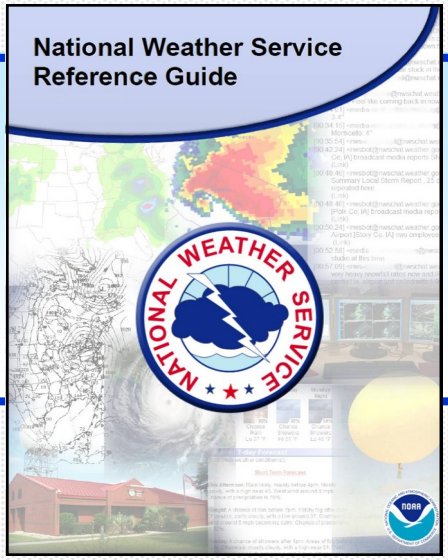

4. Specialty Centers

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Click on description to go directly to the page.

4. Specialty Centers

In addition to the local NWS offices, there are many other NWS and NOAA organizations that provide support for meteorological/hydrologic forecasts, products and services. Most of these organizations are specialized and offer services in a small section of the entire umbrella of NWS/NOAA services.

NOAA Specialty Centers

Aviation Weather Center (AWC) (more information on Page 24)

Website: http://aviationweather.gov/

Location: Kansas City, MO

Mission: Delivers consistent, timely and accurate weather information for the world airspace system. The office consists of a team of highly skilled people dedicated to working with users and partners to enhance safe and efficient flight.

NCEP Central Operations (NCO)

Website: http://www.ncep.noaa.gov/

Location: Camp Springs, Maryland

Mission: Delivers national and global weather, water, climate and space weather guidance, forecasts, warnings and analyses to its partners and external user communities.

The National Centers for Environmental Prediction (NCEP) provide a wide range of national and international products to a diverse group of recipients including but not limited to NWS offices, government agencies, emergency managers, private sector meteorologists as well as numerous meteorological organizations and societies. Nine offices make up NCEP, covering all aspects of weather and climate forecasting. These offices provide a basis unto all weather forecasts around the nation. In addition, almost all meteorological data collected across the planet is archived within one of the NCEP offices, allowing for continual analysis and developments.

River Forecast Centers (RFC) (more information on Page 15)

Website: (See Page 15 for list of websites)

Location: There are 13 River Forecast Centers across the U.S.

Mission: To save lives and decrease property damage by the issuance of flood guidance and river stage forecasts. Provide basic hydrologic forecast information for the nation's economic and environmental well being. Provide extended forecast information for water resources management.

Climate Prediction Center (CPC) (more information on Page 21)

Website: http://www.cpc.ncep.noaa.gov/

Location: Camp Springs, Maryland

Mission: Delivers climate prediction, monitoring and assessment products on timescales from weeks to years to the nation and the global community for the protection of life and property and the enhancement of the economy.

The CPC is comprised of two branches: operations and development. By analyzing dynamical, empirical and statistical procedures, the operations branch is able to formulate long range outlooks (from one week to a year in advance). In addition, the operations branch maintains stratospheric monitoring and UV forecasts. The development branch performs the necessary research, exploring the physical factors accountable for the climate fluctuations as well as monitoring the coupled ocean-atmosphere climate system.

Environmental Modeling Center (EMC)

Website: http://www.emc.ncep.noaa.gov/

Location: Camp Springs, Maryland

Mission: Develops, improves and monitors data assimilation systems and models of the atmosphere, ocean and coupled system, using advanced methods developed internally as well as cooperatively with scientists from universities, NOAA Laboratories, other government agencies and the international scientific community. The EMC is composed of three main branches: Global Climate and Weather Modeling, Mesoscale Modeling and Marine Modeling/Analysis.

Hydrometeorological Prediction Center (HPC) (more information on Page 22)

Website: http://www.hpc.ncep.noaa.gov/

Location: Camp Springs, Maryland

Mission: Delivers weather and water forecast guidance products and services in support of the daily activities of the NWS and its users. The HPC strives to be a leader in the NWS collaborative forecast process and recognized as a center of excellence by providing high-quality weather and water forecast guidance and analyses. The HPC exists to meet the real-time weather and water information needs of a growing group of users including NWS field offices, other governmental agencies, the media, the private sector, academic institutions, the international community and the general public.

Ocean Prediction Center (OPC)

Website: http://www.opc.ncep.noaa.gov/

Location: Camp Springs, Maryland

Mission: Issuance of marine warnings, forecasts and guidance in text and graphical format for maritime users. OPC originates and issues marine warnings and forecasts, continually monitors and analyzes maritime data and provides guidance of marine atmospheric variables for purposes of protection of life and property, safety at sea and enhancement of economic opportunity.

The OPC provides five day forecasts for the North Atlantic Ocean extending from Europe west to the U.S. east coast and the North Pacific Ocean, extending from the U.S. and Canadian west coast to eastern Asia. The forecasts serve an important role for commercial ships and other vessels making trans-ocean crossings.

Space Weather Prediction Center (SWPC) (more information on Page 23)

Website: http://www.swpc.noaa.gov/

Location: Boulder, CO

Mission: The nation's official source of space weather alerts, watches and warnings. The SWPC provides real-time monitoring and forecasting of solar and geophysical events which impact satellites, power grids, communications, navigation and many other technological systems. The SWPC explores and evaluates new models and products and transitions them into operations. The SWPC is the primary warning center for the International Space Environment Service.

Storm Prediction Center (SPC) (more information on Page 9)

Website: http://www.spc.noaa.gov/

Location: Norman, OK

Mission: Exists solely to protect life and property of the American people through the issuance of timely and accurate watch and forecast products dealing with severe weather, wildfires and other hazardous mesoscale weather phenomena.

Tropical Cyclone Warning Centers (more information on Page 12)

National Hurricane Center

Website: http://www.nhc.noaa.gov/

Location: Miami, FL

Mission: To save lives, mitigate property loss and improve economic efficiency by issuing the best watches, warnings, forecasts and analyses of hazardous tropical weather and by increasing understanding of these hazards through global outreach.

The NHC provides analysis and forecasts of tropical weather. The center issues warnings and forecasts for the Atlantic Ocean basin, including the Caribbean Sea and Gulf of Mexico. The NHC also issues warnings and forecasts for the eastern North Pacific Ocean basin. There are three units within the NHC: the Technical Support Branch (TSB), the Tropical Analysis and Forecast Branch (TAFB) and the Hurricane Specialist Unit (HSU). From June 1 to November 30, the main focus remains on any tropical cyclone development, however, additional tropical weather discussions and marine forecasts are provided on a year-round basis.

Central Pacific Hurricane Center

Website: http://www.prh.noaa.gov/hnl/cphc/

Location: Honolulu, HI.

The Central Pacific Hurricane Center, co-located with the WFO in Honolulu, HI, provides information concerning tropical cyclones in the Central Pacific basin, between 140 degrees West to the International Dateline. The Joint Typhoon Warning Center monitors the Pacific Region west of the International Dateline as well as the Indian Ocean.

WFO Guam

Location: Guam

WFO Guam issues tropical cyclone products for cyclones in the western North Pacific basin within their area of responsibility.

National Severe Storm Laboratory (NSSL)

Website: http://www.nssl.noaa.gov/

Location: Norman, OK

Mission: To enhance NOAA's capabilities to provide accurate and timely forecasts and warnings of hazardous weather events such as blizzards, ice storms, flash floods, tornadoes and lightning. NSSL accomplishes this mission, in partnership with the NWS, through a balanced program of research to advance the understanding of weather processes, research to improve forecasting and warning techniques, development of operational applications and transfer of understanding, techniques and applications to the NWS and other public and private sector agencies.

The NSSL is divided into three research divisions: Forecast, Radar and Warning. These three divisions together work in developing enhancements to existing weather radar, designing and testing new radar systems, developing and testing tools to improve forecasts and warnings, develop tools for severe storm monitoring and prediction and carry out field research to improve the basic understanding of severe storm processes.

Spaceflight Meteorology Group (SMG)

Website: http://www.srh.noaa.gov/smg/

Location: Houston, TX

Mission: Provides unique world-class weather support to the U.S. human spaceflight effort by providing weather forecasts and briefings to the National Aeronautical and Space Administration (NASA) personnel. Provides pre and post spaceflight weather analysis and documentation. Advises the Johnson Space Center (JSC) community of adverse weather impacting the JSC complex. Serves as meteorological consultants to the JSC community for current and future spaceflight endeavors, and develops tools and techniques to enhance SMG's weather support and to improve the science of meteorology. SMG strives for quality, accuracy, timeliness, user satisfaction and safety.

Tsunami Warning Centers (TWC) (more information on Page 25)

Website: http://tsunami.gov/

Location: Palmer, AK and 'Ewa Beach, HI

Mission: To provide reliable tsunami detection, forecasts, and warnings and to promote community resilience. The primary operational warning system objectives for carrying out this mission are to rapidly locate, size, and otherwise characterize major earthquakes, determine their tsunamigenic potential, predict tsunami arrival times, predict coastal flooding when possible, and disseminate appropriate warning and informational products based on this information.

The NWS maintains two Tsunami Warning Centers, with the responsibility of issuing warnings, advisories and watches based upon seismic and sea level data provided by NOAA and other agencies.

West Coast/Alaska Tsunami Warning Center (WC/ATWC)

http://wcatwc.arh.noaa.gov/

Forecasts for all the U.S. coastal states except Hawaii, the Canadian coast line, Puerto Rico and the Virgin Islands.

Richard Hagemeyer Pacific Tsunami Warning Center (PTWC)

http://www.prh.noaa.gov/pr/ptwc/

Forecasts for Hawaii and countries along the Pacific and Indian Oceans and the Caribbean Sea.

National Climatic Data Center (NCDC) (more information on Page 19)

Website: http://www.ncdc.noaa.gov

Location: Asheville, NC

Mission: The NCDC is the world's largest active archive of weather data. Its mission is to provide access and stewardship to the nation's resource of global climate and weather-related data, and also to assess and monitor climate variation and change. This effort requires the acquisition, quality control, processing, summarization, dissemination and preservation of a vast array of climatological data generated by the national and international meteorological services.

National Operational Hydrologic Remote Sensing Center (NOHRSC) (more information on Page 27)

Website: http://nohrsc.noaa.gov/

Location: Chanhassen, MN

Mission: The NOHRSC provides remotely-sensed and modeled hydrology products for the conterminous U.S. and Alaska for the protection of life and property and enhancement of the national economy. NOHRSC airborne, satellite, and modeled snow data and products are used by NWS RFCs, WFOs, as well as other federal, state and local government agencies, the private sector and the public to support operational and research hydrology programs across the nation.

The Office of Hydrological Development (OHD)

Website: http://www.nws.noaa.gov/oh/

Location: Silver Spring, MD

The OHD enhances NWS products by infusing new hydrologic science, developing hydrologic techniques for operational use, managing hydrologic development by NWS field offices and providing advanced hydrologic products to meet needs identified by NWS users.

The OHD is comprised of multiple units that enable it to accomplish its goals.

Advanced Hydrological Prediction Services (AHPS)

http://www.nws.noaa.gov/oh/ahps/

Provides new information and products through the infusion of new science and technology. This service improves flood warnings and water resource forecasts to meet diverse and changing user needs.

Planning, Programming, and Coordination Group (PPC)

http://www.nws.noaa.gov/oh/ppc/

Leads the planning, acquisition, tracking and resource analyses for NOAA and NWS hydrology programs.

Hydrology Laboratory (HRL)

http://www.nws.noaa.gov/oh/hrl/

Conducts studies, investigations and analyses leading to the application of new scientific and computer technologies for hydrologic forecasting and related water resources problems. HRL personnel provide training and implementation support on hydrologic forecasting techniques in support of the NWS Hydrologic Service Program.

RFC Development Management

http://www.nws.noaa.gov/oh/rfcdev/

Responsible for managing science and software development among RFCs to ensure the efficient and economical use of NWS resources to support the NWS Hydrologic Service Program.

