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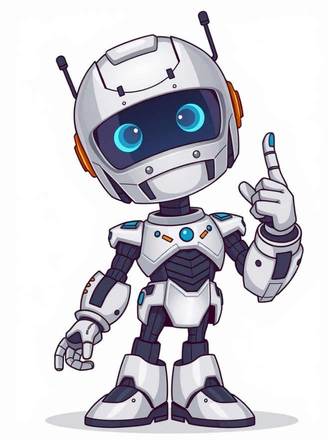

The global ocean covers more than 70 percent of Earth’s surface and contains 97 percent of the planet’s water. Data collected by NASA’s Earth-observing instruments help scientists understand how the ocean supports a vast abundance of life, regulates the climate, provides a large amount of the planet’s oxygen, and stores an abundance of carbon dioxide.Our data products include information about ocean processes including ocean circulation and surface winds; heat exchange between the ocean and atmosphere, including sea surface temperature, sea surface salinity, and sea surface height; and factors impacting water quality, including turbidity, chlorophyll concentrations, and colored dissolved organic matter. In addition, our ocean data provide optical information that aids in assessing trends in global mean sea level. Access a range of datasets and data tools to further your ocean research. NASA's theme this past Earth Day was The Ocean Touches Everything, and this is no exaggeration. The global ocean covers more than 70% of Earth’s surface and contains 97% of the planet's water. The ocean is a vast and critical reservoir that supports a diversity of life, helps regulate climate, provides a large amount of the planet’s oxygen, and stores an abundance of carbon dioxide. NASA satellite, airborne, and in-situ missions and projects are constantly collecting data about the global ocean. The Gulf Stream off the East Coast of the U.S. is a vital ocean component. This map view shows the Gulf Stream on May 29, 2024, as a ribbon of dark red hugging the coast. This warm, swift current starts in the Gulf of Mexico, flows through the straits of Florida and toward North Carolina, then turns eastward as it moves toward northwestern Europe to become the North Atlantic Current. The base true-color corrected reflectance image was acquired by the Visible Infrared Imaging Radiometer Suite (VIIRS) aboard the joint NASA/NOAA NOAA-20 satellite. Overlaid on the base image is Sea Surface Temperature from the Group for High Resolution Sea Surface Temperature (GHRSST). The Multiscale Ultrahigh Resolution (MUR) L4 analysis is based upon nighttime GHRSST L2P skin and subskin SST observations from several instruments, including the NASA Advanced Microwave Scanning Radiometer-EOS (AMSR-E), the Moderate Resolution Imaging Spectroradiometer (MODIS) aboard NASA's Aqua and Terra platforms, the U.S. Navy microwave WindSat radiometer, and in-situ SST observations from the NOAA iQuam project. Visit Worldview to visualize near real-time imagery from NASA's EOSDIS; explore past imagery in our Worldview weekly image archive. Dataset MUR-JPL-L4-GLOB-v4.1 doi:10.5067/GHGMR-4FJ04 About 8 million tons of plastic flow from rivers and beaches into the ocean every year. These plastics are carried by ocean currents and broken down by waves and the Sun into small microplastics. Much of it floats at the calm center of circular ocean currents (called gyres) in large garbage patches. The Great Pacific Garbage Patch, which is between California and Hawaii, is a well-known garbage patch because there’s a lot of ship traffic going through it. Scientists typically measure how much plastic is in garbage patches by dragging nets behind boats. This sampling method is geographically sparse and doesn’t give researchers a sense of how much plastic concentrations change over time. A new method developed by researchers at the University of Michigan (UM) maps the concentration of ocean microplastics across the world using satellite data. The researchers used data from eight microsatellites that are part of NASA’s Cyclone Global Navigation Satellite System (CYGNSS). CYGNSS satellites receive signals reflected off the ocean from global positioning system (GPS) satellites to measure the roughness of the ocean surface. These roughness measurements provide scientists with measurements of ocean wind speeds that are used to understand and predict hurricanes.When there’s plastic or other debris in the ocean, waves are dampened, creating less roughness than