

National Centers for Environmental Information

Science / Data Priorities and Mission Requirements

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NOAA Satellite and Information Service | National Centers for Environmental Information



National Centers for Environmental Information



Science within NOAA



Mission focused to
inform marine
resource
management

Coastal and ocean
impacts
Marine Ecosystems

Algorithms
Data Science
Reference Data Sets
R20 Transition
Ensure Data Quality

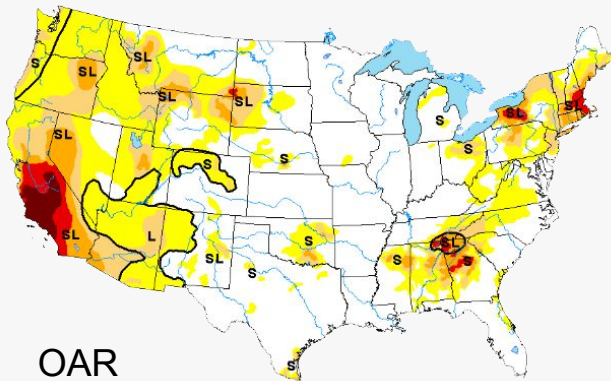
Fundamental
Research
Use-inspired
Research
Development
Transition

Numerical Weather
Prediction
Data Assimilation
High-resolution
Models
Forecast Uncertainty

Deploys, maintains
and collects data from
in-situ observational
networks
Provides
infrastructure for
ocean sciences

NESDIS Science Supports All of NOAA

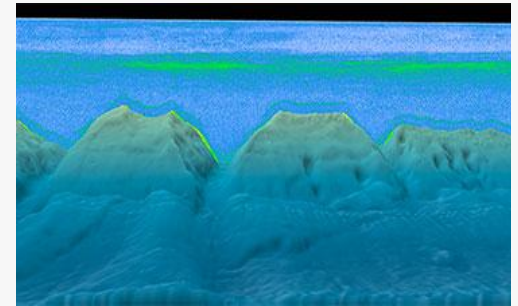
- Science functions NESDIS provides to NOAA
 - Collecting observations
 - Stewardship of data collected across NOAA and by partners: preservation, archive, access
 - Use-inspired science
 - Science-based services



OAR

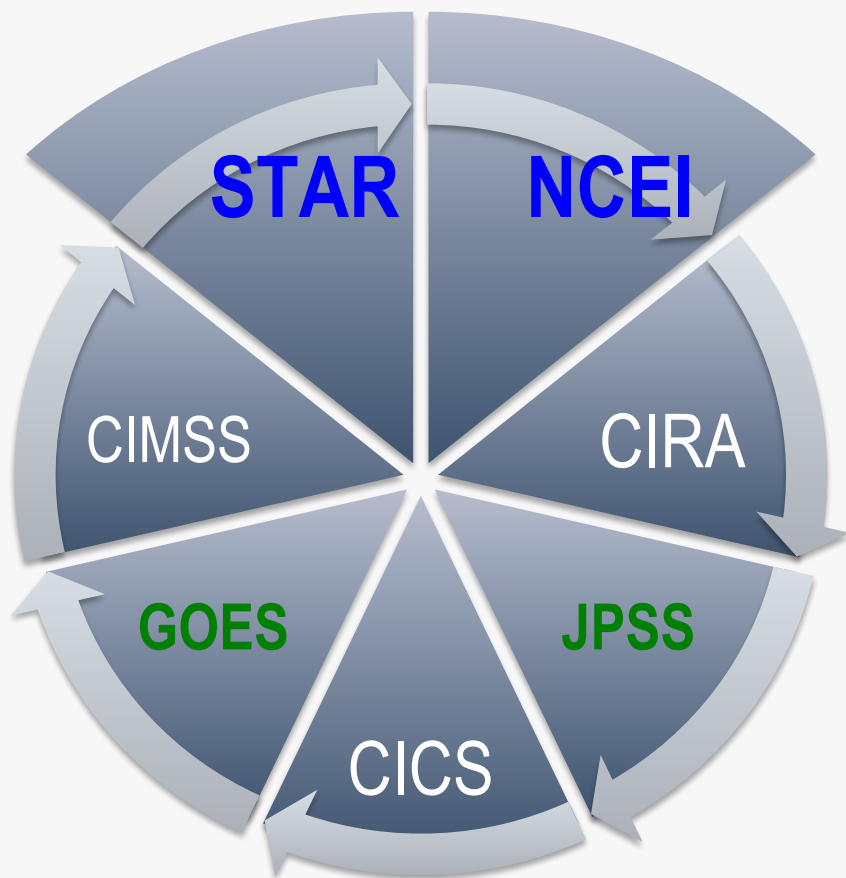


NOS



NMFS

Science throughout NESDIS



- NCEI and STAR provide our science infrastructure
- Major programs (JPSS, GOES-R) define major requirements execution, along with other NOAA offices and external users
- Cooperative Institutes (CICS, CIMSS, CIRA) provide enhancement and research access

