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Numerical simulation of the bora-driven currents during different synoptic conditions above the Adriatic

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The occurrence of the oppositely directed surface currents at the gas field Ivana (positioned in the northern Adriatic) during two consecutive bora episodes is explained by the detailed analyses of synoptic situations and several numerical experiments in which oceanographic model is forced with the wind stress and surface heat flux calculated from the fine resolution meteorological model outputs. Deep bora layer, associated with centre of cyclonic activity over the western Mediterranean and Genoa Bay, was accompanied by downwind surface currents at the gas field Ivana, whereas, on the other hand, cyclonic development characterised by inversion and southwesterly tropospheric wind above shallow bora layer induced upwind surface currents. The well expressed descent of isentropic surfaces in the bora layer observed in the latter situation is, according to Smith's hydraulic theory, indicator of significant flow acceleration from the upstream to downstream bora region and consequently slower offshore bora decay. On the other hand, vertical atmospheric structure during the former episode gives no evidence of significant flow acceleration, which agrees with the supposed fast offshore velocity decay. Mesoscale meteorological model results provide insight into the offshore bora structure with northerly offshore wind followed by northeasterly flow occupying the whole northern Adriatic. Oceanographic model results showed that during the bora episode with lower speeds and fast offshore decay of the northeast wind component the surface currents along the transect Rovinj – Po River

are dominantly in the downwind direction. During the bora episode characterised by strong intensity and slow offshore decay the cyclonic gyre is formed in the northern-most part of the Adriatic Sea due to the pronounced bora alongshore variability and the studied transect is influenced by the counter currents.