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Salt wedge intrusion in the Po River delta in the climate changes perspective

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The salt wedge intrusion (SWI) in the Po river branches is a phenomenon that affects an area of about 300 km2 of the delta, mainly dedicated to extensive agricultural activity. The reduction of freshwater discharge and the sea level rise are the two main causes of the SWI and several factors, both anthropogenic and natural, concur to worsen the phenomenon. Climate change is responsible for the reduction of the total precipitation on the river basin and its temporal delay toward warmer months reduces the snow accumulation. The increased withdrawal of water within the Po basin for the agricultural and hydroelectric power production, causes a further reduction of the freshwater discharge during the drought periods. Furthermore, the discharge reduction and the sediments digging along the river course, cause the river talweg lowering. This lead, jointly with the sea level rise, to a significant loss of relative elevation of the downstream course of the river with respect to the mean sea level. In the past, the relevant rates of the anthropic induced subsidence in the Po delta further exposed the investigated area to SWI. In this work we used both observations and a 3D mathematical model, based on the SHYFEM code to investigate the processes determining SWI. We calibrated and validated the model with a salinity profile taken along the river talweg and simulated its temporal and spatial evolution during the 2017 summer. Within the simulated period, we also determined the range of boundary condition that ensures its existence. Moreover we performed a long term climatic simulation, investigating the SWI extension and its temporal persistence.