Community Hydrologic Prediction System

http://www.nws.noaa.gov/oh/hrl/chps/index.html

Enables NOAA's research and development enterprise and operational service delivery infrastructure to be integrated and leveraged with other federal water agency activities, academia and the private sector to form the backbone of a national water information system.

Office of Operational Systems

Website: http://www.weather.gov/oos/

Location: Silver Spring, MD

Mission: Supervises operational systems and provides engineering software management, facilities, communications and logistical services, develops policy for implementation, operations, support and evaluation of operational weather systems. In addition, the OOS prepares the budget as well as managing office operations.

The OOS is composed of four divisions that enable it to achieve the purpose of the office (listed below.)

Radar Operations Center (ROC)

http://www.roc.noaa.gov/WSR88D/

The ROC provides support, guidance and maintenance of the WSR-88D systems. With increasing technology advances, the ROC oversees the modifications of the systems, enabling it to provide the best services to the NWS and to the public.

National Data Buoy Center (NDBC)

http://www.ndbc.noaa.gov/

The NDBC develops, operates and maintains the data buoy network and coastal stations across the globe. Data collected is provided to the NWS in assisting with marine forecasts.

Field Systems Operations Office

http://www.weather.gov/ops2/

This office serves as the primary operator for the AWIPS system and NOAA Weather Radio by developing the operating standards and procedures as well as maintaining and improving the systems.

Operations Division

https://www.ops1.nws.noaa.gov/index.htm

Oversees the general operations of all software and systems used by the NWS.

Office of Climate, Weather and Water Services

Website: http://www.weather.gov/os/

Location: Silver Spring, MD

Mission: To lead the NWS effort to sustain and enhance climate, water and weather services; to establish NWS operational requirements; to evaluate customer satisfaction; and to train the workforce.

The OOS is composed of eight divisions, most of which are broken down into branches (listed below.)

Operations and Requirements Division

Integrated Operations Branch

Requirements/Change Management Branch

Meteorological Services Division

Marine and Coastal Weather Services Branch

Fire and Public Weather Services Branch

Aviation Weather Services Branch

Hydrologic Services Division

Services Branch

Support Branch

National Operational Hydrologic Remote Sensing Center

Climate Services Division

N/A

Program Performance and Awareness Division

Performance Branch

Awareness Branch

Training Division

NWS Training Center

Warning Decision Training Branch

Forecast Decision Training Branch

Observing Services Division

N/A

Storm Prediction Center (SPC) Products

http://www.spc.noaa.gov/

Products created by the SPC detail the threat of non-severe and severe thunderstorms for the coming week. These are described in each of the **Convective Outlook** products. The Convective Outlook is compiled of both a graphic representation and text wording, broken down into Day 1 (today), Day 2 (tomorrow), Day 3 and Day 4-8.

The text wording supplies a synoptic overview using technical terms to describe the situation at hand while providing information about timing and locations. Below is a truncated example of the text product associated with Day 1.

Forecast Discussion

```
DAY 1 CONVECTIVE OUTLOOK
NWS STORM PREDICTION CENTER NORMAN OK
0257 PM CDT FRI JUL 02 2010

VALID 022000Z - 031200Z

...THERE IS A SLGT RISK OF SVR TSTMS FROM MT TO ND...

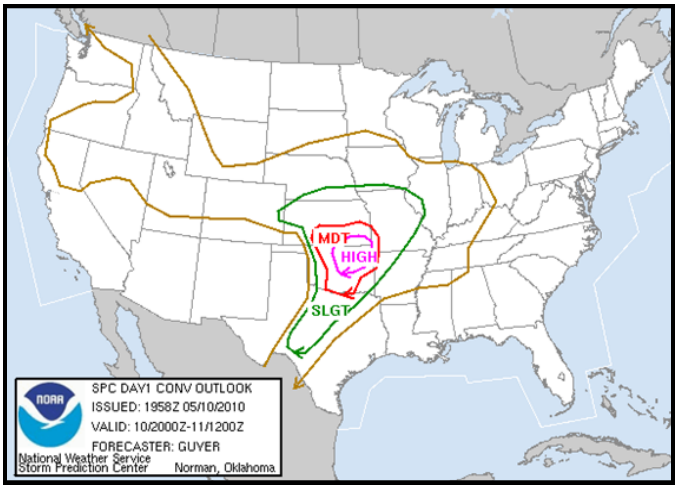
...THERE IS A SLGT RISK OF SVR TSTMS FROM NERN CO ACROSS THE
ADJACENT CENTRAL/NRN PLAINS...

...MT...
WRN EXTENT OF THE SLIGHT RISK IN SWRN TO CENTRAL MT HAS BEEN SHIFTED
EWD GENERALLY 25-55 MILES TO ACCOUNT FOR THE E/SEWD ADVANCEMENT OF
THE COLD FRONT.  EARLY AFTERNOON SURFACE ANALYSIS INDICATED THIS
BOUNDARY EXTENDED SWWD FROM NORTH CENTRAL MT /E OF HVR/ THROUGH SWRN
MT INTO SRN ID AND NWRN NV.  OTHERWISE...PREVIOUS OUTLOOK FOR MT
INTO WRN/NRN ND REMAINS ON TRACK WITH STORMS BEGINNING TO DEVELOP
OVER SWRN/SOUTH CENTRAL MT.  FARTHER ENE...STRONG CAP PER 18Z GGW
SOUNDING WITH WARMING IN THE 600-750 MB LAYER SINCE 12Z TODAY
SUGGESTS TSTM DEVELOPMENT WILL BE DELAYED UNTIL ACTIVITY SPREADS
INTO THIS REGION FROM THE W/SW WITH THE APPROACH OF THE COLD FRONT.
```

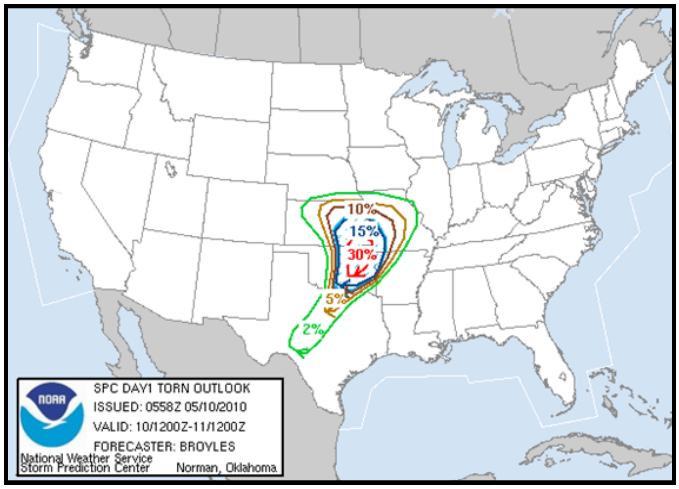
Day 1 Convective Outlook

The first of the Day 1 Convective Outlook graphics below shows an overall risk of severe weather. SLGT (slight) lines are green, MDT (moderate) lines are red, and HIGH risk lines are purple. The brown outlined area is an area of general thunderstorms. The next Day 1 graphic depicts the percentage chances of a tornado occurring. SPC also produces similar graphics for severe hail and thunderstorm wind gusts, broken down individually.

Categorical Outlook



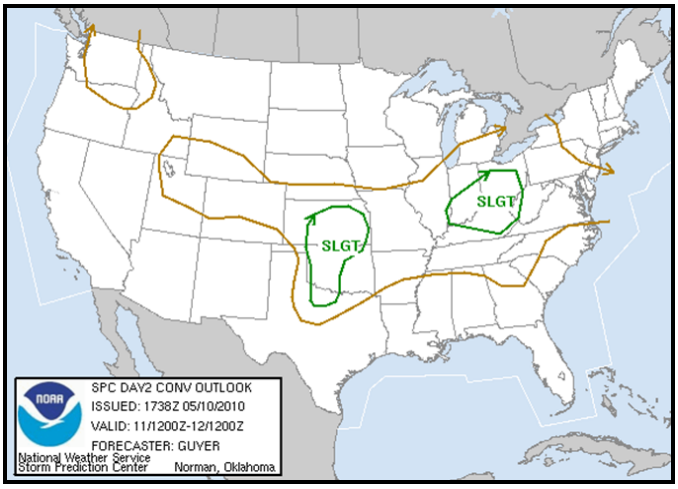
Probabilistic Tornado Outlook



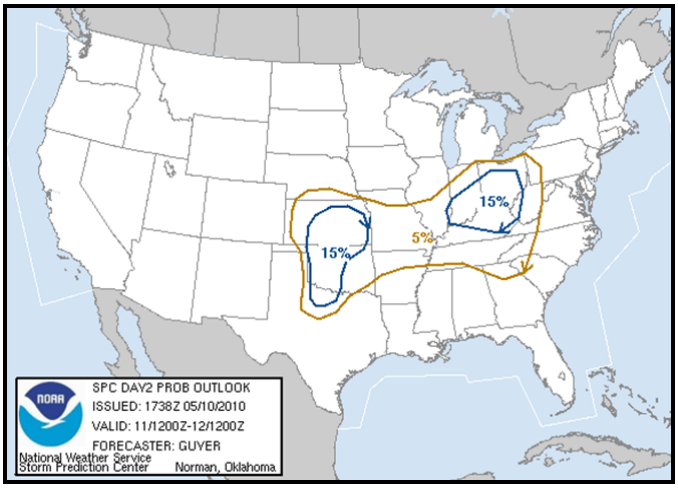
Day 2 and 3 Convective Outlook

Days 2 and 3 show an overall risk of severe weather, but the other associated graphics depict the combined probabilities of severe wind gusts, hail and tornadoes.

Categorical Outlook



Probabilistic Outlook



Day 4-8 Convective Outlook

The Days 4-8 graphic will only show areas that have a 30% probability of being impacted by severe weather.

If a "SEE TEXT" label covers an area of a day 1-3 map, there is a 5% probability of severe weather occurring, but over too small an area to warrant a slight risk. NOTE: All discussions of wind and hail is in reference to severe weather criteria (winds greater than 58 mph and hail greater than 1 inch).

For more information about what slight, moderate and high risks mean, please visit the following website:

http://www.spc.noaa.gov/misc/SPC_Prob_Conv_Otlk_Change_20060214.html

Mesoscale Discussions

In addition to providing the convective outlooks, the SPC issues other short term products. These include Mesoscale Discussions (MCD) and severe weather watches. Mesoscale Discussions are issued when conditions are rapidly changing and thunderstorm development is ongoing or expected soon. These are typically issued 1-3 hours prior to a severe thunderstorm or tornado watch. It details what is currently happening and what is expected over the next couple of hours. It also discusses where the watch is expected by citing meteorological reasoning for the concern. The MCD may also be issued to suggest that although storms are developing, widespread severe weather is not expected and a watch is unlikely. The SPC can also issue MCDs for winter weather, such as for heavy snow, blizzard or freezing rain threats.

