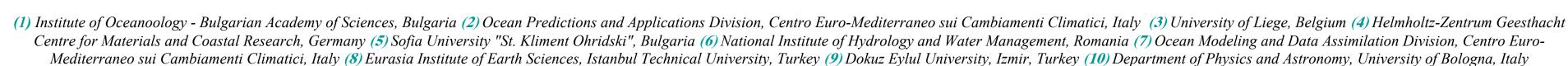
CMEMS Black Sea Monitoring and Forecasting Centre: an overview on service and scientific developments in 2016-2021 and future perspectives

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The Black Sea Monitoring and Forecasting Center (BS-MFC) provides analysis, 10-days forecast and reanalysis for the blue and green ocean state in the Black Sea region as part of the Copernicus Marine Environment and Monitoring Service (CMEMS). Its operational systems and service started to work in late 2016 and at today it includes 6 main products for the relevant components – Physics, Biogeochemistry and Waves – with a number of 72 online datasets. They include Near Real Time and Multi-Year products. BS-MFC systems implement state-of-the-art ocean modelling and data assimilation techniques: they guarantee also service standards, efficiency in operations, and users support through its Local Service Desk. Continuous developments of the modelling systems are performed through dedicated service evolution actions in order to improve the accuracy and the quality of the BS-MFC products.

System & Service Evolutions in 2020-2021 **BS-PHY BS-BIO BS-WAV** Near Real Time Reanalysis **Near Real Time Near Real Time** Reanalysis Reanalysis Atmospheric Forcing: ECMWF ERA5 1/4° Atmospheric Forcing: ECMWF 1/8° **Atmospheric Forcing: Initial Condition** Atmospheric Forcing: ECMWF 1/8° Atmospheric Forcing: ECMWF 1/8° ECMWF ERA5 (msl, cc, u10m, v10m, t2m, d2m) and GPCP monthly 01/01/1988 (msl. cc. u10m, v10m, t2m, d2m, (u10m, v10m) January climatology (1992-2018) Temporal resolution climatological precipitation Temporal resolution: Forecasts: 3hrs (first 3 days)/6 hours (next 7 **Initial Condition** ECMWF ERA5 Temporal resolution: **GPCP** monthly from the previous reanalysis. Temporal resolution: synthetic 1980 days); Analysis: 6 hours 1-hour freq. Forecasts: 3hrs (first 3 days)/6 hours (next 7 days) climatological precipitation Forecasts: 3hrs (first 3 days)/6 hours climatology Analysis: 6 hours (next 7 days) Closed boundary Initial Condition Analysis: 6 hours Condition @ the Bosporu monov & Altman Jan WAM Cycle 6, 1/36°x 1/27° The Bosporus Strait is Strait with updates in the **Initial Condition** Climatology deled as water volume flux region near the Bosporus Initial 2D wave spectrum **BAHMBI** modelling system NEMO v3.6 30 frequency bands (0.043-0.663 Hz) NEMO v3.6 and salt flux computed from NEMO v3.4 Data Assimilat enerated via fetch law from 1/36°x 1/27°, 31 z-lev Closed boundary with pelagic and benthic Including shallow water, depth refraction, current refraction and wave 3DVAR 3DVAR SSH and conservation laws nproved bathymetry and local wind field ndition @ the Bosporu partial steps components **OceanVAR OceanVAR** Partial steps Partial steps application of local Strait damping for T/S Data Assimilation (only for NRT) **Land Forcing:** matological river inputs **CMEMS Observations** River inputs Assimilation of satellite data recorded by the radar from SESAME Project Observations One-way offline coupling 72 climatological river SLA L3 SAT, SST L4 SAT & altimeters of Jason-1, Jason-2 and Jason-3 **CMEMS Reprocessed** (Ludwing et al. 2009) with NEMO currents and inputs from SESAME Proj. T/S INSITU SLA L3 Satellite and T/S in situ from CMEMS water level deviations and SeaDataNet CMEMS observations SST relaxation: SST-L4 from CMEMS SST TAC Satellite data: Chlorophyll Upgrade in the catalogue **SWH Max** 30 Upgrade in the **Bathymetry & Coastline** Chlorophy (mg/m³, May Corr +0.960 catalogue: *GEBCO 30" for the whole basin* + *High Resolution* RMSE +0.373 m 10 2005, daily average) RMSE = 0.238 (m) Offline coupling Dnieper Bias +0.245 m RErr 4.91 % Upgrade in the with BS-PHY 45°N Danube catalogue: New variables 45°N **River Runoff** – Improving the for optical Upgrade in the Danube River representation 43°N 44°N properties catalogue for ALL: 0.3 Sentinel 3a 2018 OND Hs (m) 43°N Reanalysis 0.1 SWH Jason (all merged) 42°N timeseries extended twice 28°E 30°E 32°E 34°E 36°E 38°E ner vear starting of *INTERIM* Region 2 3 production since *May 2021* **EAN** 0.012 -0.012 -0.011 0.19 0.15 0.014 new Unstructured Turkish Strait System UTSS based on Shyfem model to provide T, S, SSH, U, V Region 10 11 to the BS through the Marmara Sea for the Bosporus Strait EAN 0.04 0.009 0.055 0.07 -0.07













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