NESDIS Science Value Chain

- Use-inspired science starts with a stated need (i.e., a requirement) from a stakeholder
- Requirements are translated into the collection of observations and the development of products
- It culminates in the provision of information (e.g., to NWS) or the delivery of a service (e.g., from NCEI)



STRATEGIC PLAN

NOAA'S NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE

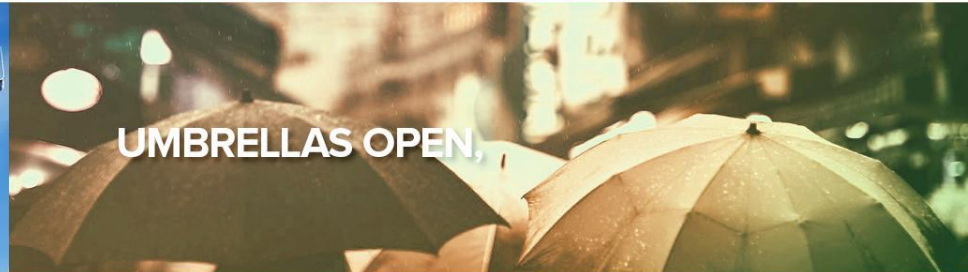
PLANES FLY,



CROPS ARE PLANTED,



UMBRELLAS OPEN,



SHIPS SAIL,



CITIES PREPARE AND
LIVES ARE SAVED



WITH FORECASTS MADE
USING DATA & INFORMATION





Strategic Objective: Algorithms

Develop, support, and adapt algorithms to provide state-of-the-art science products

- **STAR:** Major focus on development of algorithms for satellite observations from JPSS and GOES-R, NASA, and other partner satellites, primarily supporting the NOAA line offices, but also other users of satellite products for their technical applications
- **NCEI:** Development of algorithms from satellite and other data sources (e.g. VIIRS, space weather, in-situ observations) for more direct decision support applications both internal and external to NOAA



Strategic Objective: Data Science

Use data science to enhance mission value of environmental data

- **STAR:** Significant work on data fusion and data assimilation techniques (R2O) through JCSDA and STAR divisions, directed to NWS / NCEP / EMC use
- **NCEI:** Data science is a major part of NCEI's science portfolio
 - Authoritative data that enables the private sector and others to create tailored, third-party applications
 - Assessments, environmental monitoring, trend analysis and historical context for events

Data science is the science of extracting useful information from large, complex collections of data.



Strategic Objective: Integrated Data Sets

Provide integrated reference data sets that describe the state of the environment

- **STAR:** Calibration and inter-calibration of current and future satellite sensors and systems; the building block for integrated long term quality performance and assurance necessary for climate trending and change detection
- **NCEI:** Long history of producing authoritative data products including ‘gold standard’ reference data sets
 - NCEI applies proven and peer-reviewed scientific data analysis methods to develop authoritative, consistent, and continuous products that monitor our Earth
 - The results provide trustworthy information about our environment and how it is changing to help inform risk management and decision making



Objective: Transition to New Science

Transition to new science and retire outdated products and services

- **STAR:** Research and develop new satellite observation data to meet user service requirements
- **NCEI:** Obtains new science requirements from congressional mandates, external partners, and user engagement
Requirements are formally adjudicated and products are prioritized using a process approved by the NESDIS MSR