Below is a truncated example of an MCD:

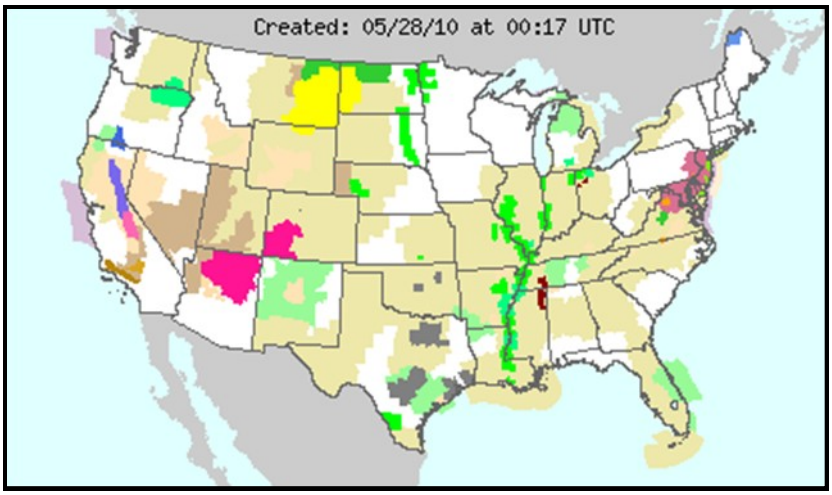
```
MESOSCALE DISCUSSION 0840
   NWS STORM PREDICTION CENTER NORMAN OK
   0907 AM CDT MON JUN 07 2010
   AREAS AFFECTED...CENTRAL KS
   CONCERNING...SEVERE POTENTIAL...WATCH UNLIKELY
   VALID 071407Z - 071530Z
    BOUTS OF SEVERE HAIL WILL REMAIN POSSIBLE THROUGH LATE MORNING
     ACROSS CENTRAL KS. WITH THE SEVERE THREAT EXPECTED TO GRADUALLY WANE
     OVER THE NEXT FEW HOURS...A SEVERE WATCH IS NOT ANTICIPATED.
     SEVERE STORMS INCLUDING ELEVATED SUPERCELLS WILL CONTINUE OVER THE
     NEXT FEW HOURS MAINLY ACROSS CENTRAL KS. BASED ON THE 12Z DODGE CITY
```

Severe Thunderstorm or Tornado Watches

When the conditions become favorable for severe weather formation, either a thunderstorm or tornado watch is issued. Watches allow the general public to become aware of the potential for severe weather and provide lead time to media, emergency management and spotters.

The SPC issues watches in collaboration with the WFO. The local NWS offices issue warnings if needed.

Tornado watches will be yellow on the map graphic below and severe thunderstorm watches salmon (colors may vary on from other sources). To access this graphic (for all watches, warnings, and advisories) refer to this web page: http://www.weather.gov/view/nationalwarnings.php?map=on



The image to the left shows a tornado watch across Montana and North Dakota (in yellow) and a severe thunderstorm watch across New Jersey, Maryland, Virginia and Delaware (salmon colored).

On the "watches" page of SPC's website, there is a map showing the current watches in effect and a watch archive feature that has a graphical representation of past watches. This graphic depicts individual counties in the watch and an associated radar image at the time the watch was issued.

Some watches are classified as a PDS or "Particularly Dangerous Situation" watch. These watches are issued when conditions are favorable for widespread significant severe weather or multiple, long-lived, strong or violent tornadoes.

PDS watches are issued, when in the opinion of the forecaster, the likelihood of significant events is boosted by very volatile atmospheric conditions. Usually this decision is based on a number of atmospheric clues and parameters, so the decision to issue a PDS watch is subjective. There is no hard thresh-old or criteria. In high risk convective outlooks, PDS watches are issued most often.

In general, Significant severe weather is: EF2 or stronger tornado, thunderstorm wind gusts 75 mph or higher, or hailstones 2" in diameter, or larger.

Below is an abbreviated example of a PDS watch.

```
EFFECTIVE THIS THURSDAY MORNING AND EVENING FROM 1135 AM UNTIL
1000 PM CDT.
...THIS IS A PARTICULARLY DANGEROUS SITUATION...

DESTRUCTIVE TORNADOES...LARGE HAIL TO 2.5 INCHES IN DIAMETER...

THUNDERSTORM WIND GUSTS TO 80 MPH...AND DANGEROUS LIGHTNING ARE

POSSIBLE IN THESE AREAS.
```

For further information on all of the SPC products, please visit these webpages:

http://www.spc.noaa.gov/products/

http://www.spc.noaa.gov/misc/about.html

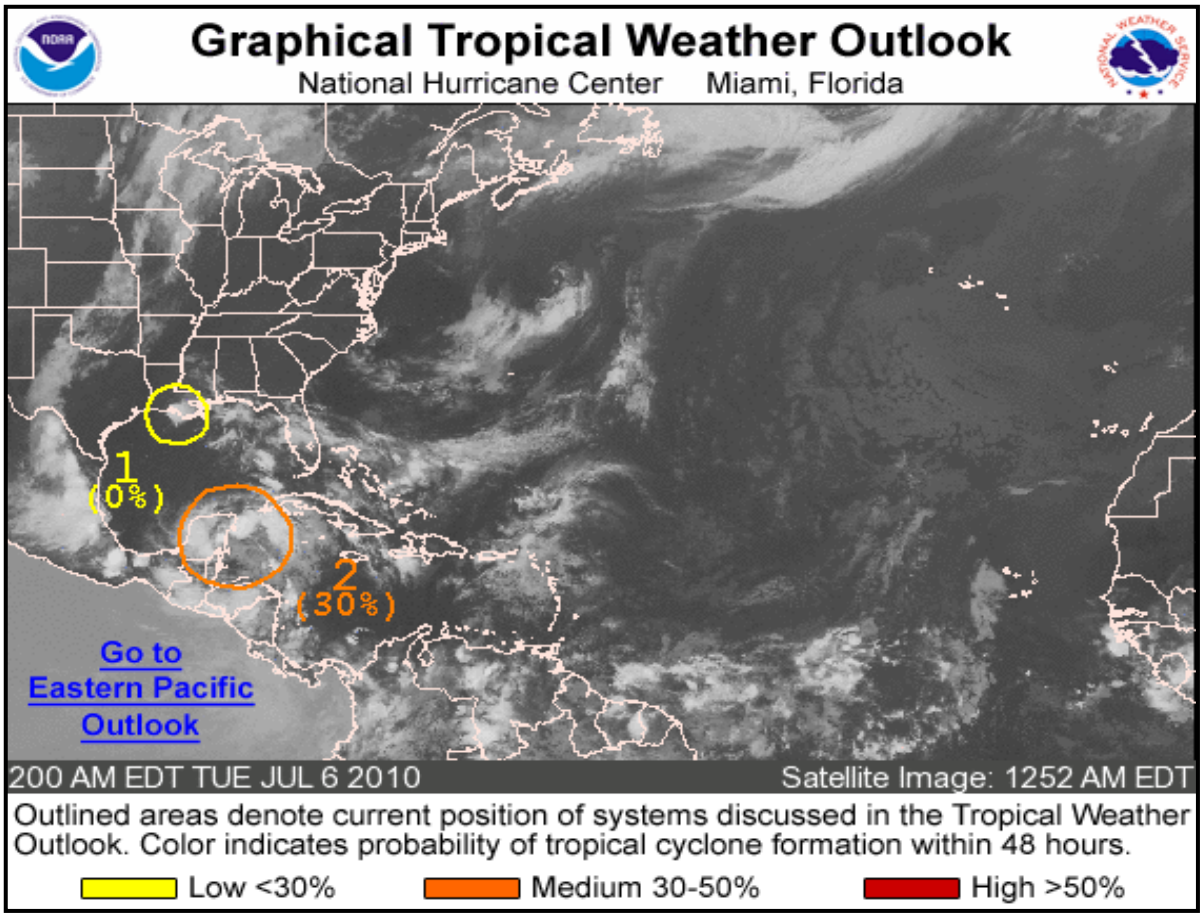
National Hurricane Center (NHC) Products

http://www.nhc.noaa.gov

The NHC in Miami, FL, provides year round forecasts of the Atlantic and Eastern Pacific Basins.

The NHC provides a tropical weather discussion, which details major synoptic weather features and significant areas of disturbed weather in the tropics. This discussion also includes information about any tropical waves, cyclones and the position of the Intertropical Convergence Zone (ITCZ).

On the main page for the NHC, a graphic shows active tropical cyclones and other areas of interest. The NHC produces a Graphical Tropical Weather Outlook that depicts these areas of disturbed weather and shows the probability of their development into a tropical cyclone within two days.



A Graphical Tropical Weather Outlook is also available for the Eastern Pacific Ocean basin. This can be obtained by clicking on the link in the lower left of the graphic above.

At the bottom of the graphic above, areas circled in yellow have a less than 30% chance of developing into a tropical cyclone during the ensuing 48 hours. Areas circled by orange have a 30-50% chance and areas in red have a greater than 50% chance of developing within 48 hours. A text explanation accompanies the graphic, which provides the synoptic overview and the forecaster expectation for tropical cyclone development.

When a cyclone develops (tropical depression/storm/hurricane), the NHC will begin issuing advisories every six hours. These advisories provide an overview of the storm: the current location, the estimated central pressure, the maximum wind speed and gust and the size (in radii) of the tropical cyclone. The advisories also provide a forecast path and inten-

sity for the next five days. If watches or warnings are in effect for the coastal areas of the U.S. or its territories, public intermediate advisories are issued every two or three hours.

The advisory package includes several text products. The Forecast/Advisory contains a list of all current watches and warnings in effect, as well as the current latitude and longitude coordinates, intensity, and system motion. The product contains forecasts of the cyclone's position, intensity, and wind field out to 5 days.

The Tropical Cyclone Discussion is a text product that explains the reasoning for the analysis and forecast of a tropical cyclone. Forecasters often describe the degree of confidence in the track and intensity forecast in the discussion. It also contains a table of the forecast positions and intensity.

Another text product included in the advisory package is the Public Advisory, which details the movement of the storm, conditions to be expected, and any watches and warnings currently in effect.

Example of an NHC Public Advisory (abbreviated):

```
WTNT31 KNHC 302036
TCPAT1
BULLETIN
HURRICANE ALEX ADVISORY NUMBER  21
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL     AL012010
400 PM CDT WED JUN 30 2010

...ALEX HEADING TOWARD NORTHEAST MEXICO WITH 90 MPH WINDS...


SUMMARY OF 400 PM CDT...2100 UTC...INFORMATION
----------------------------------------------
LOCATION...24.5N 96.8W
ABOUT 80 MI...130 KM NE OF LA PESCA MEXICO
ABOUT 105 MI...170 KM SSE OF BROWNSVILLE TEXAS
MAXIMUM SUSTAINED WINDS...90 MPH...150 KM/HR
PRESENT MOVEMENT...W OR 270 DEGREES AT 13 MPH...20 KM/HR
MINIMUM CENTRAL PRESSURE...959 MB...28.32 INCHES

 WATCHES AND WARNINGS
--------------------
CHANGES WITH THIS ADVISORY...

NONE.

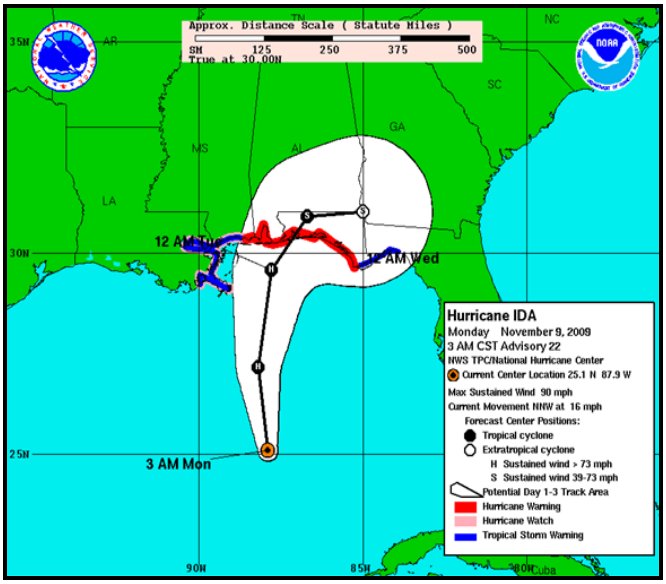
SUMMARY OF WATCHES AND WARNINGS IN EFFECT...

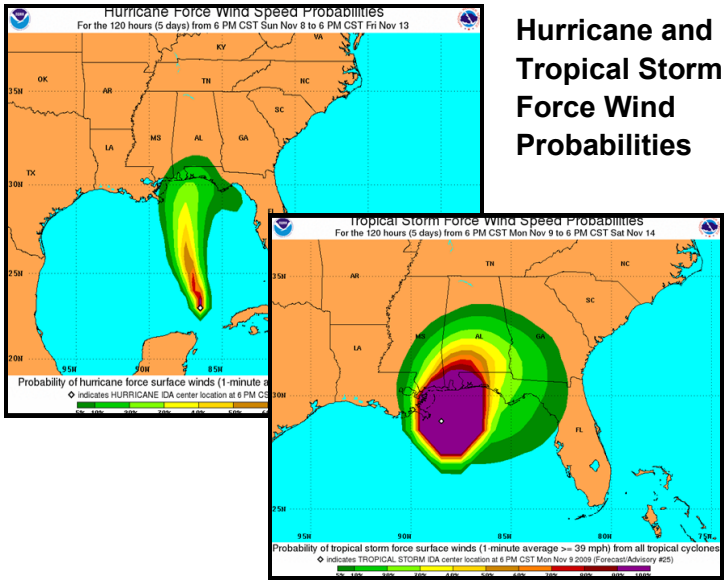
A HURRICANE WARNING IS IN EFFECT FOR...
* THE COAST OF TEXAS SOUTH OF BAFFIN BAY TO THE MOUTH OF THE RIO
GRANDE
* THE COAST OF MEXICO FROM THE MOUTH OF THE RIO GRANDE TO LA CRUZ

(TEXT CONTINUES)
```

In addition to the text products, the NHC creates multiple graphical products to depict the path and conditions expected of the storm. A three and five day cone are created, as shown below. Other graphics below show probabilities of receiving tropical storm force winds (39 mph or greater) and hurricane force winds (74 mph or greater) at specific locations during the next five days.

