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A new tool makes mapping the ocean easier

For scientists studying the ocean, finding the right data can sometimes be as challenging as figuring out what to do with it.

Want to know seafloor depth, the location of underwater mountains, or sea surface temperatures? The information exists, but it can take considerable time and computer coding to pull it together from different sources and get it into the proper format.

A team of researchers, including scientists at UC Santa Barbara, has developed a new tool designed to make that process much easier so that scientists can focus on answering questions, instead of cleaning data. The software package, called [oceandatr](#), was developed in R, a widely used programming language for data analysis. With a single command, users can access and organize a wide range of global ocean datasets and prepare them for analysis and mapping.

The team describes the new package in a [paper](#) published in *Ecology and Evolution*. According to lead author [Jason Flower](#), a project scientist at UC Santa Barbara's Environmental Markets Lab (emLab), the most important thing is that it can help anyone who wants geospatial ocean data get the data they need, in the format they want, quickly and easily.

Flower and his colleagues developed `oceandatr` in part through their work with the Waitt Institute on marine spatial planning in small island nations such as Vanuatu and Fiji.

Making ocean data more accessible

Planning the ocean's future requires data on seafloor maps, temperature and human activities such as fishing. Researchers often must gather that information from multiple sources and write new code to combine the datasets.

The team created `oceandatr` to simplify this process. Rather than repeatedly writing the same code, Flower and his colleagues turned their most commonly used programming scripts into ready-made functions in `oceandatr` to simplify the process. The R package organizes code for accessing commonly used ocean datasets, allowing researchers to prepare data for mapping and analysis with a single command. Housed in GitHub, the software is freely available to any researcher.

"This paper is unique, in that we weren't trying to answer a specific research question," said co-author [Echelle Burns](#), a project scientist at emLab. "We were building a tool for marine scientists like us, who find themselves using the same data-pulling and organizing workflow over and over again."

From seafloor depth to fishing activity

The package can retrieve a variety of spatial ocean datasets, including information about seafloor depth, seamount locations and sea surface temperature.

The researchers demonstrate two potential applications in their paper. In one example, they use ocean data to guide the planning of marine protected areas. In another, they used data to model and map where fishing activity is likely to occur. These examples represent only a fraction of what the tool can do. "The package could be used in any marine science project that requires spatial data," Flower said.

One particularly useful feature is the ability to standardize data from different sources. Researchers often need to combine multiple datasets, but those datasets may be stored using different spatial formats or scales. For example, the bathymetry

data that oceandatr pulls has a resolution of 15 arc seconds (a little less than 0.25 degree). Meanwhile, data on fishing effort is much finer, at either 0.01 degree or 0.1 degree, depending on user preference. Oceandatr helps bring them into a consistent format behind the scenes so that users can focus on analysis.

The tool accesses global datasets, however it can also be useful for researchers working in relatively small areas, including individual islands or coastal regions. “Users can supply their own datasets and oceandatr will make sure that they’re saved at the appropriate spatial scale,” Burns said.

A tool that keeps evolving

The researchers plan to continue expanding and improving oceandatr. Future additions could include daily sea surface temperature data, alongside the average sea surface temperature information already available. Flower is also working to make the software faster and more efficient so that it remains accessible to researchers working on older or slower computers.

Like many scientific software tools, oceandatr is not intended to be a finished product. “R packages are constantly evolving, and oceandatr will evolve with them,” Burns said. “It’s a ‘living package’ that’s going to continue to be updated and refined in the coming years.”

The researchers hope that by taking some of the repetitive work out of finding and preparing data, oceandatr will give scientists more time to focus on the questions that the data can help them answer.

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