a 4% sodium chloride solution, which is twice the average salinity of the Black Sea waters.

At a depth of 218 m, the traps were installed to estimate the flux from the upper quasi-homogeneous layer, at a depth of 1918 m – to estimate the flux reaching the bottom and participating in the formation of sediments. Three intermediate depths were selected to estimate the SM flux variability with depth.

Following retrieval, the containers containing the SM samples were stored in a refrigerated chamber until laboratory processing, which was carried out using a single method described in [1].

The samples were vacuum filtered through parallel pre-weighed nuclear filters with a 0.45 μm pore size to determine the total SM flux, as well as through *Whatman GF/F* glass fiber filters calcined at 450°C to determine the total, organic and carbonate carbon content.

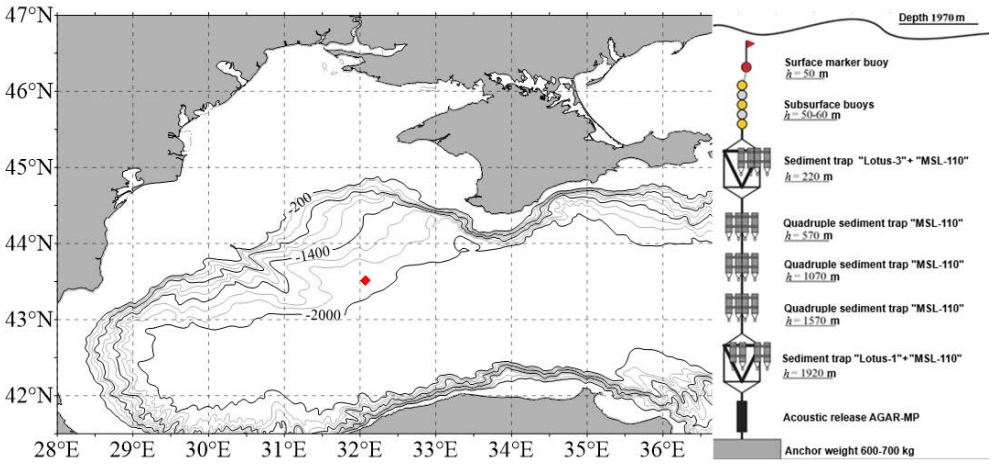
After drying at 60°C until a constant mass was achieved, the filters were weighed with the filtered substance present. This enabled the total amount of material to be obtained (dry SM mass, mg). The material was weighed using the *Adventurer AR*2140 analytical laboratory scale with a measurement accuracy of up to 0.0001 g.

The SM flux was calculated as the ratio of the dry SM mass to the product of the trap collection area and the exposure time:

$$F = \frac{m}{ST}, \tag{1}$$

where F is the SM flux, mg·m^{-2}·day^{-1}; m is the dry SM mass, mg; S is the collection area, m^2; T is the exposure time, day.

The total, organic and carbonate carbon contents were determined by coulometric titration on an AN-7529 carbon analyzer [15].



F i g. 1. Scheme of the AGOS (*a*) and the area of its installation (*b*)

F i g. 5. Concentrations of coccolithophores (*a*) and primary production (*b*) in the area of the installed trap, based on satellite data for 2022; seasonal variations of organic carbon flux (F_{org}) and inorganic carbon, as component of carbonates flux (F_{carb}), in SM at a depth of 218 m, based on the *Lotus* trap data (*c*)

The remainder of the time, the SM flux varied within the range of 2.3–25.5 mg·m^{-2}·day^{-1} with an average value of 13 mg·m^{-2}·day^{-1}. It was characterized by alternating maxima and minima (Fig. 2). The minimum SM flux occured in March; during this period, it was determined only by the organic component with no inorganic component present (Fig. 3, *b*; 4, 5). The Black Sea waters are characterized

by two peaks of phytoplankton “bloom” – autumn-winter (more intense, the maximum occurs in November – December) and winter-spring [25], this is also reflected in the seasonal distribution of SM and its flux (Fig. 2, *b*).

Thus, the seasonal dynamics of the SM flux mainly coincides with the dynamics of primary production and the number of coccolithophores (Fig. 5) [9, 26].

Conclusion

The seasonal dynamics of the SM and carbon flux are determined by the influence of both physical and biogeochemical processes. The distribution of SM fluxes was found to exhibit heterogeneity with depth and over the course of the year.

The presence of two SM flux peaks of the same intensity at depths of 218 and 1568 m was observed. The reduction in the SM flux intensity is due to the occurrence of biogeochemical processes leading to the dissolution, oxidation and mineralization of substances that constitute SM. The increase in the concentration of SM and its flux is the result of the influence of currents or the occurrence of physicochemical processes of sorption on metal sulfides.

The seasonal variability of the SM flux was primarily determined by biological processes involving plankton, with the organic component contributing 83%. The peaks in the SM flux values occurred in the summer period, with their total contribution representing 45% of the annual flux values.

The lowest SM flux was recorded in March, during this period it was determined only by the organic component with no contribution from the inorganic component.

The seasonal dynamics of SM flux correspond to satellite data on primary production and coccolithophore abundance. Furthermore, the ratio of the peak times of their “bloom” in the photosynthesis zone and inorganic carbon fluxes at a depth of 218 m correlates with the calculated sedimentation rates, which range from 1 to 36 $m \cdot day^{-1}$.

The measurements were conducted at the Center for Collective Use of the R/V *Professor Vodyanitsky* of A.O. Kovalevsky Institute of Biology of the Southern Seas of RAS.

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About the authors:

Igor N. Mukoseev, Senior Engineer, Marine Hydrophysical Institute of RAS (2 Kapitanskaya, Str., Sevastopol, 299011, Russian Federation), **ORCID ID: 0009-0000-3485-1004**, igor.mukos@gmail.com

Natalya A. Orekhova, Leading Researcher, Head of the Sea Biogeochemistry Department, Marine Hydrophysical Institute of RAS (2 Kapitanskaya, Str., Sevastopol, 299011, Russian Federation), CSc (Geogr.), **ORCID ID: 0000-0002-1387-970X**, **ResearcherID: I-1755-2017**, **Scopus Author ID: 35784884700**, natalia.orekhova@mhi-ras.ru

Contribution of the co-authors:

Igor N. Mukoseev – obtaining field data, processing measurement data, processing, analysis and description of the research results, correction of the text, preparation of graphic material, discussion of the results

Natalya A. Orekhova – problem statement, processing, analysis and description of the research results, correction of the text, preparation of graphic material, discussion of the results

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