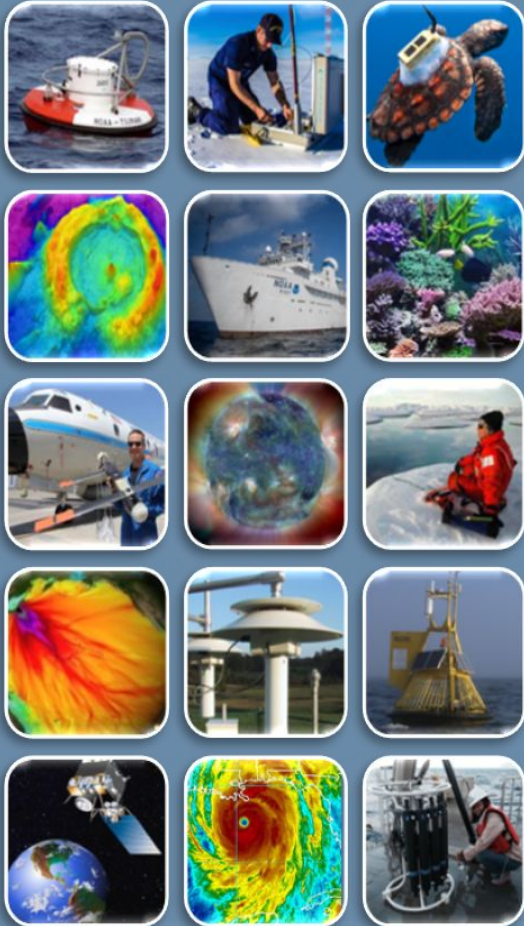
Objective: Provide Oversight

Provide oversight to ensure data are accurate and meets quality requirements

- **STAR:** Maintain and improve long-term integrated calibration/validation and standards for NOAA and non-NOAA partner satellite systems, in support of performance monitoring and anomaly resolution (GSICS, NCC)
- **NCEI:** Stewardship activities provide our science enterprise with access to data that meets the highest standards of transparency, quality and provenance. Prior to public release, NCEI has a formal Operational Readiness Review process to ensure data quality.

NCEI Science Enables Environmental Intelligence

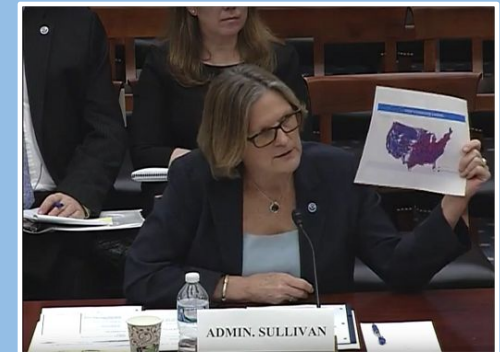
Earth Observing Systems



NCEI Science:
integrating relevant
data into
authoritative and
useful
environmental
intelligence



**Regional, national,
and global data
products and
foundational datasets
rely on international
data and international
collaboration.**





A Use-Inspired, Science-Based Organization

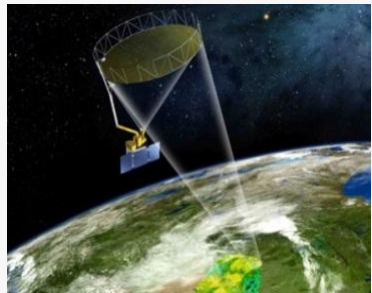
“At its heart, NESDIS is an environmental data organization. Specifically, NESDIS is a use-inspired science-based services organization that strives to provide integrated and trustworthy environmental data, data products and information to meet user requirements and needs.” - NESDIS Strategic Plan

- **Maximum precipitation estimates** that inform dam design, water resource management, insurance and building sectors risk assessments.
- **Digital Elevation Models** that inform coastal planning and enable tsunami and storm surge warnings.
- **Observations of the sun and the earth’s magnetosphere** that protect astronauts, satellites, communications, navigation and the electric power grid from solar storms.
- **Precise representations of the orientation of the earth’s magnetic field** used in billions of devices and applications ranging from everyday cell phones to energy exploration.
- **Monthly Sea Ice Index** that shows Arctic-wide changes in sea ice extent and concentration, including anomalies and trends.
- **Drought and extreme weather analyses** that integrate rain gauge, NEXRAD, and GOES/POES satellite precipitation estimates to produce authoritative environmental intelligence on precipitation patterns, trends, and normal.

