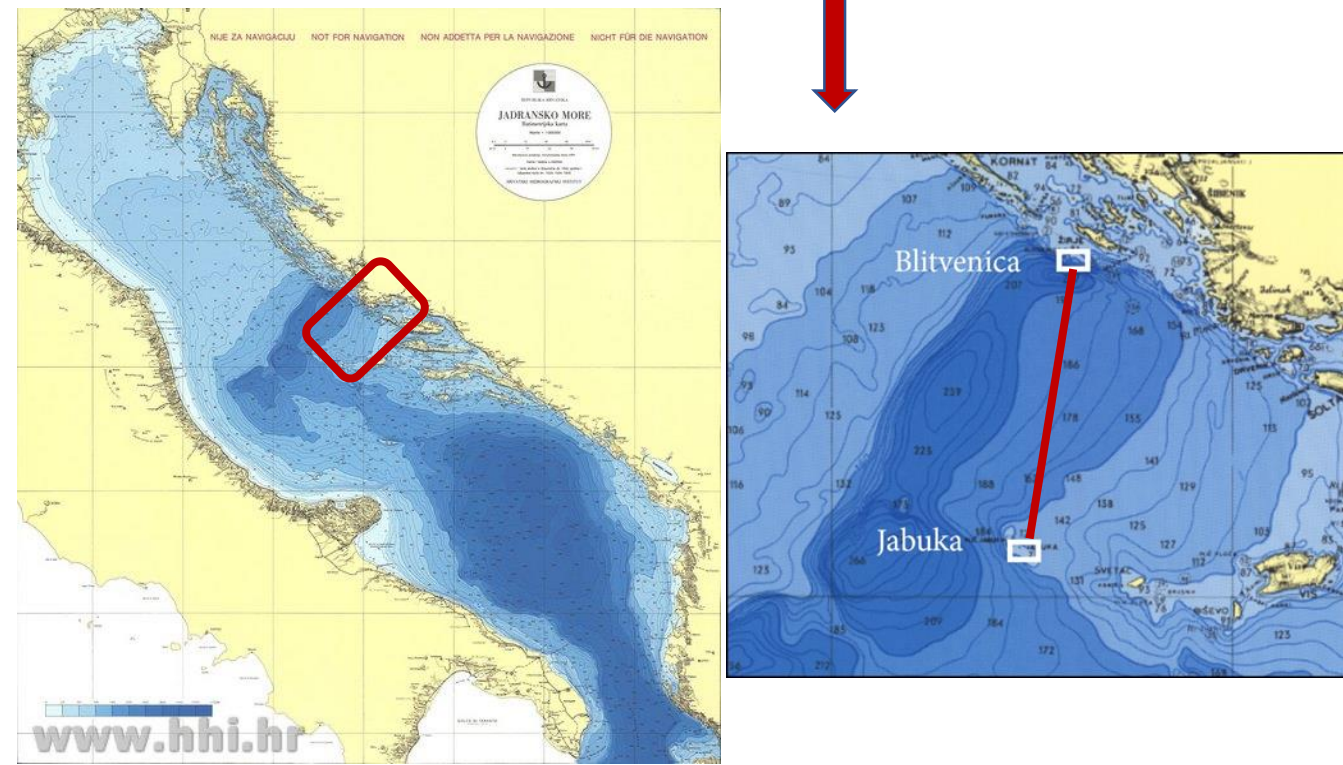


A close look at the middle Adriatic upwelling: schematized ROMS model simulations

