three of these factors. As a non-renewable resource of intrinsic importance to the European identity, we need to develop more effective and efficient sustainable adaptation and mitigation strategies in order to preserve these invaluable cultural assets for the long-term future. More reliable assessments will lead to better prediction models, which in turn will enable preventive measures to be taken, thus reducing energy and the use of resources.

For this purpose and for the first time ever, the CLIMATE FOR CULTURE project will connect completely new high resolution Climate Change evolution scenarios with whole building simulation models to identify the most urgent risks for specific regions. The innovation lies in the elaboration of a more systematically and reliable damage/risk assessment which will be deduced from high resolution downscaling of climate change simulations with whole building simulation models and new damage assessment functions. In situ measurements and investigations at cultural heritage sites throughout Europe will allow a much more precise and integrated assessment of the real damage impact of climate change on cultural heritage at regional scale. Sustainable (energy and resource efficient) and appropriate mitigation/adaptation strategies, also from previous EU projects, are further developed and applied on the basis of these findings simultaneously. All these results will be incorporated into the assessment of the economic costs and impacts. Precious collections in historic buildings from various European regions

Project objectives:

The CLIMATE FOR CULTURE project builds on the three most urgent questions for cultural heritage in the times of climate change:

1. What will be the effects of climate change on cultural heritage in Europe?
2. What mitigation strategies are necessary to prevent damage to movable and immovable cultural heritage?
3. What will it cost us, if we do not react in time?

MPI-M Contribution to the project

Two groups are involved into the Project:

- regional climate modelling, Daniela Jacob, Department “The Atmosphere in the Earth System”
- research Group Ocean Physics, Uwe Mikolajewicz, Department “The ocean in the Earth System”

MPI-M leads the Work package 1 of the project. The main objective of this WP is:
To create and to provide high resolution reliable climate evolution scenarios (excluding extreme events) for damage assessment of movable and immovable cultural heritage objects in the near and far future.
To provide better information on climate projections for the project target regions, a coupled regional high-resolution coupled regional atmosphere-ocean model (~25 km in the atmosphere, ~12 km in the ocean) will be carried out for Mediterranean region. For this purpose, the regional coupled model REMO/MPIOM will be adapted. The main outcome will be estimates of sea level rise in the Mediterranean and estimates of the effect of interactive simulation of ocean SST. Together with the high resolution REMO simulations performed in the REMO group this will yield estimates of future climate change which will serve as input for the building simulation and damage assessment. Two IPCC emissions scenarios (A1B and B1) will be taken into account. The global fields from the coupled general circulation model ECHAM5-MPIOM will be used as boundary values for the regional models. In order to separate the effect of the drift of the coupled regional model, an effect most important for the sea level estimates due to the influence of the deeper ocean layers, an additional control simulation without anthropogenic climate change is necessary.
Main deliverables of this task are high resolution climate datasets for the whole Europe for the two climate change scenarios as input for building simulation and damage assessment. The models require the input data for the time slices 1960-1990 (baseline), 2020-2050 (near future) and 2070-2100 (far future). Whereas the downscaling with the atmosphere-only model can be performed exclusively for these time slices, a coupled climate model requires the simulation of the entire covered period (1950-2100) due to large inertia of the ocean, which is essential for the estimate of the regional sea level rise. Additionally a control simulation without anthropogenic forcing is required, in order to be able to separate in the climate change simulations the climate signal from the remaining model drift. This is especially relevant for the sea level, which to a much larger degree than SST is affected by slow warming/cooling trends from the deep layers.

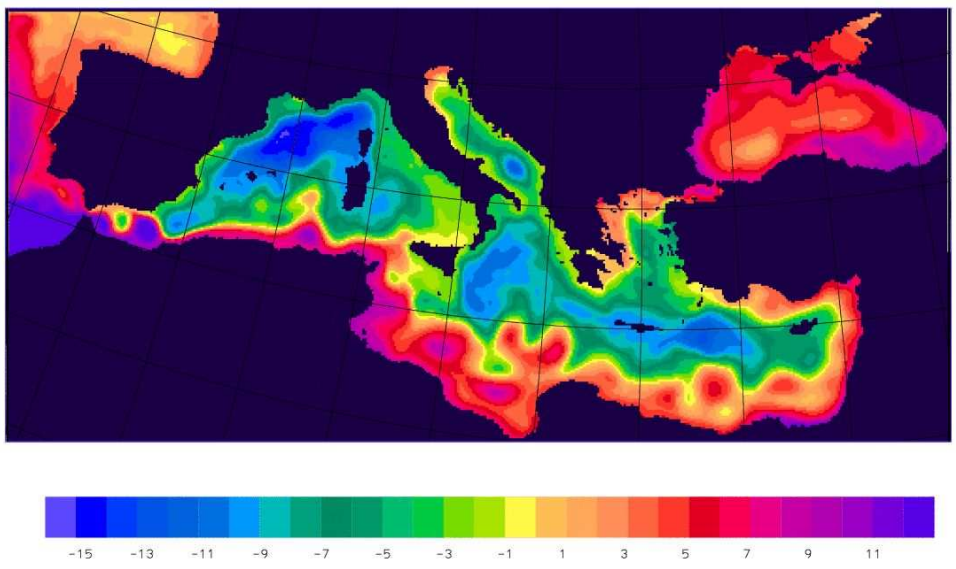

Figure 1: Simulated mean sea level of the MPIOM in cm, averaging period: 1 year