SURFACE CURRENT DYNAMICS IN THE NORTH EASTERN ADRIATIC SEA FROM HIGH-FREQUENCY RADAR OBSERVATIONS AND HIGH-RESOLUTION WIND FIELDS

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Abstract
The dominant processes governing the circulation in a 40 km x 60 km area off the Italian coast and the Istrian peninsula, Northern Adriatic Sea, are assessed using surface current measurements from high-frequency radars and high resolution wind fields for the period September 2007 – August 2008. Time-averaged currents are weak and reveal a cyclonic circulation pattern with intensification in the northern sector (Fig.1). Vorticity is prevalently positive and related either to current shear or current rotation. The flow in the region is primarily driven by winds, which impart vorticity to the current fields, whereas tidal oscillations within the diurnal and semidiurnal frequency bands have a minor role in the circulation.
Keywords: Tides, Remote Sensing, Circulation, Adriatic Sea

High frequency observations of surface currents in the Northeastern Adriatic Sea for the period September 2007 – August 2008 reveal a cyclonic circulation scheme with weaker currents in the southern part of the domain, and an intensification along the Italian coast to the North where water is shallower and wind influence is stronger (Fig. 1).

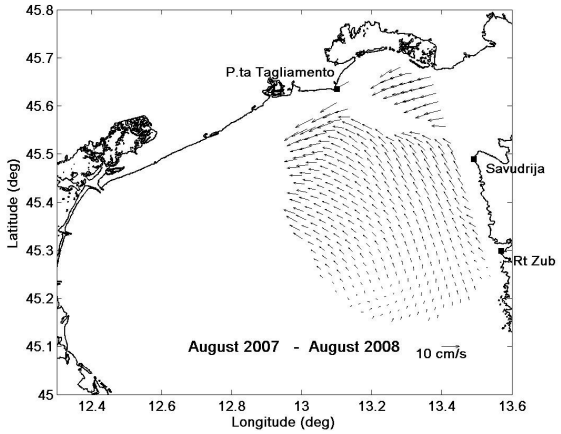

Fig. 1. Time-averaged surface flow pattern in the investigated area (Northern Adriatic Sea) as derived from High-Frequency radar observations for the period August 2007 - August 2008

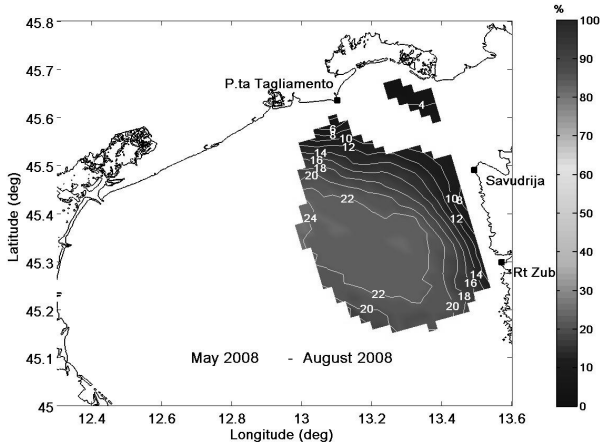

Fig. 2. Percent ratio between inertial current variance and non-tidal current variance for summer (May 2008 - August 2008) season

Tides are weak, and represent a small fraction of the overall flow variance. High-frequency non tidal oscillations (inertial oscillations; diurnal-period wind-driven currents) have different patterns in time and space. Both inertial motions and non-tidal diurnal-period oscillations increase their contribution during spring and summer seasons, when the water column is stratified (Fig. 2).

An opposite trend in variance distribution characterize these high-frequency motions, with diurnal-period currents having their maximum variance in the Northern part towards the Italian coast and the Trieste Gulf entrance, and inertial oscillations showing their maxima towards the centre of the Northern Adriatic basin.

Current vorticity is prevalently positive and related either to current shear to the North, or to current rotation to the South. Wind stress curl is the major source of surface flow vorticity for time scales longer than the local inertial period. For these time scales wind stress curl is balanced by an increased surface flow divergence.

The dominant wind regimes in the area, namely the bora and the scirocco winds, drive two different current patterns. Bora enhances the coastal jet along the Italian coast and introduces a strong cyclonic recirculation in the southern area. Scirocco on the other hand homogenizes the flow pattern and forms small-scales eddies along the Italian coastline in the Northern sector.

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