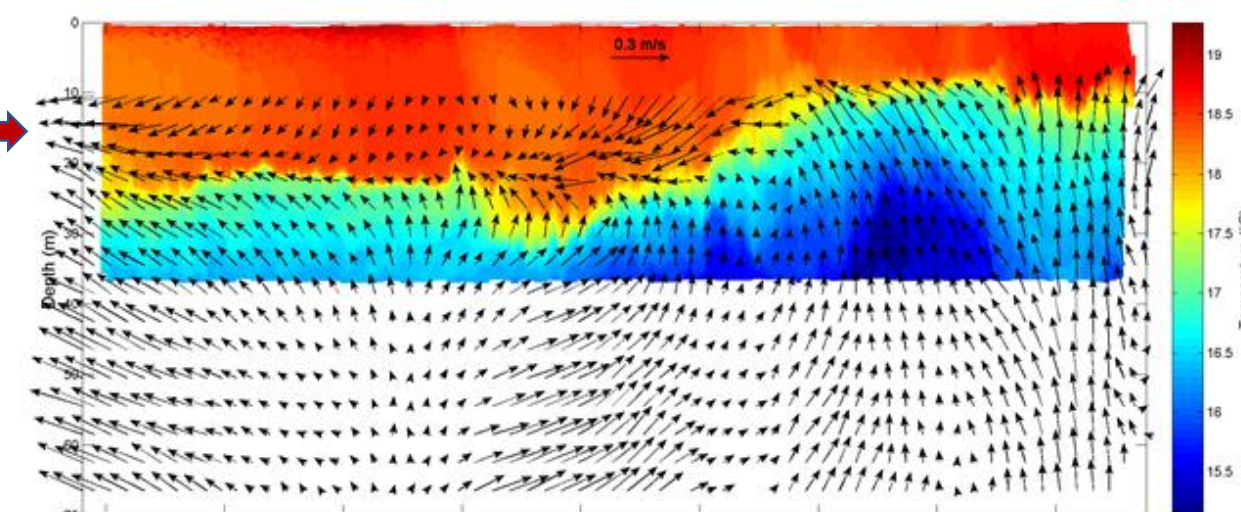
Gordana Beg Paklar⁽¹⁾, Zoran Pasarić⁽²⁾, Mirko Orlić⁽²⁾, Antonio Stanešić⁽³⁾

⁽¹⁾Institute of Oceanography and Fisheries, Šet. Ivana Meštrovića 63, 21000 Split, Croatia, ⁽²⁾Department of Geophysics, Faculty of Science, University of Zagreb, Horvatovac 95, 10000 Zagreb, Croatia, ⁽³⁾Croatian Meteorological and Hydrological Service, Grič 3, 10000 Zagreb, Croatia

Strong upwelling driven by the NNW winds was detected off the eastern middle Adriatic coast in May 2017. High resolution CTD data revealed thermocline doming by about 20 m at approximately 20 km from the coast.