expected. “In cleaner waters there’s a high degree of agreement between ocean roughness and wind speed,” said Professor Chris Ruf, principal investigator of the CYGNSS mission and one of the authors of the research. “But as you head into the Great Pacific Garbage Patch you see a bigger discrepancy between wind speed measurements and the roughness of the surface.” Ruf and UM research assistant Madeline Evans compared CYGNSS roughness measurements to NOAA measurements of ocean wind speeds to see where waters were less rough than expected. Using this method, in combination with plastic concentration data from literature, Ruf and Evans mapped daily concentrations of microplastics across the ocean. This microplastics dataset was recently published at NASA’s Physical Oceanography Distributed Active Archive Center (PO.DAAC). This research is the first to map ocean microplastics over such a large area and is the first to map concentrations at a high temporal resolution, revealing seasonal variations in microplastic concentrations. In the Great Pacific Garbage Patch for example, microplastic concentrations are higher in the summer and lower in winter. They saw similar seasonal variation in garbage patches in other gyres too, due to more vertical mixing when the temperatures are cooler. Ruf and Evans also did a time-lapse of all of the major rivers in the world and saw a large amount of microplastics coming from the Yangtze and Ganges.Another innovative way of detecting ocean debris and plastics in the ocean was recently developed by NASA’s Interagency Implementation and Advanced Concepts Team (IMPACT). The research team used machine learning, open-source tools, and imagery from Planet Labs to find debris in the ocean. They trained a model, based on ground truth observations, that can automatically detect and label marine debris globally. The open-source code they developed (available on the IMPACT GitHub) could also be used to detect other phenomena on Earth using satellite imagery.ReferencesBates, S. (2021). Scientists Use NASA Satellite Data to Track Ocean Microplastics From Space. NASA Earth Science News Team. June 28, 2021.CYGNSS (2021). CYGNSS Level 3 Microplastic Concentration Retrievals Version 1.0. PO.DAAC, CA, USA. doi:10.5067/CYGNS-L3M10CYGNSS (2018). CYGNSS Level 2 Science Data Record Version 2.1. PO.DAAC, CA, USA. doi:10.5067/CYGNS-L2X21Evans, M. C. & Ruf, C. S. (2021). Toward the Detection and Imaging of Ocean Microplastics With a Spaceborne Radar. IEEE Transactions on Geoscience and Remote Sensing. doi:10.1109/TGRS.2021.3081691My NASA Data (2020). Ocean Circulation Patterns: Garbage Patches Story Map.NASA IMPACT Unofficial (2021, June 8). Marine Debris: Finding the Plastic Needles.Shah, A., Thomas, L. & Maskey, M. (2021). Marine Debris Dataset for Object Detection in Planetscope Imagery, Version 1.0, Radiant MLHub. doi:10.34911/rdnt.9r6ekg Ocean color is a measure of sunlight that is reflected by the water and its components, such as phytoplankton, sediments, and colored dissolved organic matter (CDOM). Remotely collected ocean color data can be used as a substitute for directly sampling and examining water quality in any body of water. For example, estimates of chlorophyll-a in phytoplankton concentrations calculated from ocean color data are used as an indicator for harmful algal blooms (HABs), which occur when algae containing toxins grow out of control. These blooms can wreak havoc on the organisms that live in or depend on that ecosystem and can contaminate seafood. The primary instruments for measuring ocean color include the Moderate Resolution Imaging Spectroradiometers (MODIS) aboard NASA’s Terra and Aqua satellites, the Visible Infrared Imaging Radiometer Suite (VIIRS) on the joint NASA/NOAA Suomi National Polar-orbiting Partnership (Suomi NPP) and NOAA-20 satellites, and the Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) satellite. The joint NASA/USGS Landsat series of satellites and the ESA Sentinel-2 satellites can also be used for observations of coastal waters and lakes. Access a range of datasets and data tools to further your ocean color research.