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SOME FEATURES OF OCEANOLOGICAL CONDITIONS OF THE MICROALGAE AUTUMN-FLOWERING NEAR THE SOUTHEAST SHORE OF KAMCHATKA

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The paper demonstrates the possibilities of optical observations from the satellites Sentinel-2, 3 for studying linked physical and biological processes in the ocean's surface layer. The specific example of using an observation system for surveillance over intense autumn-flowering of phytoplankton near Kamchatka's southeast shore in September 2020 is considered. In Avachinsky Bay, the microalgae flowering manifested as areas with high chlorophyll-a concentration, coloring the sea surface into the corresponding dark green shade. On a composite image with a resolution of 10 m, significant spectral differences on the sea surface highlighted conglomerates of algae organized in complex systems of mesoscale and submesoscale interacting vortex structures. According to ERA5 reanalysis, it was found that the average monthly sea-surface temperature in Avachinsky Bay in September 2020 demonstrated a positive anomaly with a maximum (12,0° C) over the past 42 years with a climate normal of 10,4° C. It is assumed that this maximum will be surpassed if the current trends continue.

Key words: Kamchatka shore, Avachinsky bay, distant probing, microalgae flowering, sea color, sea surface temperature, vortex structures.

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REFERENCES

1. Bulatov N.V., Lobanov V.B. *Issledovanie mezomasshtabnykh vikhrey vostochnee Kuril'skikh ostrovov po dannym meteorologicheskikh sputnikov Zemli. Issledovanie Zemli iz kosmosa.* 1983. No. 3. P. 40–47.

2. *Vasil'eva A. «Uvy, my nichego ponyat' ne mozhem».* – URL: https://www.kommersant.ru/doc/4519291) (usage date: 06.11.2020 g.).

3. Konovalova G.V. *Dinoflagellyaty (Dinophyta) dal'nevostochnykh morey Rossii i sopredel'nykh akvatoriy Tikhogo okeana*. Vladivostok: Dalnauka, 1998. 300 p.

4. Kravtsova I. *«Oni sozdavali etu planetu. Oni mogut ubit' cheloveka». Beseda s rukovoditelem laboratorii morskoy mikrobioty «Natsional'nogo nauchnogo tsentra morskoy biologii» vo Vladivostoke Tat'yanoy Orlovoy*. – URL: https://meduza.io/feature/2020/10/13/oni-sozdavali-etu-planetu-oni-mogut-ubit-cheloveka) (usage date: 06.11.2020 g.).

5. Vershinin A.O., Orlova T.Y. Toxic and harmful algae in the coastal waters of Russia. Oceanology. 2008. Vol. 48. P. 524–537.

6. Caballero I., Fernández R., Escalante O.M. et al. New capabilities of Sentinel-2A/B satellites combined with in situ data for monitoring small harmful algal blooms in complex coastal waters. Sci Rep. 2020. Vol. 10, No. 8743.

7. Rodríguez-Benito C.V., Navarro G., Caballero I. Using Copernicus Sentinel-2 and Sentinel-3 data to monitor harmful algal blooms in Southern Chile during the COVID-19 lockdown. Marine Pollution Bulletin. 2020. Vol. 161. P. 111–722.

8. Sentinels Scientific Data Hub. – URL: https://scihub.copernicus.eu/ (usage date: 06.09.2020 g.).

9. The Remote Sensing and Ecosystem Modelling team. – URL: https://odnature.naturalsciences.be/remsem/software-and-data/acolite (usage date: 06.09.2020 g.).

10. European Space Agency GlobCurrent portal. – URL: https://globcurrent.oceandatalab.com (usage date: 04.10.2020).

11. Sasaoka K. et al. Temporal and spatial variability of chlorophyll-a in the western subarctic Pacific determined from satellite and ship observations from 1997 to 1999. Deep Sea Research Part II: Topical Studies in Oceanography. 2002. Vol. 49, Iss. 24–25. P. 5557–5576.

12. Bricaud A., Babin M., Morel A., Claustre H. Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parameterization. J. Geophys. Res. 1995. Vol. 100 (S7). P. 1321–1332.

13. Churilova T., Suslin V., Sosik H., Efimova T., Moiseeva N., Moncheva S., Krivenko O. Phytoplankton light absorption in the deep chlorophyll maximum layer of the Black Sea. European Journal of Remote Sensing. 2019. Vol. 52, Iss. 1. P. 123–136.

14. Gobler C.J. et al. Ocean warming since 1982 has expanded the niche of toxic algal blooms in the North Atlantic and North Pacific oceans. Proceedings Natl Acad. Sci. USA. 2017. Vol. 114. P. 4975–4980.

15. Hersbach H. et al. The ERA5 global reanalysis. The Quarterly Journal of the Royal Meteorological Society. 2020. Vol. 146, Iss. 730. P. 1999–2049.

16. The Climate Data Store. – URL: https://cds.climate.copernicus.eu (usage date: 11.10.2020).

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