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On the eastern forcing of the Azores Current

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The entrainment of Central Water by the Mediterranean Outflow as it descends the northern slope of the Gulf of Cadiz has been proposed to be the generation mechanism of the Azores Current through the production of either a planetary or topographic β-plume. Although theoretical studies exist that support this link, few attempts have been made to match these two circulation features in a realistic modeling framework. We show results of a set of nested model configurations where basin scale models with a parameterization of the Mediterranean Overflow are used to initialize and control the open boundaries of high resolution Gulf-of-Cadiz-scale grids with explicitly imposed Mediterranean Outflow. Model results confirm the hypothesis of the Azores Current forcing on the east side (β-plume theories). A time-mean recirculation cyclonic cell is developed that expands westward with transports ranging from 4 to 5 Sv. The westward increase of the AzC transport to values up to 10-15 Sv is associated with the coupling between the beta-plume generated inside the Gulf of Cadiz and the background basin scale wind-driven flow. The resulting vorticity field is constituted by a potential vorticity zonal anomaly (forced by the β-plume) over the otherwise meridionally aligned large scale flow field.