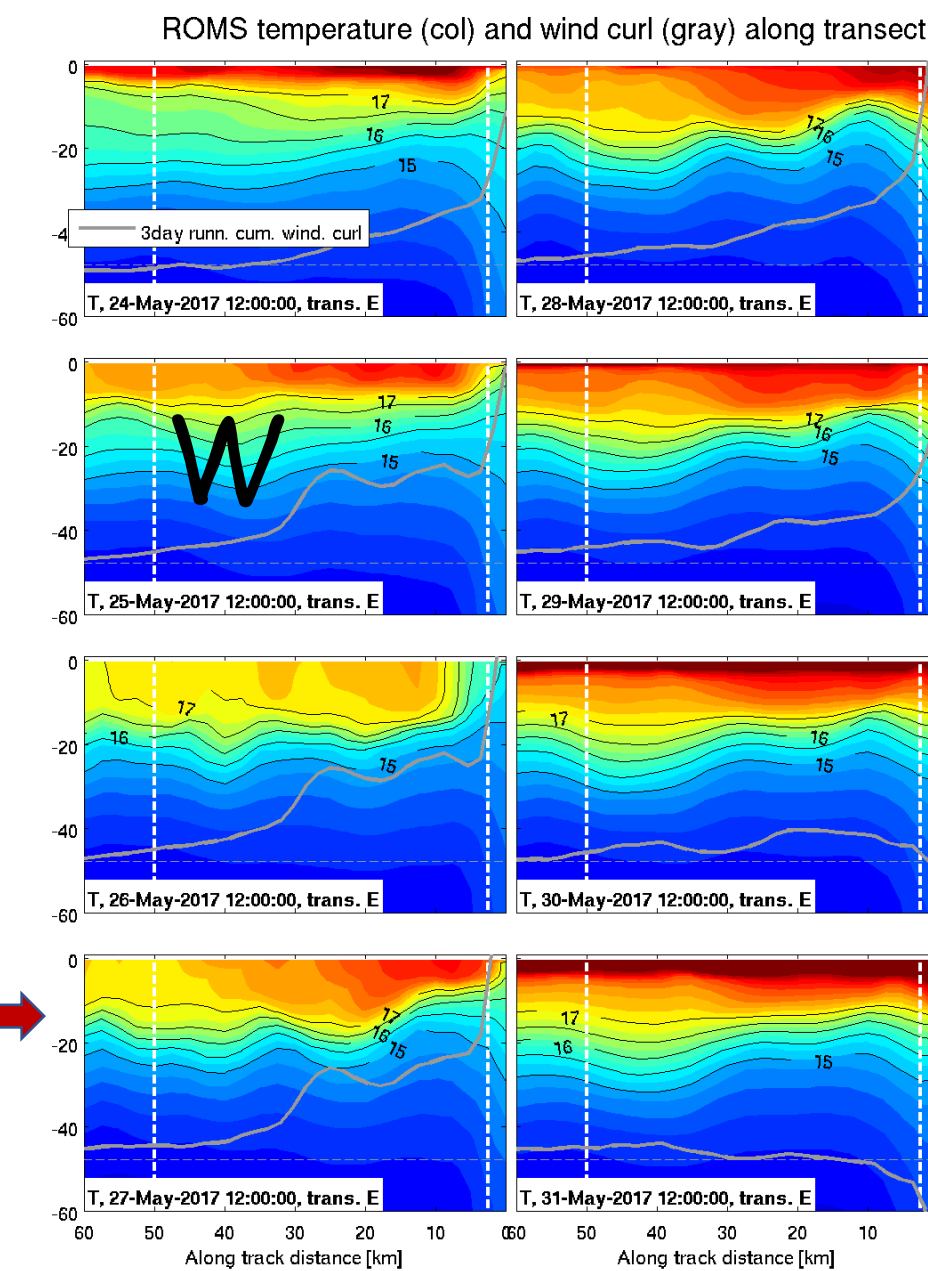


Study area (left) and CTD transect between the islands of Blitvenica and Jabuka (right).



Temperature and current measurements on 28 May 2017. NW current is directed upwards.

Adriatic scale ROMS model having 2.5 km horizontal resolution, forced by the air-sea fluxes calculated using surface fields from operational weather forecast model ALADIN/HR, river discharges, tides and water mass exchange through the Strait of Otranto, reproduces cold water dome and two-layer offshore flow in accordance with CTD and shipborne ADCP measurements.



Cross-shore temperature transects obtained in the realistic ROMS model simulation with total ALADIN wind fields (W) for the period 24 – 31 May 2017.

