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On the influence of Ocean Mixed Layer depth and Sea Surface Temperature Anomaly in the genesis and evolution of the Mediterranean Tropical-Like cyclones "IANOS"

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Over the Mediterranean basin we can occasionally observe intense cyclones showing tropical characteristics and known as Mediterranean Tropical-Like Cyclones (TLC). Previous studies focusing on past TLCs events have found that SST anomalies play a fundamental role in modulating the intense air-sea exchange of latent and sensible heat fluxes, hence controlling both development and evolution of TLCs. However, given the connection between ocean mixed layer, ocean heat content and temperature, it is important to explore also the role of the mixed layer depth (MLD). In this study we investigated the role of both SST, SST anomaly and MLD profile on genesis and evolution of a recent record-breaking TLC. Specifically, we focus on TCL "IANOS", a cyclone that originated over the southern Ionian Sea around 14 Sept 2020, moved over the Central Ionian Sea from south-west to North-East, and made landfall around 19 Sept 2020 over Greece mainland coast. It developed over a basin where a positive SST anomaly up to 4 °C was detected, which coincided with the sea area where it reached the maximum intensity. We conducted a series of experiments using an atmospheric model (WRF - Weather Research and Forecasting system) driven by underlying SST (standalone configuration) with daily update or coupled to a simple mixed-layer ocean model (SLAB ocean), with SST calculated at every time step using the SLAB ocean for a given value of the MLD. WRF was implemented with 3 km grid spacing, forced with ECMWF-IFS analysis (9 km resolution), while SST or MLD initialization, for standalone or coupled runs, respectively, are provided by the MFS-CMEMs Copernicus dataset at 4 km of horizontal resolution. For the studied TLC, the mean MLD is modified by increasing or decreasing its depth by 10 m, 30 m, 50 m, 75 m, 100 m, change the lapse rate ot MDL and studi the impacto of SST and anomaly present and estimated by climatological projections; the preliminary results show that the MLD influences not only the intensity of the cyclone but also the structure of the precipitation field both in terms of magnitude and location. At first the MLD thickness was characterized for the days in which the cyclone developed using ocean modeling data. Then we identified possible past and future climatological scenarios of MLD thickness. Starting from these data, we simulated the impact of the MLD, and consequently of the Ocean Heat Content, on the TLC. The preliminary results show that the MLD influences not only the intensity of the cyclone but also the structure of the precipitation field both in terms of magnitude and location. The results deserve further investigation in particular in the

context of climate change scenarios.