Please provide the following information, and submit to the NOAA DM Plan Repository.

Reference to Master DM Plan (if applicable)

As stated in Section IV, Requirement 1.3, DM Plans may be hierarchical. If this DM Plan inherits provisions from a higher-level DM Plan already submitted to the Repository, then this more-specific Plan only needs to provide information that differs from what was provided in the Master DM Plan.

URL of higher-level DM Plan (if any) as submitted to DM Plan Repository:

1. General Description of Data to be Managed

1.1. Name of the Data, data collection Project, or data-producing Program:
US Wave by Month

1.2. Summary description of the data:
These data depict a wave energy resource characterization for the US Exclusive Economic Zone. This climatology is based on a multi-resolution 32 year hindcast that used the WaveWatchIII and Simulating WAve Nearshore (SWAN) wave models. A collection of five variables are reported at the annual and monthly intervals. Statistics for each variable are provided as point and hexagon features.

1.3. Is this a one-time data collection, or an ongoing series of measurements?
One-time data collection

1.4. Actual or planned temporal coverage of the data:
2022-10-14

1.5. Actual or planned geographic coverage of the data:
W: -179.9, E: 179.9, N: 61.5, S: 15

1.6. Type(s) of data:
(e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.)
Map (digital)

1.7. Data collection method(s):
(e.g., satellite, airplane, unmanned aerial system, radar, weather station, moored buoy, research vessel, autonomous underwater vehicle, animal tagging, manual surveys, enforcement activities, numerical model, etc.)

1.8. If data are from a NOAA Observing System of Record, indicate name of system:

1.8.1. If data are from another observing system, please specify:

2. Point of Contact for this Data Management Plan (author or maintainer)

2.1. Name:

2.2. Title:
Metadata Contact

2.3. Affiliation or facility:

2.4. E-mail address:

2.5. Phone number:

3. Responsible Party for Data Management

Program Managers, or their designee, shall be responsible for assuring the proper management of the data produced by their Program. Please indicate the responsible party below.

3.1. Name:

3.2. Title:
Data Steward

4. Resources

Programs must identify resources within their own budget for managing the data they produce.

4.1. Have resources for management of these data been identified?

4.2. Approximate percentage of the budget for these data devoted to data management (specify percentage or "unknown"):

5. Data Lineage and Quality

NOAA has issued Information Quality Guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information which it disseminates.

5.1. Processing workflow of the data from collection or acquisition to making it publicly accessible

(describe or provide URL of description):

Process Steps:

- 2022-10-14 00:00:00 - The hindcast data processing consisted of the following main steps: 1. Read, filter, and calculate individual years annual/monthly statistics from annual data files and save a. Using the NREL Developer API the hindcast data output was read directly from the AWS repository. b. Each regional annual file was