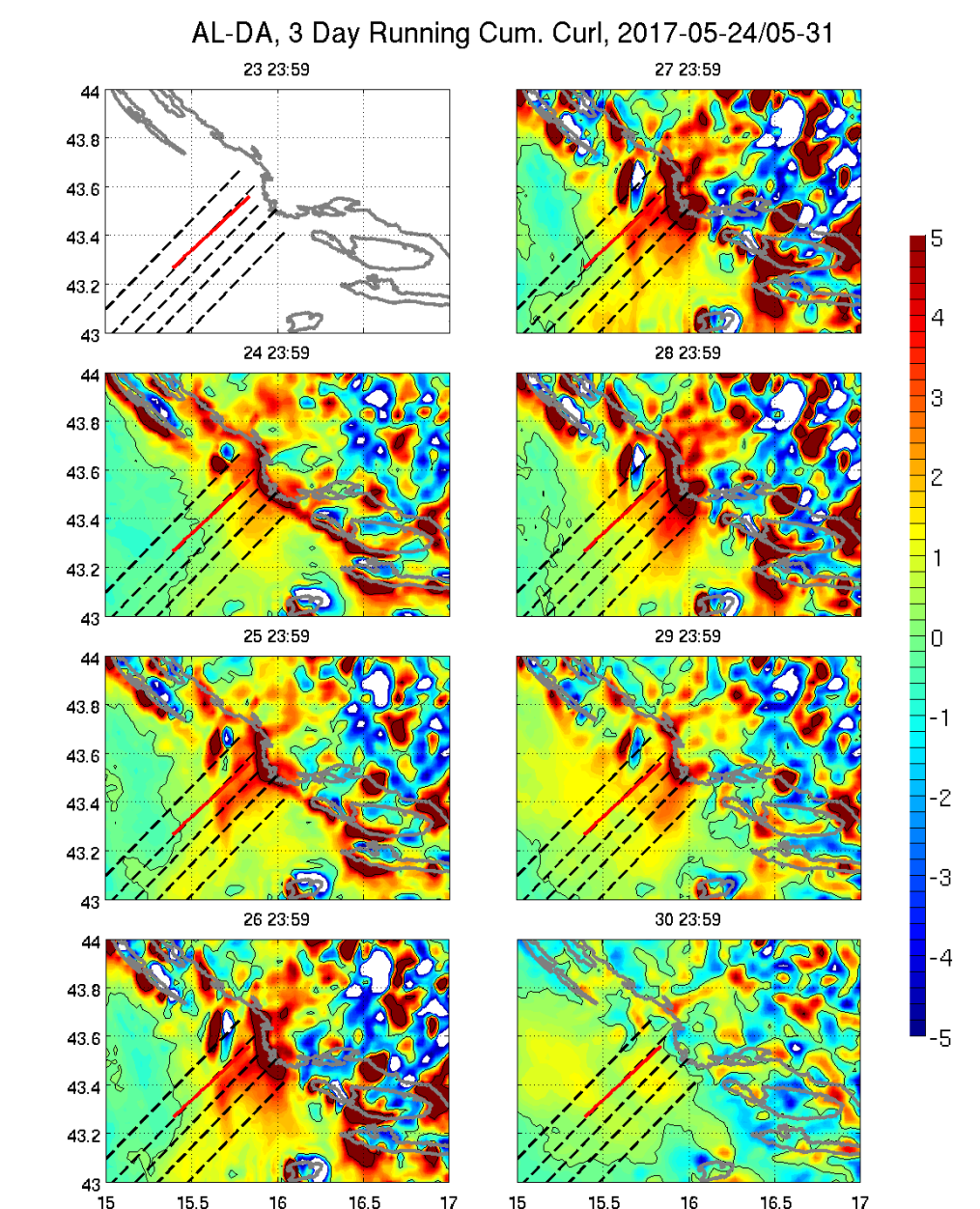
Helmholtz-Hodge decomposition of the total wind field W (Bhatia et al., 2014):