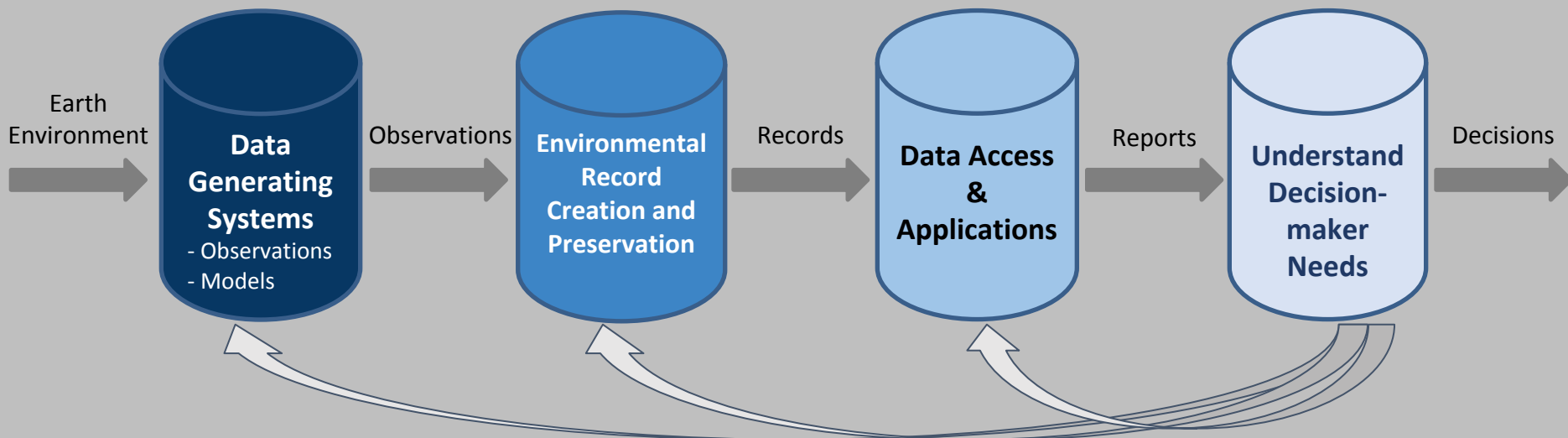
NCEI Products Span from Local to Global, and Weekly to Decadal Scales



NCEI Supports the Full Information Lifecycle



- Makes foundational investments in environmental information production and preservation
- Develops use-inspired science-based services to:
 - Inform decisions
 - Support other information and service providers (i.e. private sector)



CONGRESSIONAL MANDATES

ANNUAL BUDGET GUIDANCE

NOAA AND EXTERNAL PARTNERS

NCEI USER ENGAGEMENT

Documented and Validated
Requirements
(Contracts, SLAs, etc.)

Sustain

Retire

Develop

Product
Termination

Product
Development



NCEI Prioritization of Requirements

- Use-inspired science products scored to quantify their relative importance
- System developed in 2014 by Data Centers and approved at NESDIS MSR
- Provides a rationale for balancing the science portfolio

Prioritization Criteria

Importance to the public, users, and/or scientific community

Compliance with federal law or binding international treaty

Supports administration priorities or signed agreements

Provides input to other products

Required to provide authoritative government standards

Protection of life and property

Economic impacts

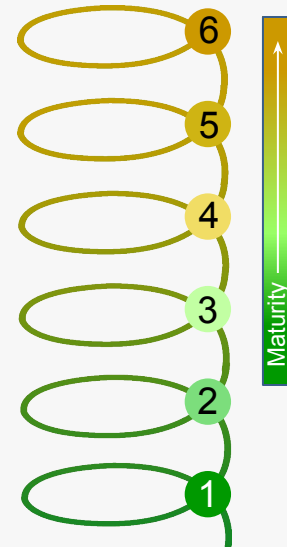
Uniqueness of NOAA's contribution

Contribution to NESDIS Strategic Plan

NCEI Tiered Model for Use-Inspired Science



Maturity Matrix Model





NCEI Model Aligned with NESDIS Goals

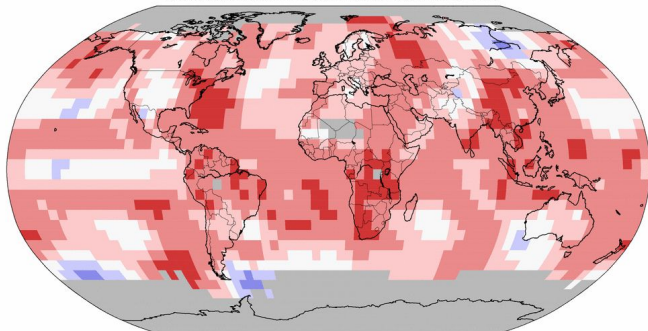
Tier	NESDIS Use-Inspired Science Goal
6	Use data science to enhance mission value of environmental data
5	Provide oversight to ensure data are accurate and meets quality requirements
4	Provide integrated reference data sets that describe the state of the environment
3	Develop, support, and adapt algorithms to provide state-of-the-art science products