3-day cone





Hurricane and Tropical Storm Force Wind Probabilities

The **Tropical Analysis and Forecast Branch** creates products detailing conditions on numerous bodies of water. Some examples of the products include:

High Seas: Used mainly by large transoceanic vessels but can also be used by smaller vessels or those on shorter voyages. It gives an overview of winds and waves, as well as any convective activity. This product will include any marine warnings for the area.

Offshore Water Forecast: Provides forecast and warning information to mariners who travel the oceanic waters adjacent to the U.S. and its territorial coastal waters. This forecast serves users who operate from the coastal waters to several hundred nautical miles from shore with 10 different products issued by the National Hurricane Center, the Ocean Prediction Center, the Honolulu Weather Forecast Office, the Anchorage Weather Forecast Office and the Juneau Weather Forecast Office.

Marine Weather Discussion: A semi-technical product, analogous to the Area Forecast Discussion (AFD) issued by the local National Weather Service Forecast Offices, primarily used as a means to explain the scientific rationale behind the Offshore Waters Forecast and to summarize the warnings in effect. The Marine Weather Discussion is used to convey forecast and warning information to federal agencies, weather-sensitive officials and the media.

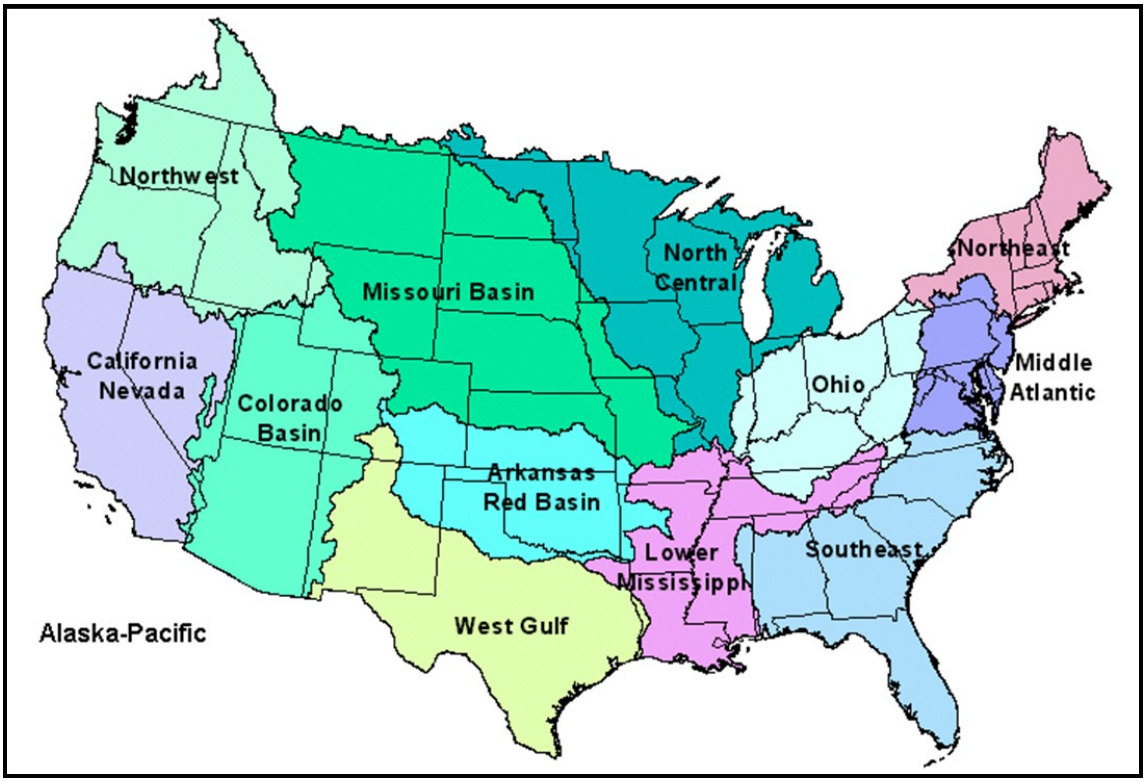
Tropical Surface Analysis: Created every six hours to depict the current state of the atmosphere, specifically the sea level pressure field and any relevant synoptic surface features. The Tropical Surface Analysis is attached to surface analyses over North America, the North Atlantic Ocean, the North Pacific Ocean and the Western Pacific Ocean to create the National Weather Service Unified Surface Analysis.

For more information on all the products generated, please visit the following site:

http://www.nhc.noaa.gov/abouttafbprod.shtml#MIM

River Forecast Center (RFC) Products

Thirteen RFCs provide hydrologic/hydrometeorologic forecast and guidance products along with other forms of technical support to NWS offices in its area of responsibility. The RFC also provides forecast and guidance products to an increasing number of users outside the NWS, especially water management agencies. In doing so, the RFC serves as a major reference point for these users. The role of the RFC staff is to prepare stage, flow, volume and velocity forecasts for the next three to four days; extended range stage, flow, volume and ice melt forecasts for more than one week into the future; flash-flood guidance; and related types of products. Forecasts of seasonal snow melt or water-year runoff are prepared monthly in areas where snow is the principal source of stream flow. Additionally, RFC activities include calibrating hydrologic models, maintaining real-time hydrometeorological databases and being involved in interagency planning activities, such as forecast coordination and data exchange.



River Forecast Centers

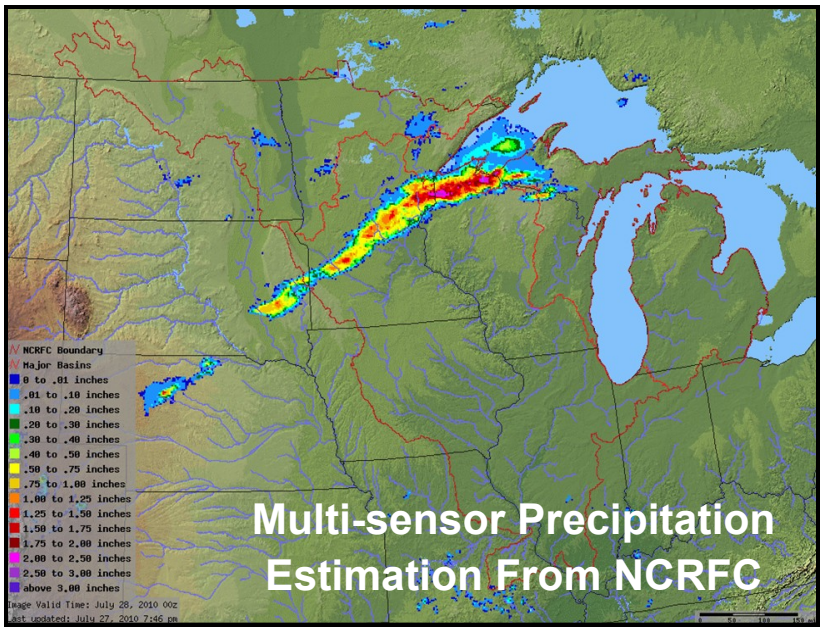
Alaska-Pacific RFC - Anchorage, AK
http://www.weather.gov/aprfc/
Arkansas-Red Basin RFC - Tulsa, OK
http://www.weather.gov/abrfc/
California-Nevada RFC - Sacramento, CA
http://www.cnrfc.noaa.gov/
Colorado Basin RFC - Salt Lake City, UT
http://www.cbrfc.noaa.gov/
Lower Mississippi RFC - Slidell, LA
http://www.weather.gov/lmrfc/
Middle Atlantic RFC - State College, PA
http://www.weather.gov/marfc/
Missouri River Basin RFC - Pleasant Hill, MO
http://www.weather.gov/mbrfc/
North Central RFC - Chanhassen, MN
http://www.weather.gov/ncrfc/
Northeast RFC - Taunton, MA
http://www.weather.gov/nerfc/
Northwest RFC - Portland, OR
http://www.nwrfc.noaa.gov/
Ohio RFC - Wilmington, OH
http://www.weather.gov/ohrfc/
Southeast RFC - Peachtree City, GA
http://www.weather.gov/serfc/
West Gulf RFC - Forth Worth, TX
http://www.weather.gov/wgrfc/

RFC products are broadly grouped into three categories: (1) forecast products, (2) support/guidance products, (3) data products.

Deterministic Hydrologic Forecast (RVF): RFCs use the deterministic hydrologic forecast product to provide routine and event-driven hydrologic forecasts. Information provided in this product includes short-term hydrologic forecasts and river ice forecasts. The RVF is a guidance product from the RFC, but the official forecasts/warnings are issued only by local NWS WFOs.

Contingency River Forecast (CRF): This product is provided for impending flood or high water events when the future impact of one or more numerical model solutions. The CRF product contains river forecasts based on a variety of model solutions that represent scenarios different from the one used in the "official" or "most likely" deterministic forecast. For example, if the official deterministic forecast uses 18 hours of QPF, a CRF could be produced with a full three days of QPF. Alternatively, it could contain a range of QPFs (e.g., 1, 2, 3, 4, and 5 inches.) This internal product is not distributed over NWS-supported public dissemination pathways, but may be provided to partners through secure mechanisms.

Assimilated Data Fields: RFCs assimilate remotely-sensed precipitation estimates, QPF, and other hydrometeorological information for use in their hydrologic forecast operations. This assimilated information may be forwarded to other offices inside and outside the NWS. The image to the right is an example of gridded multi-sensor precipitation estimation from the NCRFC.



Streamflow Guidance (ESG): The ESG product is generally used by RFCs to provide hydrologic forecast information of an advisory or descriptive nature. Information provided in this product includes flood potential outlooks/guidance and discussions of medium and long-term hydrologic forecasts.

Extended-Range Streamflow Prediction (ESP): The ESP product is for long-term/extended-range hydrologic forecast information generally of a numeric or probabilistic nature. Information distributed under this category includes water supply forecasts, drought and water resources guidance and long-term probabilistic forecast information. This product is distributed over NWS-supported public dissemination pathways and posted on the Internet.