$$W=R+D+H$$

R – rotational component, $\text{div}(R)=0$

D – divergent component, $\text{rot}(D)=0$

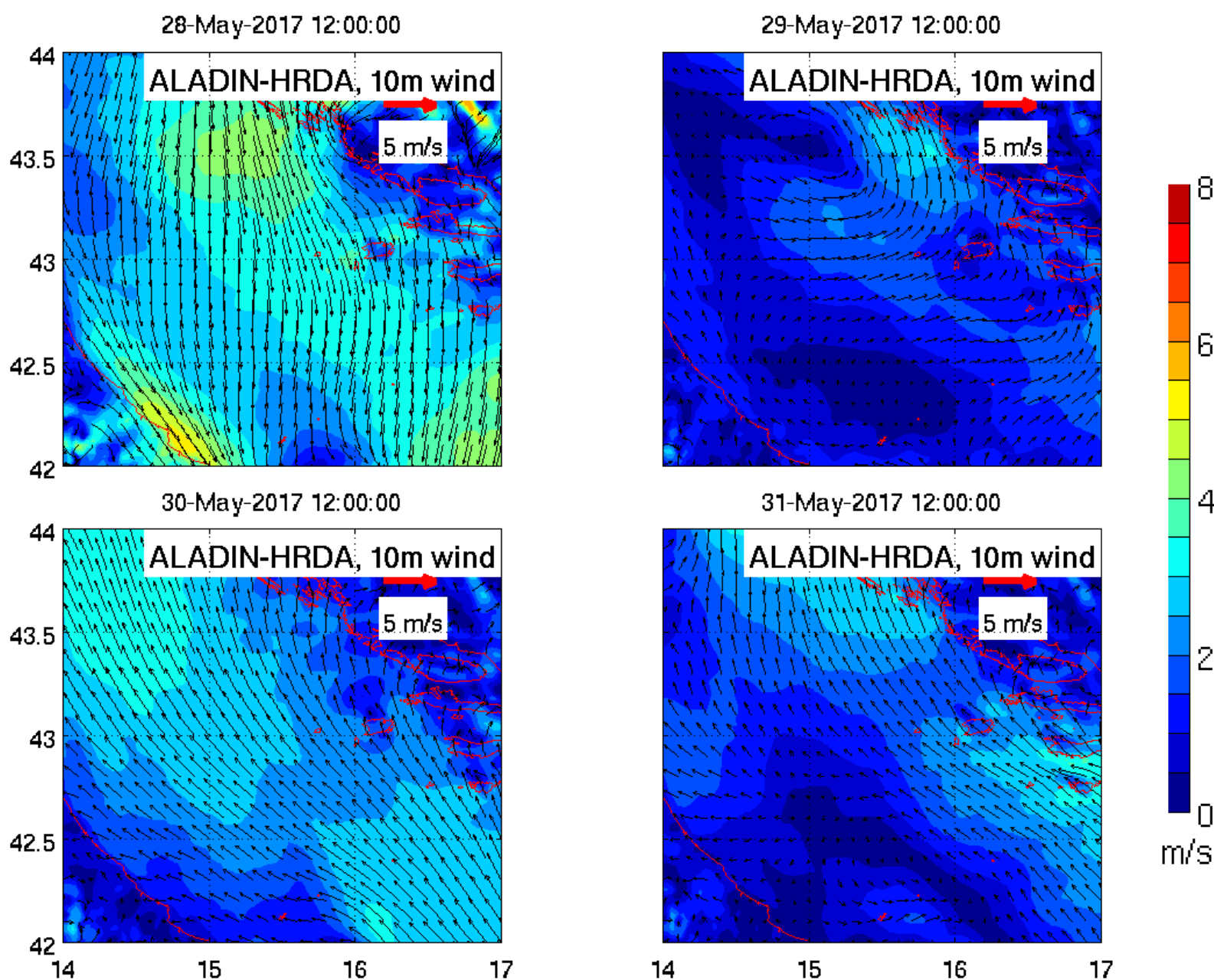
H - harmonic component, $\text{div}(H)=0$, $\text{rot}(H)=0$



