DATASHEET: Ocean Warming Monthly Variation (1992-2019) Dataset

INTRODUCTION

Dataset Name
OceanWarmingMonthlyNASA.xlsx (1992-2019)
Datasheet Author
NASA Office of STEM Engagement Note: This datasheet follows the format of the Educator-Facing Datasheet for Derivative Datasets. (see also Datasets for K-12 Data Science, Datasheets for Datasets)
Date Datasheet Created
May 2023
Context
This dataset shows monthly changes in ocean heat content from 1992 to 2019, relative to 1992. Ocean heat content is shown for the entire water column, from the surface to the bottom of the ocean. Data is expressed in zettajoules (ZJ). As a reference, the total energy consumption around the world is around **half** a zettajoule annually Ocean heat content values are calculated using satellite observations, in-water instrument measurements, and ocean circulation computer models. Satellite observations used include sea level height from the Jason-series satellite altimeters, and ocean bottom pressure from the GRACE and GRACE-Follow On missions, among others. In-water instruments measure temperature and salinity profiles from conductivity-temperature-depth instruments (CTDs), Argo profiling floats, eXpendable BathyThermographs (XBTs), instrumented mooring arrays, and ice-tethered profilers (ITPs). NASA's Estimating the Circulation and Climate of the Ocean (ECCO) project maintains and runs the computer models. Ocean heat content is an essential metric for understanding climate change and the Earth's energy budget. The oceans are the dominant reservoir for the storage of heat in the climate system. The effects of ocean warming include sea level rise due to thermal expansion, coral bleaching, accelerated melting of Earth's major ice sheets, intensified hurricanes, and changes in ocean health and biochemistry. Vital Signs of the Planet: Ocean Warming Earth's Energy Balance

1. ORIGIN

Where can the original dataset be found?
Vital Signs of the Planet: Ocean Warming Select "Get Data" under the heading: Ocean Heat Content Changes Since 1992 (NASA)

Credit: NASA ECCO
Users are referred back to the original dataset for the most recent values. The original dataset for this derived datasheet is duplicated as a tab in "OceanWarmingMonthlyNASA.xls"

2. METADATA

Column Name	Description
Col A Date	Date formatted as **yyyy-mm-dd**
Col B Ocean Heat Content	Change in Ocean Heat Content in zettajoules (ZJ) relative to 1992. Data values are monthly averages for the time period Jan. 1992 through Dec. 2019.

3. MOTIVATION

For what purpose was the **original** dataset created?
To create a climate data record and monitor how global ocean heat content is changing over time.
For what purpose was the **derived** dataset created?
To simplify the dataset to serve as an entry point for data analysis of Earth system datasets for the K-12 classroom.
Who created the **original** dataset?
NASA ECCO Project
Who created the **derived** dataset?
NASA Office of STEM Engagement
Who funded the creation of the **original** dataset?
National Aeronautics and Space Administration (NASA)
Who funded the creation of the **derived** dataset?
National Aeronautics and Space Administration (NASA)

4. COMPOSITION

What does a row in the dataset represent?
Monthly global ocean heat content variation relative to 1992, expressed in zettajoules, as computed using state-of-the-art ocean circulation models and global ocean data sets.
How many rows are in the dataset, in total?
336 rows covering Jan. 1992 to Dec. 2019.   Original dataset is updated as more recent data becomes available.
Does the dataset contain all possible rows or is it a sample of rows from a larger dataset?
All possible rows as of date of datasheet creation.
If it's a sample, describe your sampling process (random, weighted, etc). Is the sample representative of the larger set (e.g., geographic coverage)?
n/a

5. DERIVATION PROCESS

Who was involved in the data derivation process and how were they compensated?
NASA Office of STEM Engagement.
What processes (e.g. cleaning, filtering, labeling) did the derivation process perform?
Added Column Headings.   Column A Date: Removed text string representing time.   Column B Ocean Heat Content: Rounded up to nearest whole number.
If software was used to perform the derivation, is it available? If so, please point to a link or other access point.
n/a
What information was removed or transformed during derivation that might influence the findings of an analysis (e.g., deleting rows due to missing data, a sampling mechanism that over-samples from a particular group, etc.)?
n/a

6. USES

Are there real-world applications of the dataset that an educator should be aware of?
• Scientific studies to monitor ocean heat content over time and create a climate data record. • Ocean heat content is an essential metric for understanding climate change and the Earth's energy budget. • Validate climate model simulations. • Impacts to ocean currents and heat transport. • Impacts to marine wildlife including ice-associated marine mammals. • Impacts to commercial and local fisheries and world food production.

7. EDUCATOR'S GUIDE

Are there recommended subsets to be explored?
NASA studies long term trends. All data points are needed to compile a comprehensive time series to better understand these phenomena.
Are there outliers or unusual observations to be pointed out?
• Dataset shows continuous and steady rise in global ocean heat content with increase accelerating beginning at the end of 2017.
Are there any correlations in the derivative dataset to be pointed out?
n/a
Does the data embody any computing or statistical learning goals (e.g., columns have a particular skew, correlations demonstrate Simpson's Paradox, etc.)?
n/a
What potential threats to validity would be worth discussing?
n/a
Suggestions for student activities
• Sea Level Rise Classroom Activities • My NASA Data: Hydrosphere Lesson Plans • Calculate decadal rate of change. • Compare to rates of sea level change.