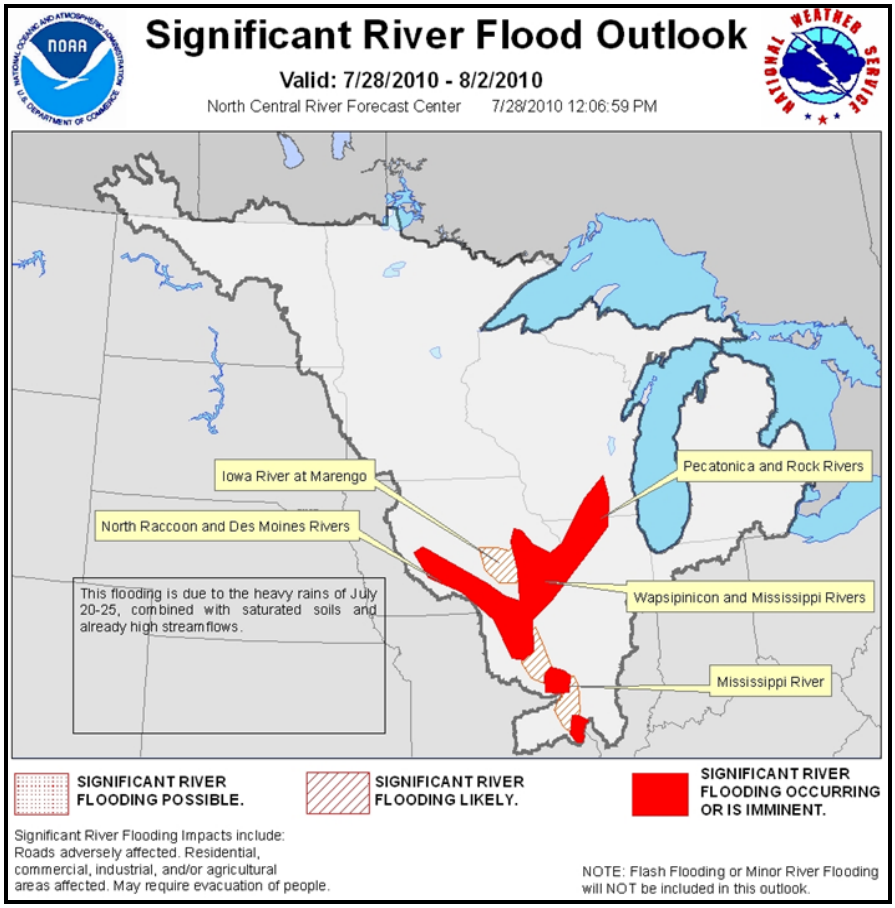
Flash Flood Guidance (FFG): Flash flood guidance is a numerical estimate of the average rainfall over a specified area (or pre-defined grid) and time interval required to initiate flooding on small streams. FFG products are distributed over NWS-supported public dissemination pathways and posted on the Internet.

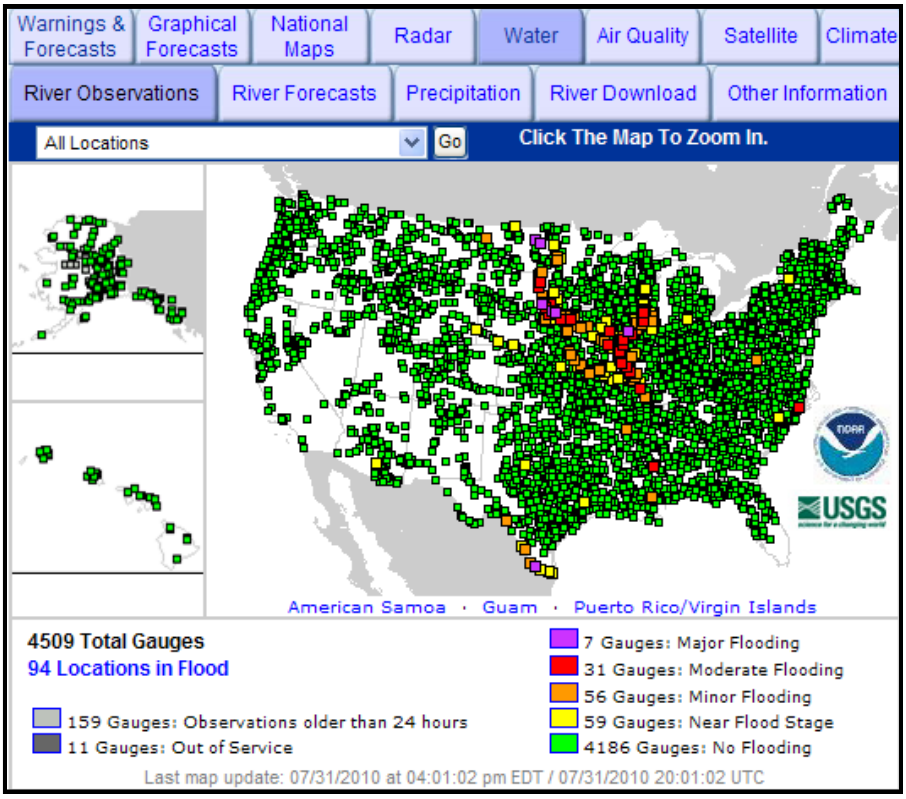
Headwater Flash Flood Guidance (FFH): Headwater flash flood guidance is a numerical estimate of the average rainfall over a specified small stream basin and time interval required to initiate flooding on the stream. FFH products are distributed over NWS-supported public dissemination pathways and posted on the Internet.

Hydrometeorological Discussion (HMD): Hydrometeorological discussions provide a hydrology-oriented overview of the current and expected hydrometeorological situation across the RFC area.

Hydrometeorological Data Products (RRx): These products contain precipitation and other hydrometeorological data from various networks, including the NWS Cooperative Network, flood warning systems, ASOS, and networks operated by partnering agencies.

Significant River Flood Outlook Product
This graphical product broadly identifies areas where potential exists for significant river flooding during the next five days. "Significant flooding" is defined as flooding which falls in the moderate and major categories. Each RFC posts their significant river flood outlook product on their web server and the CONUS RFCs transmit their product to Hydrometeorological Prediction Center (HPC) at the NCEP. The significant river flood outlook product can be used as guidance by WFOs when they prepare local hydrologic outlooks. The significant river flood outlook product helps the NWS meet its mission by graphically depicting areas of river flood potential. This helps partners and other users focus and optimize their flood mitigation activities.

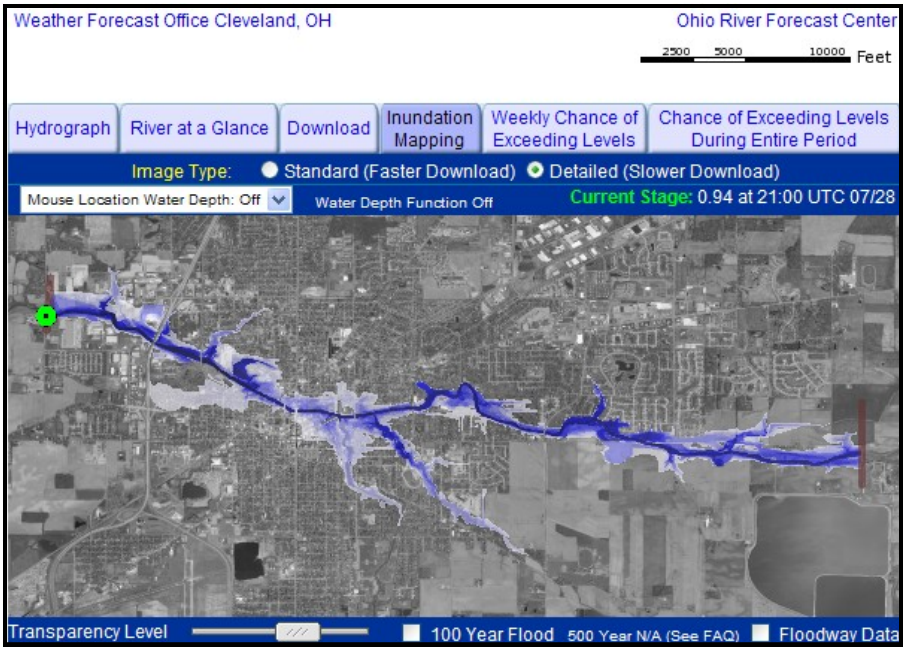




Advanced Hydrologic Prediction Service
The hydrologic forecast information and observed data contained in products described in the previous sections, as well as additional output from WFO and RFC hydrologic modeling systems, are incorporated into graphical products and a forecast information database. These graphical products provided through the Internet and other mechanisms, the forecast information database from which they are derived, and improvements to the underlying hydrologic science and forecasting technology form the core of the Advanced Hydrologic Prediction Service (AHPS).

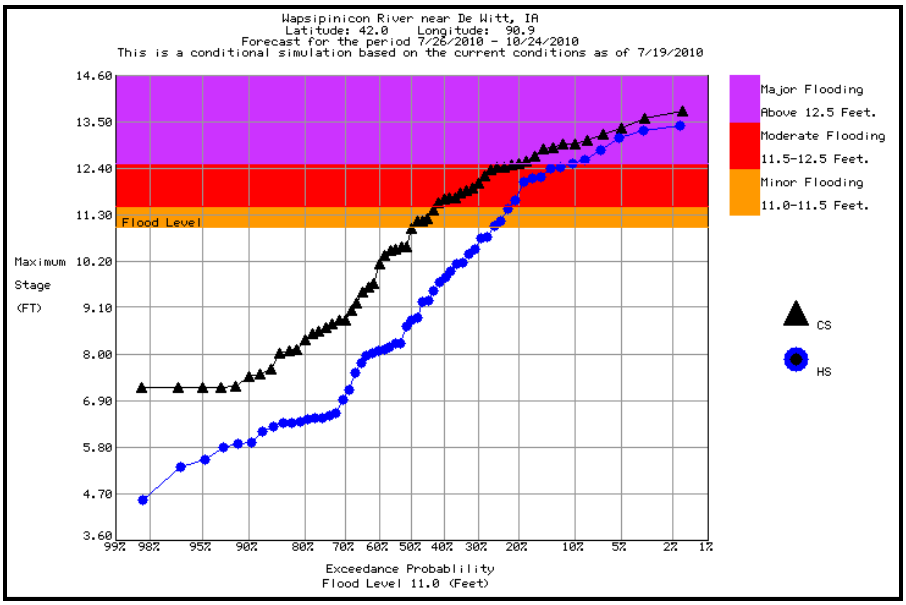
AHPS Web Link:
http://water.weather.gov/

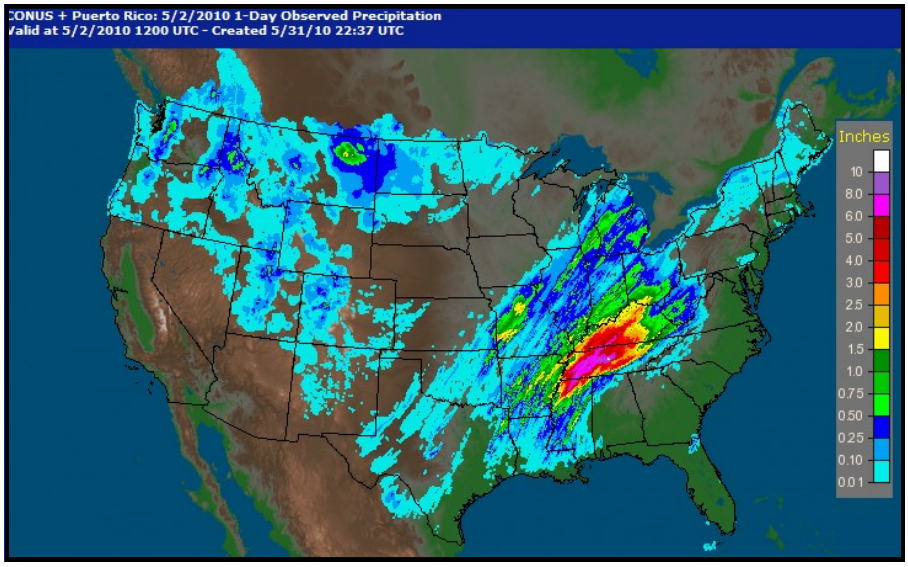
Other examples of RFC products:



Flood Inundation Mapping
http://water.weather.gov/ahps/inundation.php

Probabilistic Flood Forecasts
http://water.weather.gov/





Quantitative Precipitation Estimation
http://water.weather.gov/precip/

National Climatic Data Center (NCDC)

http://www.ncdc.noaa.gov

The NCDC collects and archives nearly 99 percent of all NOAA's data from not only local observers but global offices as well. The center contains over 150 years of data, including 320 million paper records, 2.5 million microfiche records and 1.2 petabytes of digital data. Data can be received in many forms, including but not limited to satellites, radar, NWS COOP (cooperative observers), aircraft, ships, radiosondes, wind profilers, rocketsonde and NWS forecast/warning/ analysis products.