read individually, filtering the data from a 3-hour time step to a daily time step (every 8th time step). This was required for efficient processing speed and reasonable storage needs. c. Of the ten wave data variables available only 5 were used in this data processing: i. Mean Wave Direction - Direction Normal to the wave crests (compass direction, where wave is coming from) ii. Significant Wave Height - Wave height based on the zeroth spectral moment (i.e., H_m0) iii. Mean Absolute Period - Resolved Spectral Moment (m_0/m_1) iv. Peak Period - The period associated with the maximum value of the wave energy spectrum v. Maximum Energy Direction - The direction from which the most wave energy is travelling (compass direction, where wave is coming from) d. While reading the data bad (missing) values were removed. For the West Coast and Hawaii regions these values were represented with either -9 or -999, in the Atlantic region these were represented by nan. e. All the daily time step values were collected and then averaged for the whole year and for each month of the year. This averaged data was then written to a local CSV file with the hindcast node ID, decimal degree coordinates, and 5 wave variable statistics. i. The two wave direction variables were handled slightly differently (see below). f. For the two direction variables: i. Averaging the direction (in degrees) without vector data would not prove accurate averages. Instead, the directions were binned into 16 direction bins. Each bin covered 22.5 degrees and was represented by the degree value in the middle of that range, for example, the bin covering 78.75-101.25 was written as 90, and the range of +/-11.25 around 0 (north) was written as 0. This binning was done to support identifying the mode later when annual/monthly statistics were calculated. ii. Instead of calculating and saving the annual and monthly average, the number of occurrences for each directional bin throughout that year was tallied for the annual and monthly timescales and was saved as a CSV. 2. Calculate annual and monthly statistics for the full 32-year period a. Once all annual and monthly files were prepared, the statistics for each wave variable were prepared to cover the full 32-year period at an annual and monthly level. b. For the period and height variables: i. The mean value for each of the individual years was averaged together and saved for each hindcast data point in a CSV for the annual and monthly means. c. For the direction variables: i. Using the frequency data by directional bin, the annual and monthly values for all 32 years were totaled for each bin. The bin with the largest frequency over the 32 years (mode) was selected and the direction for that bin was saved in a CSV for the annual and monthly means. ii. At the same time, another set of CSV files were saved that included the totaled frequencies for each bin both on an annual and monthly level covering the full 32-year period. These statistics were used later to help generate the gridded summary products.
- 2022-10-14 00:00:00 - 1. Hind Cast Points with annual statistics a. From one of the annual CSV files, a point feature class was created using the latitude and longitude of each hindcast data point. The hindcast record id was also incorporated as a unique point id. b. The annual statistic for each of the five variables was then incorporated as an attribute for each point. c. Any points where all of the five statistics where NULL (mainly just points near the shoreline, that were also NULL in

the hindcast data) were removed. 2. Tables of Monthly statistics for each variable a. Each of the monthly statistic CSV files were converted to a geodatabase table. b. The table consisted of the Point ID (that matches the point in the annual points feature class) and then twelve fields with the statistics for each month. c. Any table records where the statistics were all NULL, were removed from the table (these were the same records that were removed from the annual point dataset) 3. Summary Hexagon Grid Creation a. A hexagon grid was created using 3 resolutions (1 km2, 10 km2, and 100 km2) using the ArcGIS Pro - Generate Tessellation geoprocessing tool, with the following settings: i. Spatial Reference - EPSG:3857 WGS84 Web Mercator (Auxiliary Sphere) - using this ensures that the hexagons will look correct in a map service and works for a projected coordinate system for all regions. ii. Shape Type - Hexagon iii. Extent - same as the hindcast point extent for that region iv. Cell size - 1 km2, 10 km2, or 100 km2 b. An attribute field was added to each of the hexagon grids to store annual wave direction mode, mean absolute period, and mean significant wave height summary statistics. c. Wave statistics were then summarized based on all the hindcast data points that fell within each hindcast hexagon cell (for each resolution). i. For the mean absolute period and mean significant wave height: 1. Used the ArcGIS Pro Summarize Within geoprocessing tool to calculate the mean for each hexagon cell and each variable: a. Input - hexagon grid feature class b. Summary Features - annual hind cast point feature class c. Kept all input polygon features d. Statistics - mean for both period and height variables 2. Joined this output to the original hexagon layer and populated both variable attribute fields with these results ii. For the wave direction mode: 1. Created a temporary point feature class from the annual wave direction bin frequency data (count of occurrence in each bin over the whole 32-years). 2. Used the ArcGIS Pro Summarize Within geoprocessing tool to calculate the sum for each cell: a. Input - hexagon grid feature class b. Summary Features - temporary points of direction bin frequency c. Kept all input polygon features d. Statistics - sum for each of the 16 direction bin frequency fields 3. For each hexagon grid cell, the direction bin that had the largest frequency (sum of all point frequencies within that cell) was identified as the mode, and the direction mode was set to be that bin's mid-point direction in degrees. 4. Joined this output to the main hexagon layer and populated Wave Direction Annual Mode attribute field with these results.
- 2023-11-22 00:00:00 - Added data for the Alaska region

5.1.1. If data at different stages of the workflow, or products derived from these data, are subject to a separate data management plan, provide reference to other plan:

5.2. Quality control procedures employed (describe or provide URL of description):

6. Data Documentation

The EDMC Data Documentation Procedural Directive requires that NOAA data be well documented,

specifies the use of ISO 19115 and related standards for documentation of new data, and provides links to resources and tools for metadata creation and validation.

