

# THE AUTONOMOUS TETHERED PROFILER WINCHI

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The article focuses on the development of an autonomous moored profiler for operational oceanography. It describes a new version of the shallow-water tethered underwater apparatus equipped with a winch. The technical characteristics and components of the apparatus, along with the design of the newly integrated winch, are outlined. The apparatus is intended for continuous monitoring of the active layer of the sea up to a depth of 50 meters. Tests conducted in the waters of the north-eastern shelf of the Black Sea in September 2024 confirmed that the equipment fully met the specified criteria. The functionality of the apparatus was verified at a depth of 30 meters, and a 5-day trial was carried out. Throughout this deployment, the apparatus completed 227 descent/ascent cycles (every half hour) from the sea surface to the bottom anchor release at a depth of 24 meters. The tests provided valuable insights into the apparatus's motion underwater, particularly in conditions of light sea storm, intense internal waves, and strong currents. The data collected during the tests included information on the short-term variations in vertical distributions of sea temperature and salinity, dissolved oxygen, and photosynthetically active radiation. The data samples from the multiparametric survey are also shown. The article highlights the benefits of using an autonomous underwater moored profiling apparatus for positional monitoring.

**Keywords:** underwater tethered profiler, autonomous buoy station, monitoring, marine environment, operational oceanography

## References

- Carlson D.F., Ostrovskii A.G., Kebkal K.G., Gildor H. Moored Automatic Mobile Profilers and Their Applications. Ed. G. Oren. Advances in Marine Robotics. Lambert Academic, 2013. P. 169–206. ISBN: 978-3-659-41689-7.
- Ostrovskij A.G., Zacepin A.G., Derevnin V.A., Nizov S.S., Pojarkov S.G., Cibul'skij A.L., Shvoev D.A. Zajakorennaia avtomaticheskaja izmeritel'naja sistema «Akvakond» dlja vertikal'nogo profilirovaniija morskoj sredy. Okeanologija. 2008. Vol. 48, No. 2. P. 297–306. (In Russ.).
- Ostrovskij A.G., Zacepin A.G., Ivanov V.N., Nizov S.S., Solov'ev V.A., Timashkevich G.K., Cibul'skij A.L., Shvoev D.A., Kebkal K.G. Zajakorennaia profilirushushaja okeanskaja observatorija. Podvodnye issledovaniya i robototekhnika. 2009. No. 2/8. P. 50–59. (In Russ.).
- Ostrovskij A.G., Zacepin A.G., Solov'ev V.A., Cibul'skij A.L., Shvoev D.A. Avtonomnyj mobil'nyj apparatno-programmnijj kompleks vertikal'nogo zondirovaniija morskoj sredy na zajakorennoj bujkojovoj stancii. Okeanologija. 2013. Vol. 53, No. 2. P. 259–268. (In Russ.).
- Ostrovskij A.G., Zacepin A.G., Shvoev D.A., Volkov S.V., Kochetov O.Ju., Ol'shanskij V.M. Avtomaticheskij podlednjyj zond. Okeanologija. 2020. Vol. 60, No. 6. P. 978–986. DOI: 10.31857/S0030157420060106. (In Russ.).
- Kochetov O.Ju., Ostrovskij A.G., Volkov S.V., Ol'shanskij V.M. Unificirovannaja apparatno-programmnaja platforma sistemy upravlenija avtonomnyh podvodnyh apparatov. Podvodnye issledovaniya i robototekhnika. 2018. No. 1. P. 59–69. ISSN: 1992-4429. eISSN: 2409-4609. (In Russ.).
- Ostrovskii A.G., Emelianov M.V., Kochetov O.Y., Kremenetskiy V.V., Shvoev D.A., Volkov S.V., Zatsepin A.G., Korovchinsky N.M., Olshanskiy V.M., Olchev A.V. Automated tethered profiler for hydrophysical and bio-optical measurements in the Black Sea carbon observational site. Journal of Marine Science and Engineering. 2022. Vol. 10. P. 322. DOI: 10.3390/jmse10030322
- Araci S., Borghini M., Canesso D., Chiggiato J., Durante S., Schroeder K., Sparnocchia S., Vetrano A., Honda T., Kitawaza Y., Kawahara H., Nakamura T. Trials of an autonomous profiling buoy system. Journal of Operational Oceanography. 2016. Vol. 9. P. s176–s184. DOI: 10.1080/1755876X.2015.1115631

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