

Forty-five years of oceanographic and meteorological observations at a coastal station in the NW Mediterranean: a ground truth for satellite observations

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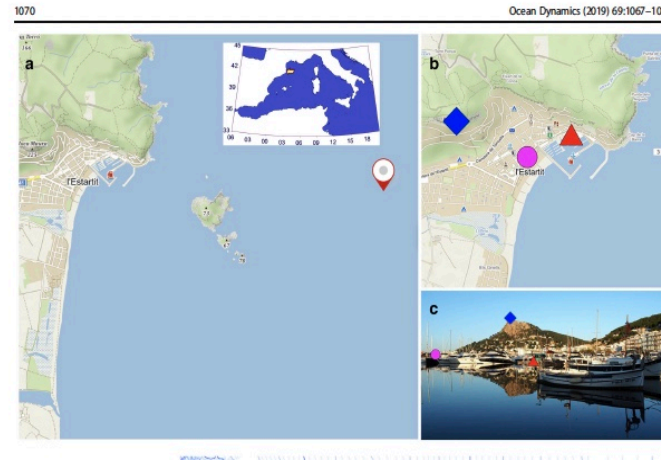
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INTRODUCTION

Marine and atmospheric parameters, including temperature observations from surface to 80 m (at 6 depths) are measured since September 1973 on a higher-than-weekly frequency, at a coastal station 4 km offshore L'Estartit (Costa Brava; NW Mediterranean). This constitutes the longest available uninterrupted oceanographic time series in the Mediterranean Sea. The present contribution focuses on observed climatic trends in temperature ($^{\circ}\text{C}/\text{year}$) of air (AT; 0.05), sea surface (SST; 0.03), sea at 80 m depth (S80T; 0.02) as well as comparison with trends estimated from coincident high resolution satellite data.

CONCLUSIONS:

The trending evolution is not uniform across seasons, being significantly higher in spring for both AT and SST, while in autumn for S80T. Other climatological results are a stratification increase ($0.02^{\circ}\text{C}/\text{year}$ in summer temperature difference between 20 m (S20T) and S80T), trends in summer conditions at sea (when S20T > 18°C), estimated as 0.5 and 0.9 days/year for the starting day and period respectively, and a decreasing trend of nearly 2 days/year in the period of conditions favourable for marine evaporation (when AT < SST). The good agreement for 2013–2018 (RMS 0.5–0.6, bias -0.1 to -0.2 ; trends of $0.09^{\circ}\text{C}/\text{year}$ in situ vs. 0.06 to $0.08^{\circ}\text{C}/\text{year}$ from satellite) allows considering this observational site as ground truth for satellite observations and a monitoring site for climate change.



Location of Coastal Stations

Product	RMS	Bias	Scatter	Max	Min
MUR 1 km	0.54	-0.14	0.52	2.16	-3.32
MUR 25 km	0.55	-0.01	0.54	2.20	-3.34
GOS 1 km	0.53	-0.14	0.51	2.26	-1.93
GOS 6 km	0.54	-0.20	0.50	2.30	-2.03
CMC 10–20 km	0.56	-0.16	0.54	1.97	-2.73
OSTIA 5 km	0.62	-0.20	0.59	2.43	-2.87
NCEI 25 km	0.79	-0.32	0.72	2.50	-4.24

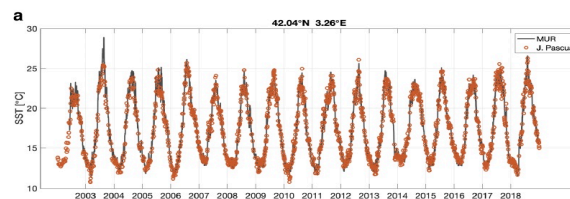


Figure: SSTs from MUR and coastal station

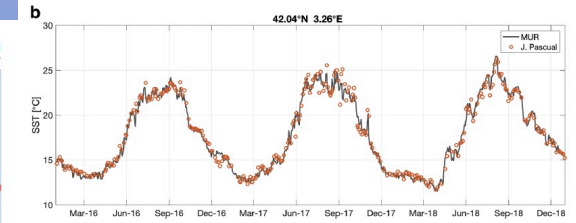


Figure: Zooming in on SSTs for 2016–2018

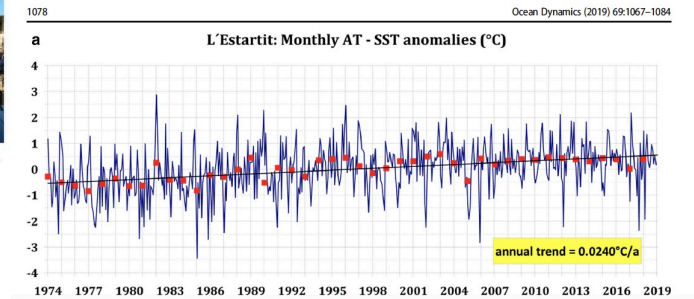


Figure: Atmospheric Temperatures – SST Anomalies

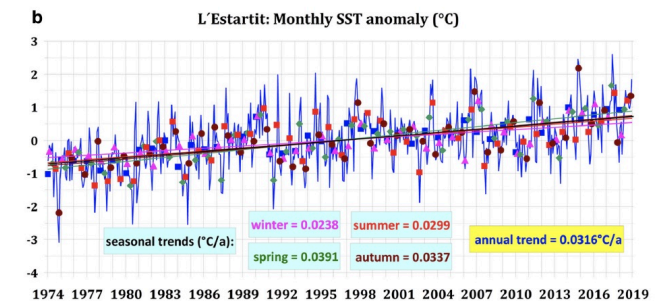


Figure: Monthly SST anomalies from Coastal Station