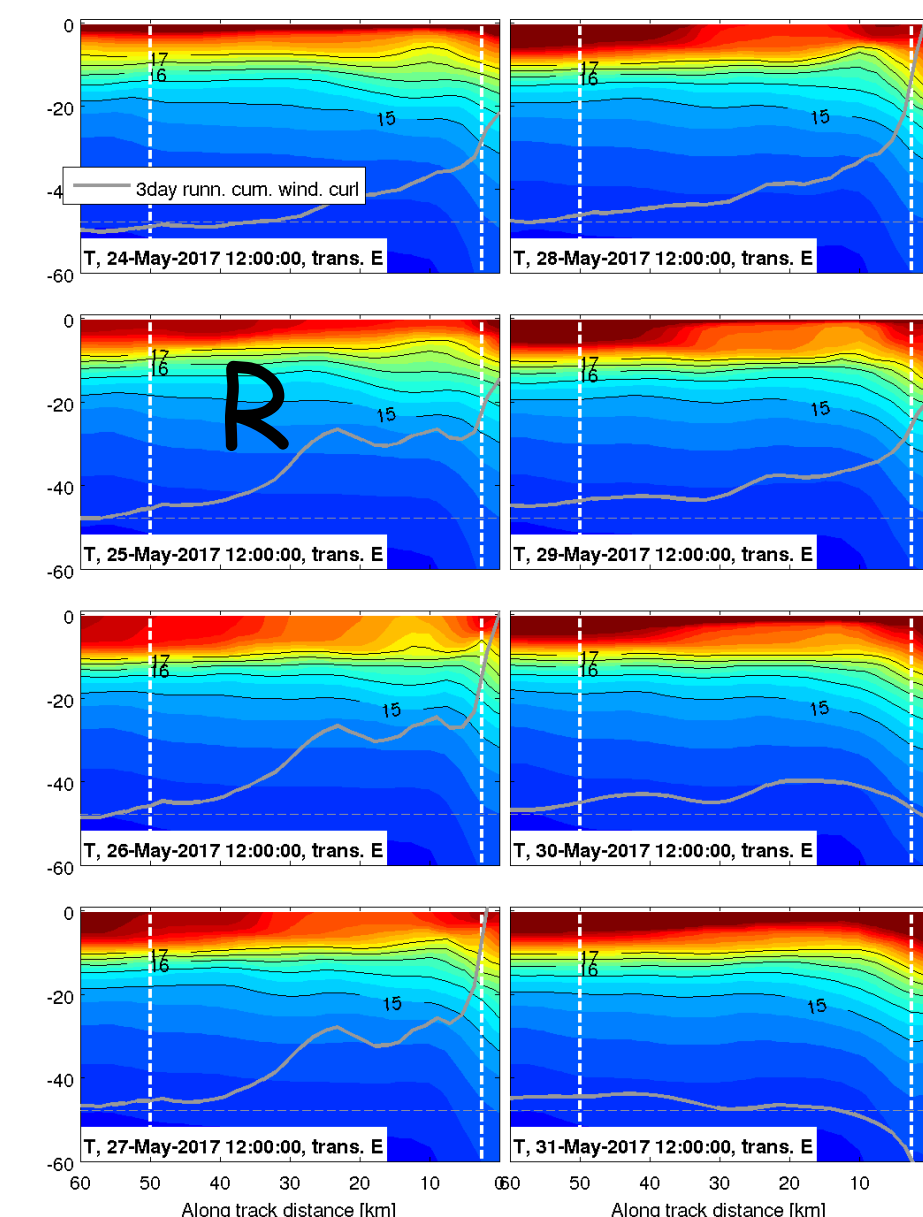
Wind curl of ALADIN 2-km surface wind fields for the period 24 – 31 May 2017.

CONCLUSIONS

1. Schematized numerical experiments were designed to elucidate driving forces for the coastal and open-sea upwelling.
2. The positive rotational wind component (R) is responsible for the recorded rising of thermocline on 28 May through Ekman pumping.
3. In the simulations with divergent wind component ($W-R$), the thermocline doming disappears and coastal upwelling is reproduced for the same dates as in the realistic experiment.



ALADIN 2-km surface wind fields obtained by dynamical adaptation from original ALADIN 8-km resolution fields during and after field experiment: 28–31 May 2017.



Cross-shore temperature transects obtained in the schematized ROMS model simulations forced with rotational (R) and divergent ($W-R$) components of ALADIN wind fields for the period 24 – 31 May 2017.

