Climate of the 6th Century based on the Fully Forced Regional Climate Model COSMO - CLM over the Eastern Mediterranean and the Nile

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Introduction
Understanding how past societies responded to extreme climate conditions is important for gaining insight into current and future climate. The Eastern Mediterranean (EM) and the Nile River basin (NR) are ideal areas for interdisciplinary natural scientific and historical studies and modelling experiments due to the abundance of proxy and historical data in the last millennium.

The 6\textsuperscript{th} century AD is of particular interest from both a historical and scientific perspective, as it coincides with a period of prosperity for the Eastern Byzantine Empire and political stability, but which also experienced a plague pandemic and significant climate variability in parallel as a result of a major cluster of volcanic eruptions.

Method
• The RCM COSMO-CLM is used in this study in an adjusted paleoclimate version, with orbital, solar, GHG, volcanic and land-use forcings.
• The new MPI-ESM-LR simulation ‘Mythos’ that is performed under the CMIP6 protocol (MPI-ESM-LR ‘past2k’) (Jungclaus et al., 2017) at ~1.875° resolution acts as the boundary data.

Table 1. COSMO-CLM setup

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model version</td>
<td>COSMO-CLM v5.0_clm16</td>
</tr>
<tr>
<td>Interpolation</td>
<td>INT2LM v2.05_clm1</td>
</tr>
<tr>
<td>External Data</td>
<td>transient using MPI-ESM output</td>
</tr>
<tr>
<td>Driving model</td>
<td>MPI-ESM with CMIP6-PMIP4 settings</td>
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<tr>
<td>Grid size</td>
<td>0.44°</td>
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<tr>
<td>Period</td>
<td>500BCE - 1850CE</td>
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</tbody>
</table>

Conclusions
• Cooling over the Eastern Mediterranean in both winter and summer of period 536 – 545 CE, same pattern can be observed during the summers of Nile River basin. While in winters, the temperature decrease is not as obvious as it is in summers after the volcanic eruption of this period.
• Followed by a wet winters and dry summers after the volcanic eruptions during 536 – 545 CE over the Eastern Mediterranean.
• The Nile River basin experiences a dry summer during 536 – 545 CE.

References
Jungclaus, J. H et al. The PMIP4 contribution to CMIP6 – Part 3: The last millennium, scientific objective, and experimental design for the PMIP4 past1000 simulations, Geoscientific Model Development.

Acknowledgement
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