The NCDC can be contacted by either accessing their website or contacting the office personally by mail, email or phone. It may take a few days to receive requested documents, so contact the NCDC right away if you have a time sensitive need for the data. Even though a person can request the data from a WFO, it is only considered official data when obtained from the NCDC.

A large amount of free climatological data can be found at http://www7.ncdc.noaa.gov/IPS/. However, a fee will be included for access to some of the datasets. Included are:

- Local Climatological Data: Summaries from major airport weather stations. Includes temperature, degree days, precipitation and winds taken at hourly intervals. Lag time of one to two months.
- Climatological Data: Station maximum and minimum temperatures and precipitation. May also include snow fall amount and soil temperatures. Lag time of six months.
- Hourly Precipitation Data: Hourly Precipitation data from NWS offices, FAA and COOP stations. Lag time of four to six months.
- Storm Data: Monthly publication of storm occurrences by state.
- Monthly Climate Data for the World: Includes temperatures, pressure, precipitation, vapor pressure, hours of sunshine, wind and dew point depressions. Lag time of four to six months.
- COOP Data: Temperature and precipitation measured at COOP sites across the country. Lag Time of one to two months.
- Climatological Data National Summary: General summary of weather conditions across the nation, extreme temperature and precipitation records, heating and cooling degree days, flood data, storm summaries, upper air data and sunshine and solar radiation.

Mailing Address:

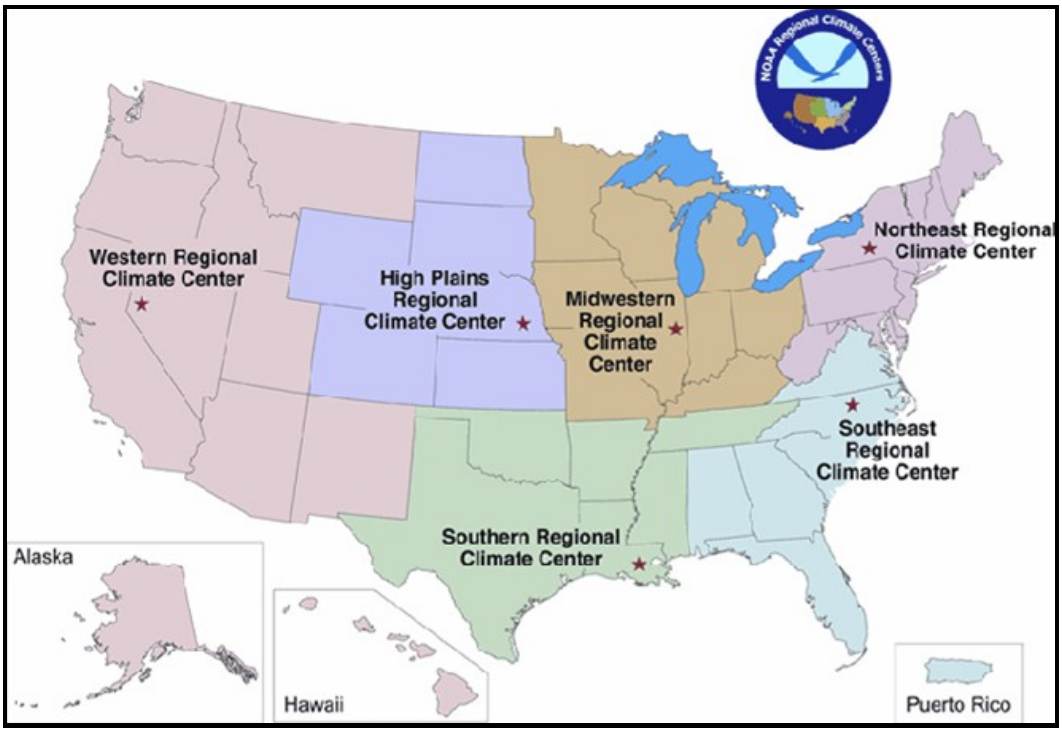
National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville NC 28801-5001

Phone Number: (828) 271 – 4800

Fax Number: (828) 271 - 4876

Further contact information can be found at http://www.ncdc.noaa.gov/oa/about/ncdccontacts.html

Regional Climate Data Centers



High Plains Regional Climate Center

Location: Lincoln, NE

Website: http://www.hprcc.unl.edu/

Midwestern Regional Climate Center

Location: Champaign, IL

Website: http://mrcc.isws.illinois.edu/

Northeast Regional Climate Center

Location: Ithaca, NY

Website: http://www.nrcc.cornell.edu/

Southeast Regional Climate Center

Location: Chapel Hill, NC

Website: http://www.sercc.com/

Southern Regional Climate Center

Location: Baton Rouge, LA

Website: http://www.srcc.lsu.edu/

Western Regional Climate Center

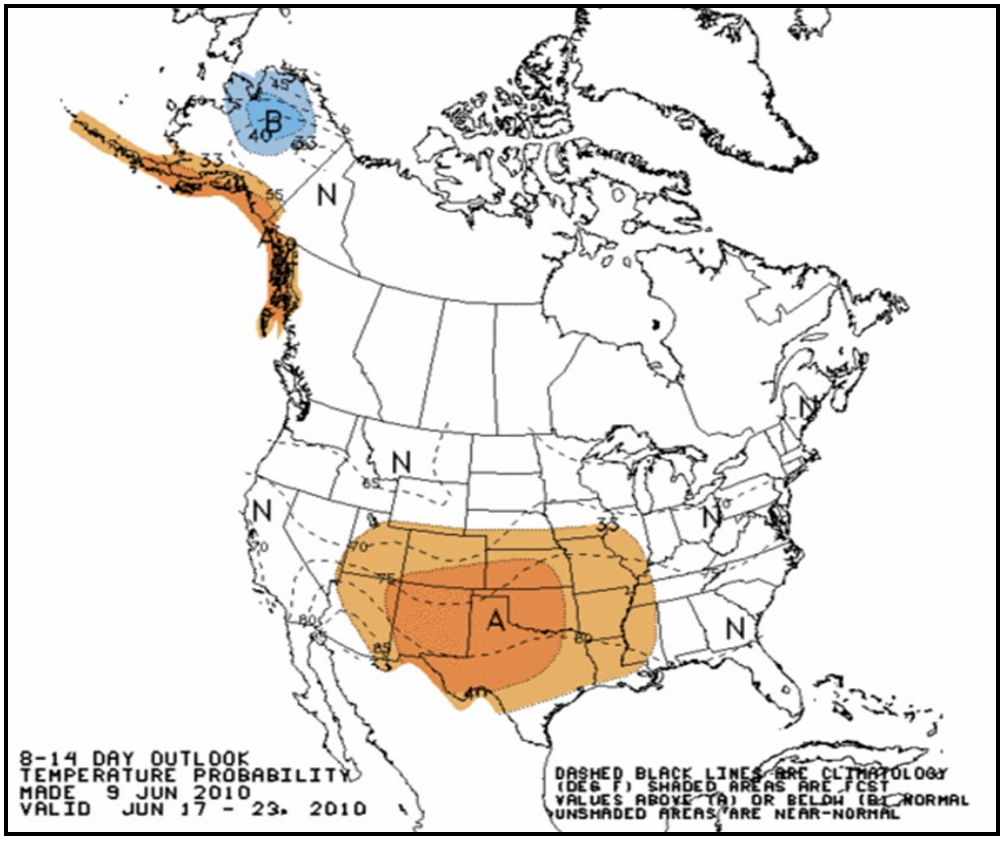
Location: Reno, NV

Website: http://www.wrcc.dri.edu/

Climate Prediction Center (CPC) Products

http://www.cpc.noaa.gov

The Climate Prediction Center produces long range forecasts of temperature and precipitation anomalies across the U.S. The main products are outlooks for 6-10 days, 8-14 days, 1 month and 3 months.



A graphic depicting the 8-14 day temperature outlook. Note the "A" (in orange) refers to above normal temperatures forecasted, "B" (in blue) refers to below normal temperatures expected and the "N" relates to normal temperatures.

The outlook provides a graphic representation of what can be expected for temperatures and precipitation. The temperature graphic will show the probability that the temperature will be above normal (shades of orange and red) and below normal (shades of blue). The same is done for the precipitation, with above normal forecasts depicted with shades of green and below normal values depicted with shades of brown. Both temperature and precipitation forecasts are created for days 6-10 and 8-14, as well as for one month (monthly outlook) and for the next three months (seasonal outlook). Additionally, a drought outlook and a graphic of hazards relating to temperature/wind (extreme heat or cold), precipitation (heavy rain/flooding) and soil/wildfire (drought) are available.

Within the outlooks, the chance of the temperature or precipitation being above or below normal is broken down into percentage of occurrence. In the month and three month outlooks, the temperature and precipitation chances are broken down into percentages as well, though rather than stating a normal chance, these areas are defined by "EC" or equal chance. Equal chance means there is an equal chance (33.3%) of the temperature/precipitation being above, below or near normal levels.

Hydrometeorological Prediction Center (HPC) Products

http://www.hpc.ncep.noaa.gov/

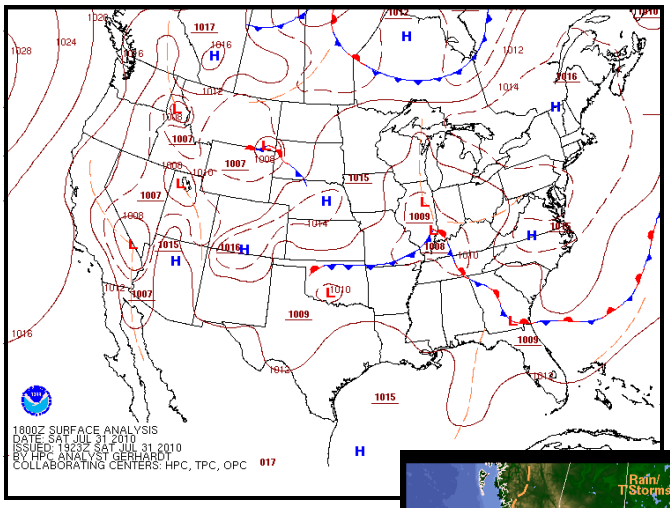
HPC is located in the World Weather Building in Camp Springs, MD and is one of the nine National Centers for Environmental Prediction (NCEP). The HPC exists to meet the real-time weather information needs of a growing group of users including NWS field offices, other governmental agencies, the media, the private sector, academic institutions, the international community, and the general public. The HPC helps support the NWS mission of protecting lives and property and enhancing the national economy.