GLOBAL TEMPERATURE

(winner NOAA Gold Medal Award)



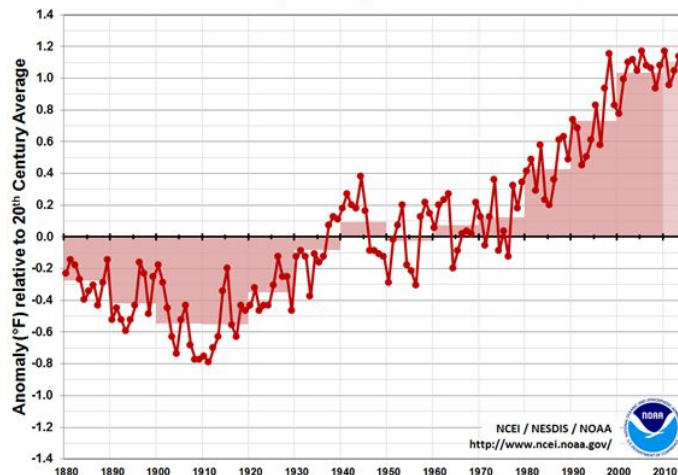
Land & Ocean Temperature Percentiles Aug 2016
 NOAA's National Centers for Environmental Information
 Data Source: GHCN-M version 3.3.0 & ERSST version 4.0.0



Record Coldest
 Much Cooler than Average
 Cooler than Average
 Near Average
 Warmer than Average
 Much Warmer than Average
 Record Warmest

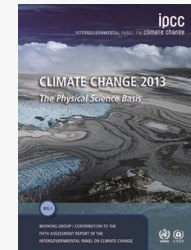
Fri Sep 16 09:45:33 EDT 2016

Annual Global Temperature (Combined Land & Ocean)



