Conceptual transient model provides new insights into **mechanisms** and **timing** of **sapropel formation**

Transient box model analysis of sapropel formation in the Mediterranean Sea

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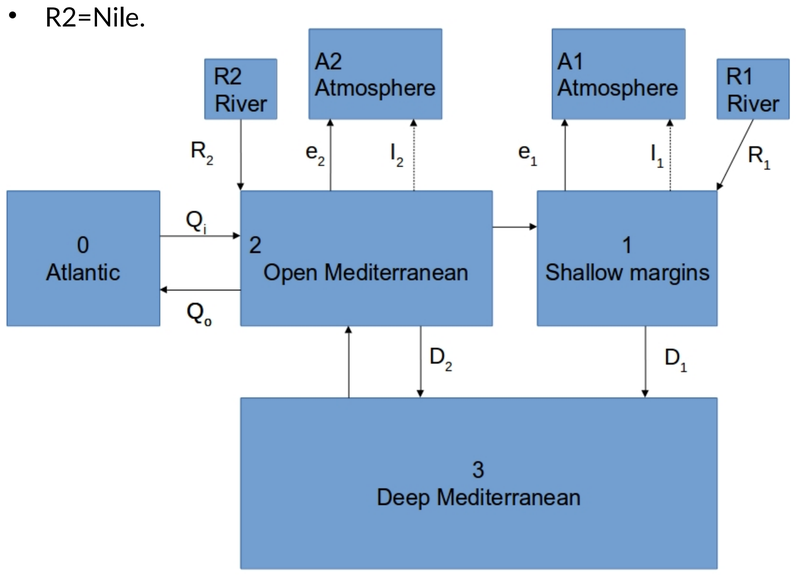
Introduction

Sapropel formation in the Mediterranean Sea has been studied extensively in the geological record, and with snapshot and short time-slice experiments with (Oceanic) General Circulation Models. We present a compact box model to describe and investigate the physical processes causing sapropel formation. In contrast, we present a conceptual box model to investigate the physical processes causing sapropel formation. The model allows us to focus on the transient, nonlinear response of the system over an entire precession cycle.

Methods

- We divide the Mediterranean Sea into three dynamic boxes. (1, 2, and 3 in the diagram below).
- Each box has its own temperature and salinity.
- River outflow and evaporation (E-P) are predefined, all other fluxes are calculated from density gradients, temperature gradients, and conservation of salt and volume.
- Each run: full precession cycle.
- R1=Rivers from Europe.
- R2=Nile.



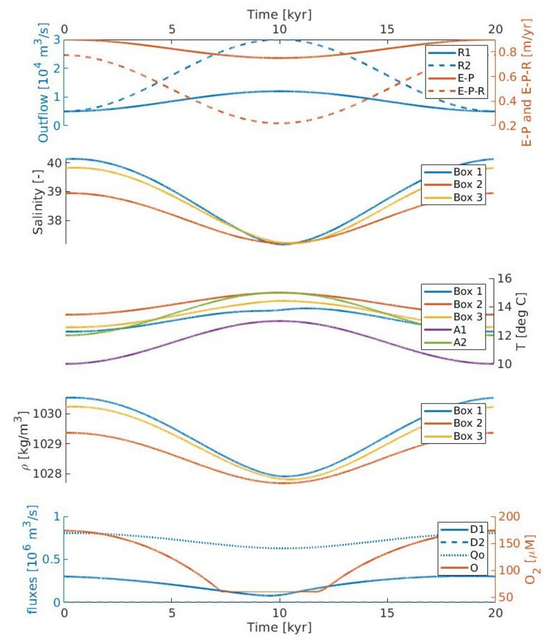
Results

Discussion+conclusions

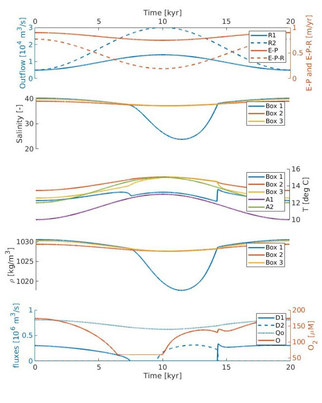
- Small change in DWF → large impact in bottom water oxygenation.
- Each sapropel is different.
- Sapropels are the result of non-linear behavior.
- No linear relation with insolation → phase undefined.
- Interuptions or sudden terminations occur in the model when the freshwater buget of (part of) the basin reverses.

Extra figures

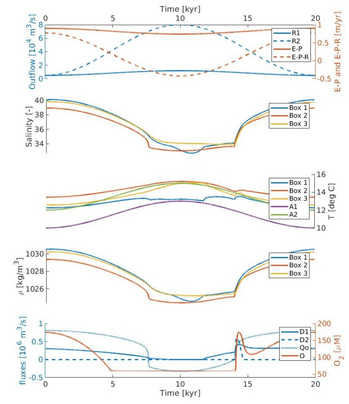
Adding atmospheric temperature variability



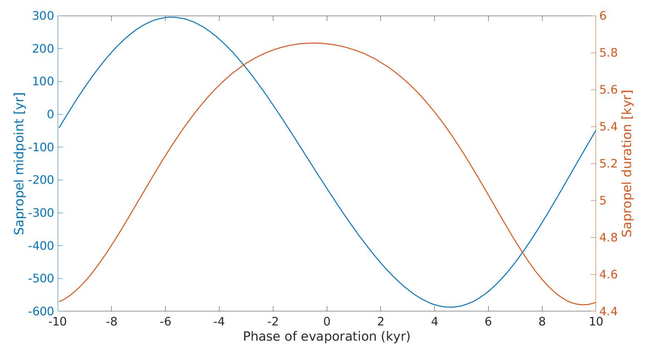
FWB of margins reverses



FWB of whole basin reverses



Sapropel timing+ duration as a function of the phase of evaporation



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