6.1. Does metadata comply with EDMC Data Documentation directive?

No

6.1.1. If metadata are non-existent or non-compliant, please explain:

Missing/invalid information:
- 1.7. Data collection method(s)
- 2.1. Point of Contact Name
- 2.4. Point of Contact Email
- 3.1. Responsible Party for Data Management
- 4.1. Have resources for management of these data been identified?
- 4.2. Approximate percentage of the budget for these data devoted to data management
- 5.2. Quality control procedures employed
- 7.1. Do these data comply with the Data Access directive?
- 7.1.1. If data are not available or has limitations, has a Waiver been filed?
- 7.1.2. If there are limitations to data access, describe how data are protected
- 7.2. Name of organization of facility providing data access
- 7.2.1. If data hosting service is needed, please indicate
- 7.3. Data access methods or services offered
- 7.4. Approximate delay between data collection and dissemination
- 8.1. Actual or planned long-term data archive location
- 8.3. Approximate delay between data collection and submission to an archive facility
- 8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?

6.2. Name of organization or facility providing metadata hosting:

NMFS Office of Science and Technology

6.2.1. If service is needed for metadata hosting, please indicate:

6.3. URL of metadata folder or data catalog, if known:

https://www.fisheries.noaa.gov/inport/item/67978

6.4. Process for producing and maintaining metadata

(describe or provide URL of description):

Metadata produced and maintained in accordance with the NOAA Data Documentation Procedural Directive: https://nosc.noaa.gov/EDMC/DAARWG/docs/EDMC_PD-Data_Documentation_v1.pdf

7. Data Access

NAO 212-15 states that access to environmental data may only be restricted when distribution is explicitly limited by law, regulation, policy (such as those applicable to personally identifiable

information or protected critical infrastructure information or proprietary trade information) or by security requirements. The EDMC Data Access Procedural Directive contains specific guidance, recommends the use of open-standard, interoperable, non-proprietary web services, provides information about resources and tools to enable data access, and includes a Waiver to be submitted to justify any approach other than full, unrestricted public access.

7.1. Do these data comply with the Data Access directive?

7.1.1. If the data are not to be made available to the public at all, or with limitations, has a Waiver (Appendix A of Data Access directive) been filed?

7.1.2. If there are limitations to public data access, describe how data are protected from unauthorized access or disclosure:

7.2. Name of organization of facility providing data access:

7.2.1. If data hosting service is needed, please indicate:

7.2.2. URL of data access service, if known:

https://marinecadastre.gov/data/
https://marinecadastre.gov/downloads/data/mc/AlaskaWaveClimate.zip
https://marinecadastre.gov/downloads/data/mc/AtlanticWaveClimate.zip
https://marinecadastre.gov/downloads/data/mc/HawaiiWaveClimate.zip
https://marinecadastre.gov/downloads/data/mc/PacificWaveClimate.zip

7.3. Data access methods or services offered:

7.4. Approximate delay between data collection and dissemination:

7.4.1. If delay is longer than latency of automated processing, indicate under what authority data access is delayed:

8. Data Preservation and Protection

The NOAA Procedure for Scientific Records Appraisal and Archive Approval describes how to identify, appraise and decide what scientific records are to be preserved in a NOAA archive.

8.1. Actual or planned long-term data archive location:
(Specify NCEI-MD, NCEI-CO, NCEI-NC, NCEI-MS, World Data Center (WDC) facility, Other, To Be Determined, Unable to Archive, or No Archiving Intended)

8.1.1. If World Data Center or Other, specify:

8.1.2. If To Be Determined, Unable to Archive or No Archiving Intended, explain:

8.2. Data storage facility prior to being sent to an archive facility (if any):
Office for Coastal Management - Charleston, SC

8.3. Approximate delay between data collection and submission to an archive facility:

8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?
Discuss data back-up, disaster recovery/contingency planning, and off-site data storage relevant to the data collection

9. Additional Line Office or Staff Office Questions
Line and Staff Offices may extend this template by inserting additional questions in this section.