

4.4. THE HYDROGRAPHY AND CIRCULATION OF THE MARMARA SEA

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ABSTRACT

Seasonal and interannual variabilities of the circulation and hydrography of the Marmara Sea are determined using a variety of instruments such as satellite images, CTD and ADCP measurements.

Infra-red and visible satellite images of the Marmara Sea indicate main features of its circulation and upper layer evolution of the waters in transit. During typical flow conditions in the spring and summer, the relatively colder Black Sea waters enter the Marmara Sea in the form of a jet reaching the Bozburun peninsula in the south, then turning west and northwest to reach the Thracian coast and exiting towards the Dardanelles.

The upper layer circulation of the Marmara Sea is determined from ADCP measurements and from dynamical calculations based on hydrographic data. The mean upper layer circulation is anti-cyclonic, mainly driven by the southward flowing Bosphorus jet in the enclosed domain. The Bosphorus flow is well defined, except during the low discharges of the autumn and winter periods, when the jet becomes weaker and tends to become attached to the west coast near the exit.

Observations from hydrographic surveys are used to describe the density current flowing through the Dardanelles strait into the Marmara Sea. Aegean water plunges below the surface and flows into the Marmara Sea. The sub-halocline waters of the Marmara Sea are renewed with the incoming Dardanelles lower layer flow. This flow takes the form of a turbulent buoyant plume which first sinks down and then spreads out into the interior.

A "filling box" model applied to the Dardanelles-Marmara Sea system shows that the seasonal variability of the Dardanelles inflow, interior mixing and shape of the oxygen consumption profile play crucial roles in the sub-halocline water mass characteristics of the Marmara Sea.



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