NCEI / NESDIS / NOAA
<http://www.ncel.noaa.gov/>

Climate change and human health report - NCA 2016



IPCC -2013

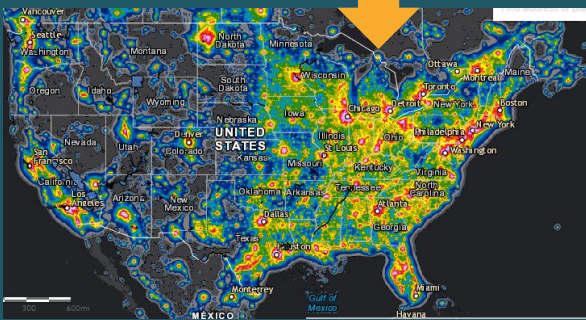


Nighttime VIIRS - Products to Applications

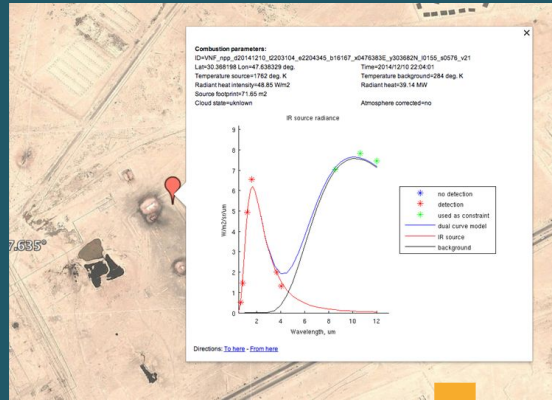
Nighttime lights



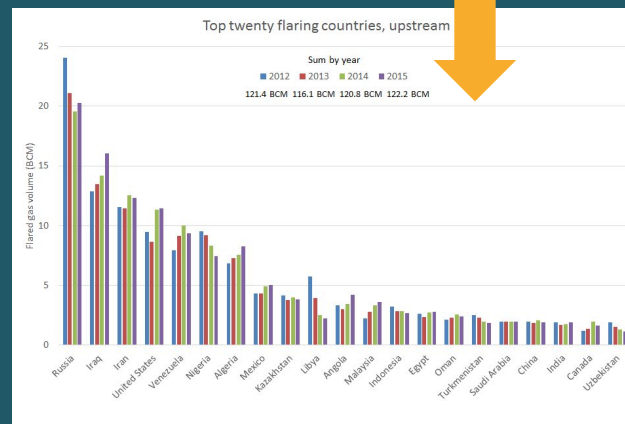
Light pollution map



Nightfire data of flares



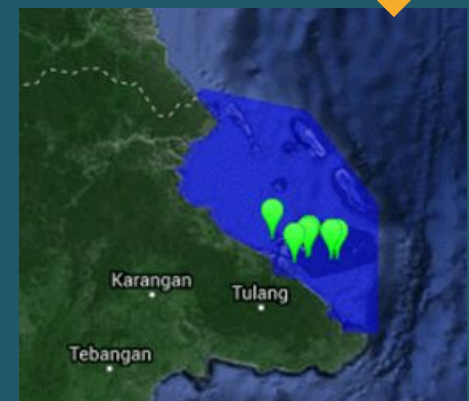
Tracking of national flared gas volumes



Boat detections

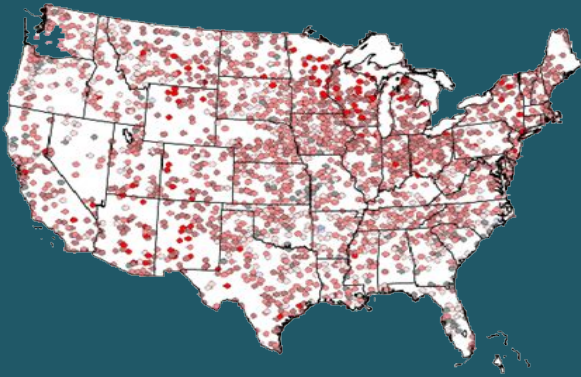


Near-real time alerts for Marine Protected Areas

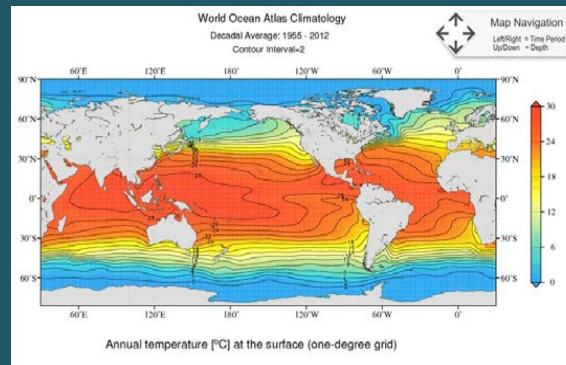


Other Reference Products

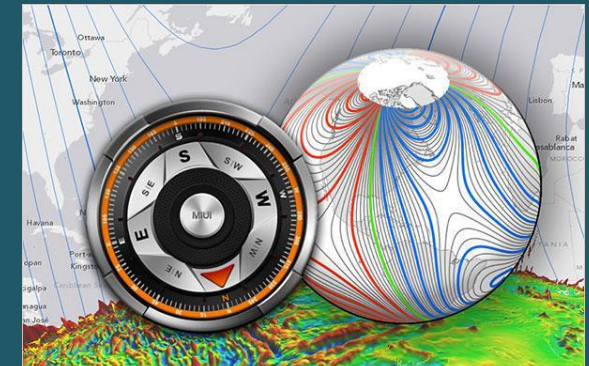
Climate Normals



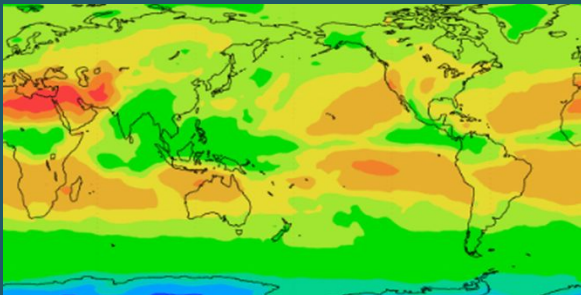
World Ocean Atlas



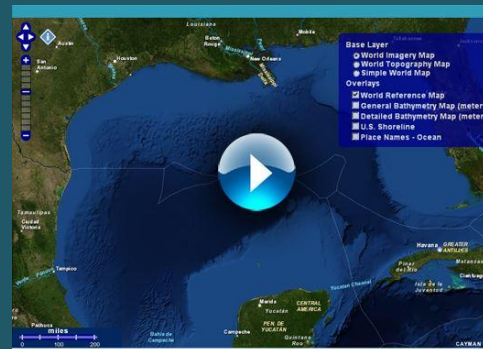
Earth's Magnetic Field



Reference Environmental Data Records



Gulf of Mexico Data



Coastal/Ocean Depths