List of HPC text products:

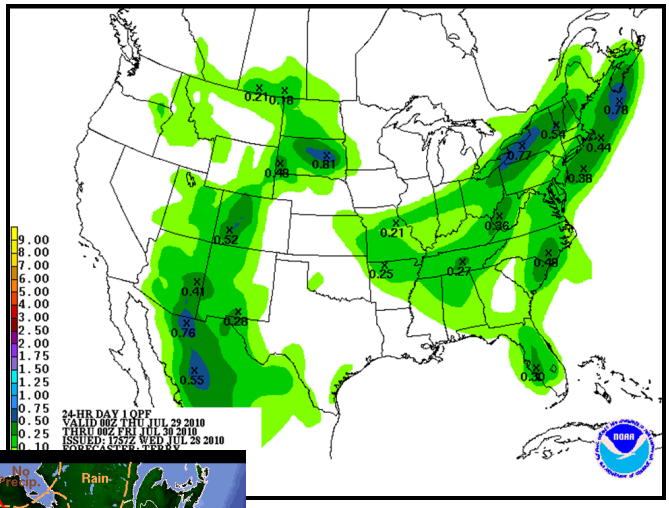
- Short Range Public Forecast Discussion (PMDSPD)
- Preliminary Extended Forecast Discussion (PREEPD)
- Final Extended Forecast Discussion (PMDEPD)
- Quantitative Precipitation Forecast Discussion (QPFPFD)
- Excessive Rainfall Discussion (QPFERD)
- Heavy Snow Discussion (QPFHSD)
- Model Diagnostic Discussion (PMDHMD)
- NAM Air Quality Diagnostic Discussion
- Hawaiian Message (PMDHI)
- Alaskan Extended Forecast Discussion
- South American Synopsis (PMDSA)
- South American Model Discussion (PMDSA)
- Caribbean Narrative (PMDCA)
- Storm Summaries
- Tropical Public Advisories - Atlantic
- Tropical Public Advisories - Pacific

http://www.hpc.ncep.noaa.gov/html/discuss.shtml

Other examples of HPC products:

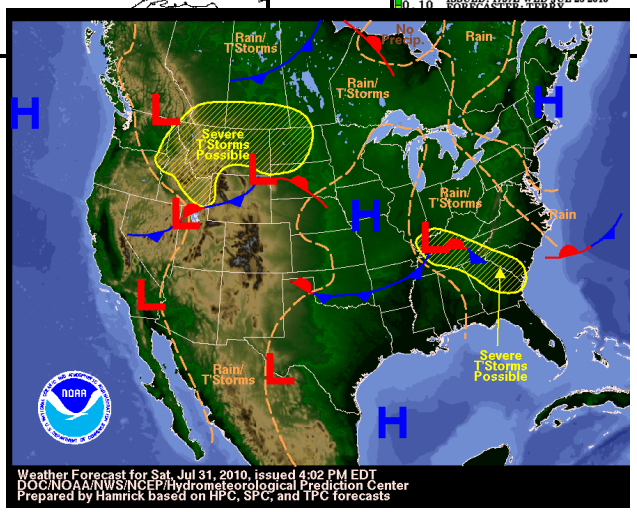


Surface Analysis Maps



Quantitative Precipitation Forecasts

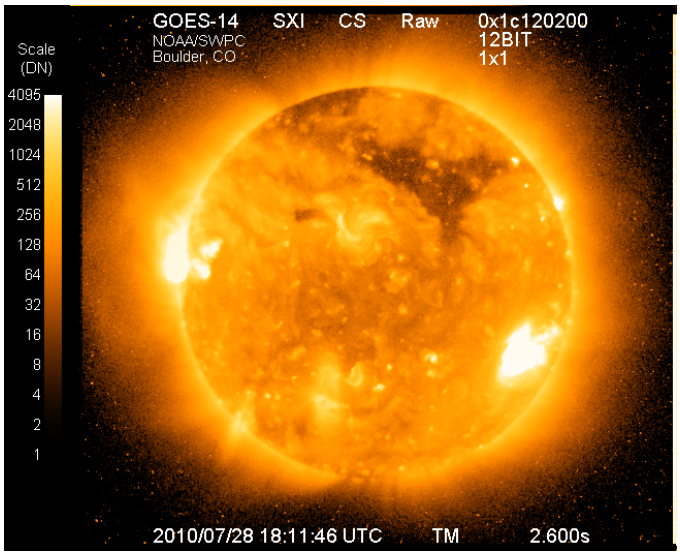
Surface Analysis and Forecast MAPS



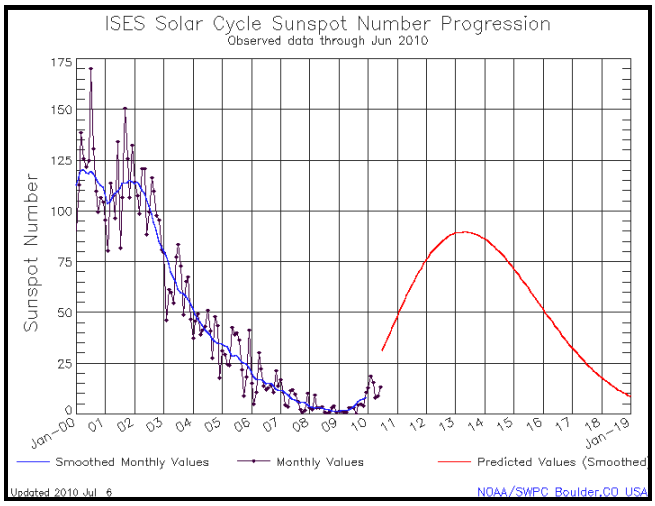
Space Weather Prediction Center (SWPC) Products

http://www.swpc.noaa.gov/

The SWPC provides real-time monitoring and forecasting of solar and geophysical events that impact satellites, power grids, communications, navigation and many other technological systems. SWPC also explores and evaluates new models and products and transitions them into operations. SWPC is the primary warning center for the International Space Environment Service and works with many national and international partners with whom data, products and services are shared.



Alerts and Forecasts



Example of SWPC Bulletin:

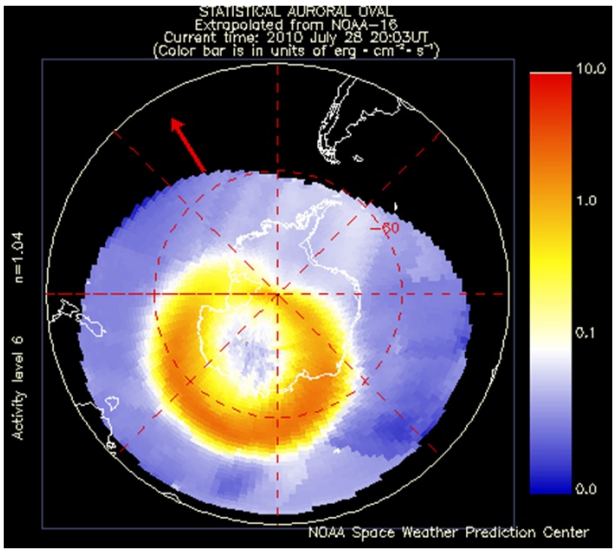
SPACE WEATHER ADVISORY BULLETIN #10- 1
2010 April 05 at 12:13 p.m. MST (2010 April 05 1213 UTC)

****** STRONG GEOMAGNETIC STORM IN PROGRESS ******

A geomagnetic storm began at 05:55 AM EST Monday, April 5, 2010. Space weather storm levels reached Strong (G3) levels on the Geomagnetic Storms Space Weather Scale. The source of the storming is an Earth-directed Coronal Mass Ejection associated with a weak solar flare that occurred in Active Region 1059 on April 3 at 05:54 AM EST. This is expected to be an isolated storm that should subside quickly. Other than the flare and CME erupting on April 3, this active region has not produced any significant activity. Systems that can be affected include electric power systems, spacecraft operations, high-frequency communications, GPS, and other navigation systems.

Other Products and Services:

- **SWPC Reports and Summaries (example below)**
  - *Solar Activity Forecast: Solar activity is expected to be at very low levels. However, there will be a chance for an isolated C-class flare from Region 1089.*
  - *Geophysical Activity Forecast: Geomagnetic field activity is expected to decrease to quiet to unsettled levels during days 1 - 2 (28 - 29 July) as the coronal hole high-speed stream gradually subsides. Quiet conditions are expected on day 3 (30 July).*
- **Space Weather Models**
- **Solar and Geometric Indices**
- **Instrument Measurements**



Aviation Weather Center (AWC) Products

http://aviationweather.gov/

The primary responsibility of the AWC is to provide guidance and products for aviation planning purposes. The AWC issues warnings that cover the conterminous United States and extend over large portions of the North Pacific and North Atlantic airspace.

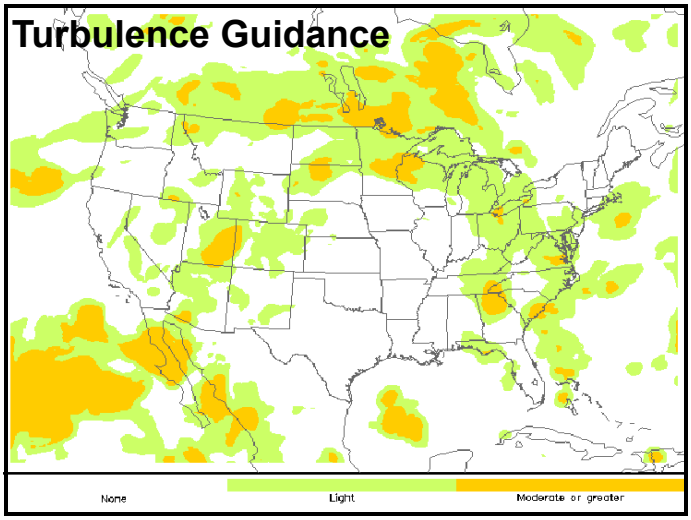
The AWC issues two primary text products:

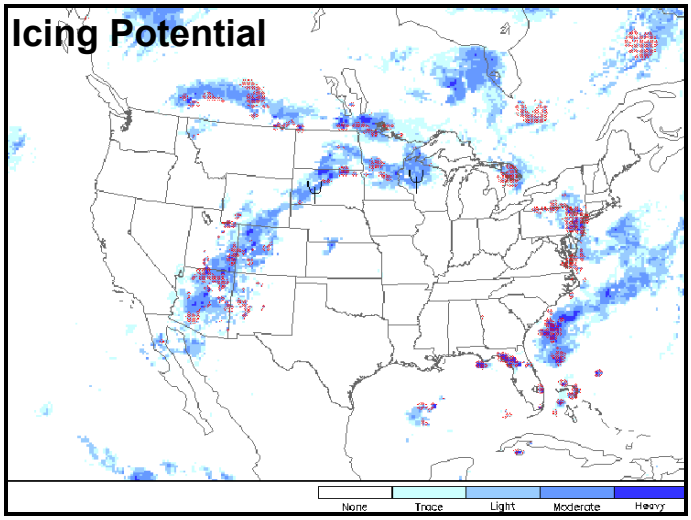
- **AIRMET** (Airmen's Meteorological Information): Information on icing, turbulence, mountain obscuration, low-level wind shear, instrument meteorological conditions, and strong surface winds.

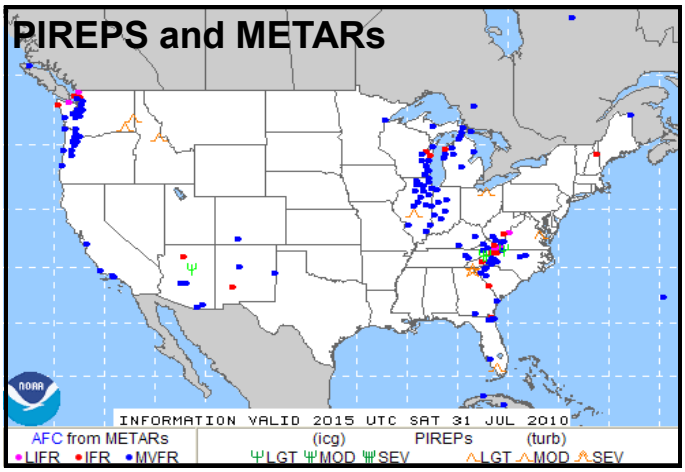
- **SIGMET** (Significant Meteorological Information)
  Convective: Issued for an area of thunderstorms affecting an area of 3,000 square miles or greater, a line of thunderstorms at least 60 mi long, and/or severe or embedded thunderstorms affecting any area that are expected to last 30 minutes or longer.
  Non-convective: Issued for severe or greater turbulence, severe or greater icing, or instrument meteorological conditions due to dust, sand, or volcanic ash (over 3,000 square mile areas).

