

Toward a More Predictable Ocean: Initiatives for More Societally Utilized Ocean Forecast

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Advances in understanding ocean phenomena have been driven by the expansion of ocean observation networks, including Earth observation satellites and automatic observation buoys, alongside improvements in the accuracy of ocean predictions due to progress in numerical model research and development. Forecast data has been available for the open ocean, where phenomena with relatively long timescales and horizontal scales of several hundred kilometers dominate. Coupled with recent improvements in computing power, it is now possible to perform real-time forecasts with the required spatio-temporal resolution for coastal areas, where phenomena with timescales of about a day and horizontal scales of tens of kilometers are the focus.

In the ocean (especially coastal areas), various economic activities such as fishing, shipping, and construction take place. Forecast about the marine environment—including currents, water temperature, and waves—is critically important for conducting these activities safely and efficiently. Although much of the economic activity in the ocean occurs in coastal areas, sufficient forecast has not been readily available until now. With the aforementioned scientific and technological advances, the foundation for real-time marine environment forecast is being established. Ocean Eyes Co., Ltd. (hereinafter OE) is engaged in the business of creating forecast data for coastal areas and providing it to society in a useful form.

Numerical models output time-series data for physical variables such as three-dimensional flow velocity and water temperature. Unlike daily weather forecasts, which have been created and published for many years and are seamlessly integrated into daily life, ocean forecast has been scarcely utilized until now. Even if physical variables themselves are provided as forecast, users receiving the data are often unfamiliar with its utilization and may not be able to effectively leverage it. To promote the effective use of forecast, interpreting and converting it into metrics tailored to individual activities proves more useful. As one example, OE constructs potential fishing ground prediction models by combining environmental information estimated from numerical models with actual catch data using machine learning. By integrating ocean forecast, it provides fishing ground forecasts. This information reduces the time spent searching for fishing grounds in fishing vessel operations, enhances fishing efficiency, and contributes to reducing carbon dioxide emissions by lowering fuel consumption. By applying fishing ground prediction technology, we have also developed whale appearance prediction. Collisions with cetaceans, particularly involving smaller vessels, pose a navigational risk and raise concerns about marine conservation due to cetacean injuries. Such information is expected to contribute to safer and more environmentally sustainable economic activities.

Based on insights gained from our business development efforts to date, we feel that achieving a “predictable ocean” requires not only accurately forecasting physical phenomena, but also integrating economic activities and biological knowledge in the marine environment. Moving forward, we believe it is crucial to combine expertise from a wider range of fields, both industry and academia, to strive for a “more predictable ocean.” This will encourage more people to utilize forecast, sparking greater interest in the oceans and generating new demands for information. We hope this will serve as a catalyst for more people to engage with the oceans, further advancing research and development as well as business development.

Keywords: Numerical ocean model, Realtime ocean forecast, Potential fishing ground prediction,
Information for safety navigation, Machine learning applied to ocean data