Project: **970**

Project title: **TARANTO**

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In the past year, we continued working on the second paper, which is aiming at establishing a transfer function to reconstruct past climate variability and marine biogeochemical variations from marine sediment proxy records.

For this purpose, we investigated how the thermal structure of the upper ocean is recorded in the proxies deposited in the marine sediment. Instead of following the traditional way to evaluate the relationship between spatial distributions of surface sediment proxy data (e.g. alkenone index, Max et al., 2020) and modern environmental parameters (e.g. sea surface temperature, Mohtadi et al., 2011) with the assumption that temporal variations leave the same signature in the proxy as spatial variations, we directly investigated the temporal relationships between modelled variations in the sediment and in the upper ocean.

Contrary to the generally accepted view that the sediment temperature record (e.g. the alkenone-derived SST) is a plausible proxy for annual mean SST (e.g. Jalali et al, 2018; Müller et al., 1998), we found that in the Mediterranean Sea temperatures recorded in sediment flux of detritus are less correlated with the local annual mean SST than with the late winter/early spring monthly mean SST except for the northern part of the Adriatic Sea (Figs. 1a-c). Our results imply that seasonal variations in marine production and export of organic material are important aspects that need to be considered when interpreting sediment records in the Mediterranean region.

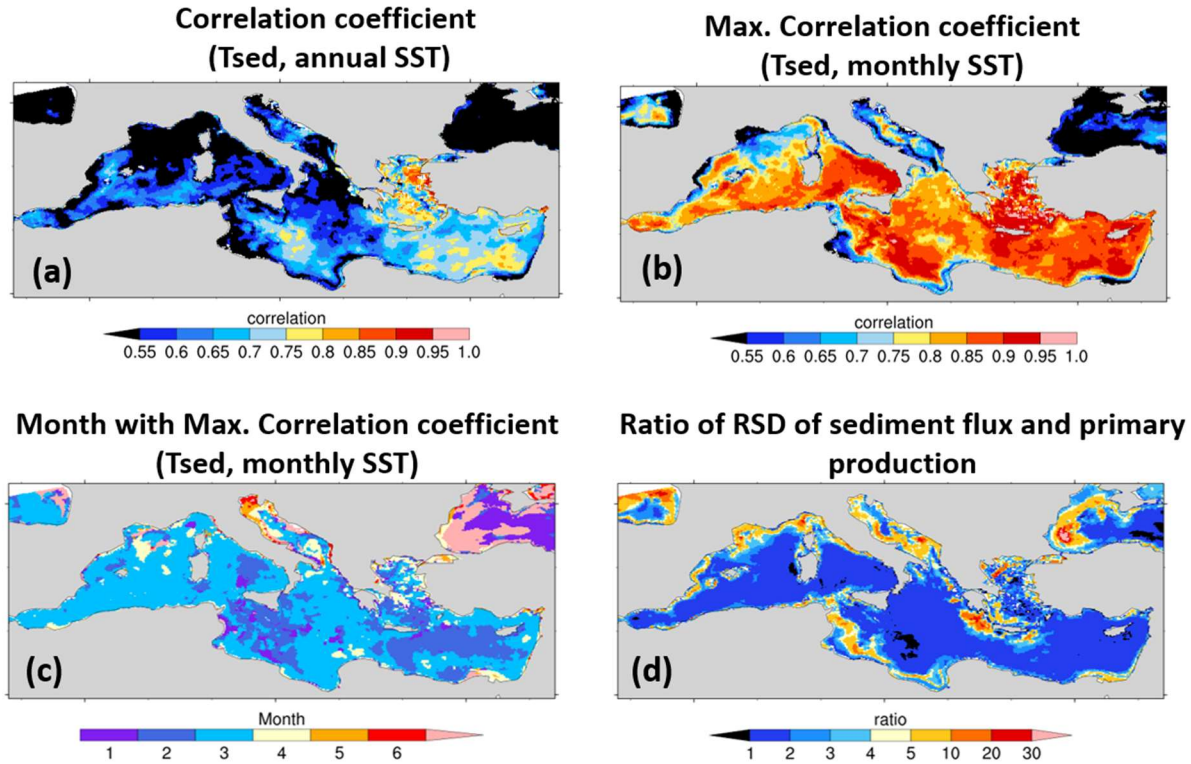

Fig.1 (a) Spatial distribution of the correlation coefficient between the annual mean temperature recorded in the simulated sediment flux of detritus and the simulated annual mean SST. (b) Spatial distribution of the maximum correlation coefficient between the annual mean temperature recorded in the simulated sediment flux of detritus and the simulated monthly mean SST. Shown is the highest correlation coefficient at each model grid point. (c) Month in which the highest correlation shown in (b) occurs. (d) The ratio between the relative standard deviation (RSD) of annual mean sediment flux of detritus and RSD of annual mean vertically integrated primary production for each model grid.

We further compared the relative standard deviation (RSD) of annual mean sediment flux of detritus and RSD of local annual mean vertically integrated primary production to qualitatively evaluate the relative strength of disturbance processes (e.g. resuspension) to the local sinking. We found that the nonlocal disturbance seemed

to be rather strong everywhere except for the deep basins (Fig.1d), indicating that even high deposition records on the shelf do not allow reliable reconstruction of interannual variability.

Further investigation of key factors influencing the sediment records as thermometers of the upper ocean is needed. This work will be continued in the next year to finally complete the paper for submission.

References:

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