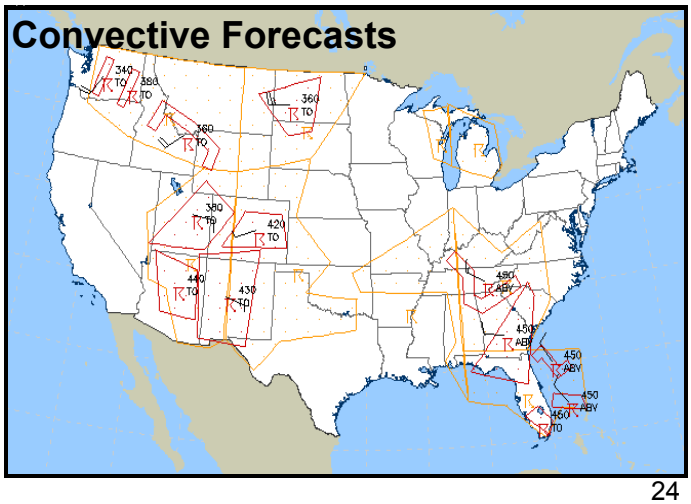
The AWC also produces several graphical products including analysis and prognostic charts, graphical wind and temperature charts, and turbulence guidance.

In addition to these products, the AWC, in a joint effort with several organizations, provides a comprehensive website for the aviation community. The Aviation Digital Data Service **(ADDS)** makes text, digital and graphical forecast products, weather analyses and observations of aviation-related weather variables available in one location on the web.









Tsunami Warning Center (TWC) Products

http://tsunami.gov/

NOAA's tsunami mission is to provide reliable tsunami detection, forecasts and warnings and to promote community resilience. The primary objectives for carrying out this mission are to rapidly locate, size, and otherwise characterize major earthquakes, determine their tsunamigenic potential, predict tsunami arrival times, predict coastal flooding when possible, and disseminate appropriate warning and informational products based on this information.

The primary recipients of tsunami messages are coastal state/province departments of emergency services, the Federal Emergency Management Agency, National Weather Service offices, Canada's Atlantic Storm Prediction Center, the U.S. Coast Guard, and military bases. While these agencies are considered primary, the bulletins are available through a variety of means.

The TWC issue warnings, watches, advisories, and information statements. Each has a distinct meaning relating to local emergency response. In summary:

Warning -> Inundating wave possible -> Full evacuation suggested

Watch -> Danger level not yet known -> Stay alert for more info

Advisory -> Strong currents likely -> Stay away from the shore

Information -> Minor waves at most -> No action suggested

Tsunami Warning: A tsunami warning is issued when a potential tsunami with significant widespread inundation is imminent or expected. Warnings alert the public that widespread, dangerous coastal flooding accompanied by powerful currents is possible and may continue for several hours after arrival of the initial wave. Warnings also alert emergency management officials to take action for the entire tsunami hazard zone. Appropriate actions to be taken by local officials may include the evacuation of low-lying coastal areas and the repositioning of ships to deep waters when there is time to safely do so. Warnings may be updated, adjusted geographically, downgraded or canceled. To provide the earliest possible alert, initial warnings are normally based only on seismic information.

Tsunami Watch: A tsunami watch is issued to alert emergency management officials and the public of an event which may later impact the watch area. The watch area may be upgraded to a warning or advisory, or canceled, based on updated information and analysis. Therefore, emergency management officials and the public should prepare to take action. Watches are normally issued based on seismic information without confirmation that a destructive tsunami is underway.

Tsunami Advisory: A tsunami advisory is issued due to the threat of a potential tsunami which may produce strong currents or waves dangerous to those in or near the water. Coastal regions historically prone to damage due to strong currents induced by tsunamis are at the greatest risk. The threat may continue for several hours after the arrival of the initial wave, but significant widespread inundation is not expected for areas under an advisory. Appropriate actions to be taken by local officials may include closing beaches, evacuating harbors and marinas and the repositioning of ships to deep waters when there is time to safely do so. Advisories are normally updated to continue the advisory, expand/contract affected areas, upgrade to a warning or cancel the advisory.

Tsunami Information Statement: A tsunami information statement is issued to inform emergency management officials and the public that an earthquake has occurred, or that a tsunami warning, watch or advisory has been issued for another section of the ocean. In most cases, information statements are issued to indicate there is no threat of a destructive tsunami and to prevent unnecessary evacuations as the earthquake may have been felt in coastal areas.

Example of a Tsunami Warning:

```
PZZ535-530-545-560-455-540-450-356-353-350-255-250-210-110-
156-153-150-130>135-CAZ006-506-508-509-514-505-002-001-ORZ022-
002-021-001-WAZ503-506>511-001-514>517-021-312022-
/X.NEW.PAAQ.TS.W.0063.090131T1922Z-000000T0000Z/
COASTAL AREAS BETWEEN AND INCLUDING POINT SUR CALIFORNIA TO
THE WASHINGTON-BRITISH COLUMBIA BORDER
1122 AM PST SAT JAN 31 2009

...A TEST TSUNAMI WARNING IS IN EFFECT WHICH INCLUDES THE
COASTAL AREAS OF CALIFORNIA - OREGON AND WASHINGTON FROM
POINT SUR CALIFORNIA TO THE WASHINGTON-BRITISH COLUMBIA BORDER...

TSUNAMI WARNINGS MEAN THAT A TSUNAMI WITH SIGNIFICANT WIDESPREAD
INUNDATION IS IMMINENT OR EXPECTED. TSUNAMIS ARE A SERIES OF
WAVES POTENTIALLY DANGEROUS SEVERAL HOURS AFTER INITIAL ARRIVAL
TIME. ESTIMATED TIMES OF INITIAL WAVE ARRIVAL FOR SELECTED
SITES IN THE WARNING ARE PROVIDED BELOW.

CRESCENT CITY-CA 1144 PST JAN 31 WESTPORT-WA 1258 PST JAN 31
CHARLESTON-OR 1208 PST JAN 31 SAN FRANCISCO-CA 1304 PST JAN 31
SEASIDE-OR 1247 PST JAN 31 NEAH BAY-WA 1308 PST JAN 31

FOR ARRIVAL TIMES AT ADDITIONAL LOCATIONS SEE
WCATWC.ARH.NOAA.GOV
```

Example of Other Information Included Tsunami Products:

```
RECOMMENDED ACTIONS
IT IS NOT KNOWN - REPEAT NOT KNOWN - IF A TSUNAMI EXISTS BUT A
TSUNAMI MAY HAVE BEEN GENERATED. PERSONS IN LOW-LYING COASTAL
AREAS SHOULD BE ALERT TO INSTRUCTIONS FROM THEIR LOCAL EMERGENCY
OFFICIALS. EVACUATIONS ARE ONLY ORDERED BY EMERGENCY RESPONSE AGENCIES.

- PERSONS IN TSUNAMI WARNING COASTAL AREAS SHOULD MOVE INLAND TO
  HIGHER GROUND.

- PERSONS IN TSUNAMI ADVISORY AREAS SHOULD MOVE OUT OF THE
  WATER... OFF THE BEACH AND OUT OF HARBORS AND MARINAS.

THIS MESSAGE IS BASED MAINLY ON EARTHQUAKE DATA. AS MORE
INFORMATION BECOMES AVAILABLE THE WARNING AND ADVISORY AREAS
WILL BE REFINED.

PRELIMINARY EARTHQUAKE PARAMETERS
MAGNITUDE - 7.7
TIME - 1015 AKST JAN 31 2009
       1115 PST JAN 31 2009
       1915 UTC JAN 31 2009

LOCATION - 42.0 NORTH 124.0 WEST
           85 MILES/137 KM N OF EUREKA CALIFORNIA
           255 MILES/410 KM SW OF PORTLAND OREGON

DEPTH - 6 MILES/10 KM

THE PACIFIC TSUNAMI WARNING CENTER IN EWA BEACH HAWAII WILL
ISSUE MESSAGES FOR HAWAII AND OTHER AREAS OF THE PACIFIC
OUTSIDE THE STATES AND PROVINCES LISTED ABOVE.
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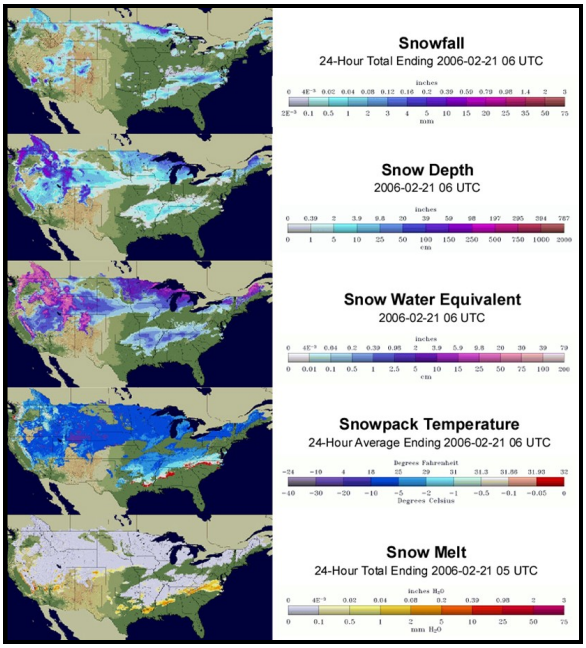
National Operational Hydrologic Remote Sensing Center (NOHRSC)

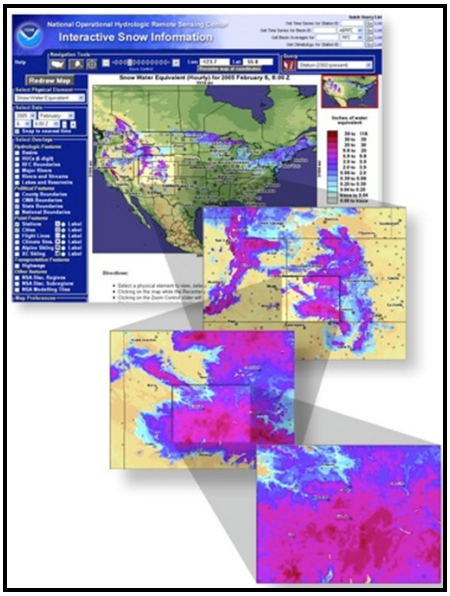
http://www.nohrsc.nws.gov/

National Snow Analysis



The NOHRSC produces a daily National Snow Analysis (NSA) for the conterminous U.S. using a physically-based energy-and-mass-balance model operated on a 1-km spatial scale with hourly temporal scale. The NOHRSC snow model ingests all available ground-based, airborne and satellite snow observations and assimilates these observations into the snow model state variables to provide the most up-to-date estimates of snowpack properties. The NSA provides estimates of snow water equivalent, snow depth, surface and profile snowpack temperatures, snowmelt, surface and blowing snow sublimation, snow-surface energy exchanges and precipitation. NSA product formats include: (1) daily national and regional maps for nine snowpack characteristics, (2) seasonal, two-week, and 24 hour movie-loop animations for nine snowpack characteristics, (3) text summaries, (4) a suite of interactive maps, text, and time series products including weather observations and (5) gridded snow products for the CONUS.

Airborne Snow Survey Program

The NOHRSC has developed, and currently maintains, an operational Airborne Gamma Radiation Snow Survey Program to make airborne snow water equivalent (SWE) and soil moisture measurements. Airborne SWE measurements are integrated into the NOHRSC NSA and are used by WFOs and RFCs when issuing river and flood forecasts, water supply forecasts and spring flood outlooks. Local emergency managers, in turn, use this information when planning for flood events.

The NOHRSC pilots assist local and regional NWS offices by taking aerial photographs during snow surveys and publishing them to the NOHRSC webpage. During emergencies, when aircraft availability permits, NOHRSC pilots can conduct aerial surveys of flood extent, ice jam extent and even photograph damage from natural disasters such as tornadoes.