ESSENTIALS OF METEOROLOGY (7th ed.)

WEBLINKS

Chapter 1

A Career Guide in the Atmospheric Sciences

http://www.ametsoc.org/AtmosCareers/index.html

Find out about a career in meteorology

AirNow

http://airnow.gov/

Track ozone in real-time and its impact on the Air Quality Index (AQI).

Answers @ NOAA _ Pressure

http://findanswers.noaa.gov/noaa.answers/consumer/Search.asp?catID2=221&catID1=52&SearchType=advanced

Check out answers from NOAA about barometric pressure questions.

Atmospheric

http://weather.uwyo.edu/upperair/sounding.html

Plot current and past soundings of the temperature and humidity high in the atmosphere.

Billion Dollar U.S. Weather Disasters

http://www.ncdc.noaa.gov/oa/reports/billionz.html

Search a comprehensive list of $1B weather disasters affecting the United States since 1980.

Global Measured Extremes of Temperature and Precipitation

http://www.ncdc.noaa.gov/oa/climate/globalextremes.html

View a continent-by-continent summary of weather extremes.

International Commission on History of Meteorology

http://www.meteohistory.org/

View a comprehensive history of meteorology from the International Commission on History of Meteorology.

Measuring, Visualizing, and Analyzing Wind

http://www.uwsp.edu/geo/faculty/ritter/geog101/textbook/circulation/digging_deeper_wind.html

Visualize the wind using the Beauforrt Scale and other tools.

NWS Radiosonde Factsheet

http://www.ua.nws.noaa.gov/factsheet.htm

Get the basics on the NWS radiosonde program.

NWS Weather Fatality, Injury and Damage Statistics

http://www.nws.noaa.gov/om/hazstats.shtml

Explore the causes of weather-related fatalities in the United States.

Ozone Hole Education Resources

http://ozonewatch.gsfc.nasa.gov/education/index.html

This NASA site is an in-depth look at the causes of the ozone as well as its past, present and future.

Standard Atmosphere

http://ggweather.com/standard_atmosphere.htm

Use this table to determine the relationship of pressure, humidity and temperature.

The Hydrologic Cycle

http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/hyd/home.rxml

Dive into the hydrologic cycle with this tutorial from the University of Illinois, Urbana.

Trends in Carbon Dioxide

http://www.esrl.noaa.gov/gmd/ccgg/trends/

Monitoer atmospheric carbon dioxide from NOAA's Earth Systems Research Lab on Mauna Loa in Hawaii.

Water Cycle Summary

http://ga.water.usgs.gov/edu/watercyclesummary.html

Visually track the course of water through the atmosphere, oceans and land.

Weather Calculator

http://ggweather.com/calc.htm

Convert between temperature scales, plus calculate heat index and wind chill.

Chapter 2

Climate and Earth's Energy Budget

http://earthobservatory.nasa.gov/Features/EnergyBalance/page6.php

Visualize the sun and earth energy budget.

Geophysical Institute Aurora Forecast

http://www.gedds.alaska.edu/auroraforecast/

Monitor the latest effects of the solar wind in creating the Aurora Borealis and Aurora Australis.

News about Space Weather

http://www.spaceweather.com/

Find out news and events plus extensive background about space weather from this preeminent site on the topic.

Orbits and Light

http://astro.unl.edu/naap/motion1/orbits_light.html

The orientation of the sun's rays is graphically presented to show their radiant energy at different sun orientations.

Ozone Hole Watch

http://ozonewatch.gsfc.nasa.gov/education/index.html

Monitor the latest news and data about the earth's ozone hole.

Seasons and Ecliptic Simulator

http://astro.unl.edu/naap/motion1/animations/seasons_ecliptic.html

See an animated look at the tilt and rotation of the earth as it revolves around the sun.

The Electromagnetic Spectrum

http://imagine.gsfc.nasa.gov/docs/science/know_l2/emspectrum.html

See animations and explanations of the Electromagnetic Spectrum from NASA.

Today's Space Weather

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

Track space weather and its impact on the atmosphere with daily data from NOAA.

What Is the UV Index?

http://www.epa.gov/sunwise/doc/what_is_uvindex.html

Explore the UV Index and its effects on health.

Chapter 3

Contour Analysis

http://itg1.meteor.wisc.edu/wxwise/contour/

Learn to draw isotherms on a weather map through a series of contouring exercises.

NWS Jetstream - Wind Chill

http://www.srh.noaa.gov/jetstream//global/chill.htm

Graphical charts and tables illustrate the combined effects of temperature and winds.

Synoptic Climatology Lab

http://www.as.miami.edu/geography/research/climatology/

Visit the preeminent laboratory researching heat health issues.

WMO Weather & Climate Extremes Map

http://wmo.asu.edu/maps/map.html

Use a graphical interface to find worldwide temperature extremes by continent.

Weather Instrument Shelter

http://www.erh.noaa.gov/rah/education/edu2.html

Build and site an instrument shelter for accurate temperature readings.

World Weather/Climate Extremes Archive

http://wmo.asu.edu/

Browse through the official World Meteorological Organization archive of extreme temperatures.

Chapter 4

Cloud and Precipitation Online

http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/cld/home.rxml

Learn about the formation of clouds in this online tutorial.

Fog

http://www.sciencedaily.com/articles/f/fog.htm

Get the latest news and articles about fog.

NGA - Constable's Greatest Landscapes

http://www.nga.gov/exhibitions/2006/constable/earlylife.shtm

Learn about the arguably world's best cloud painter from the National Gallery of Art.

NWS Jetstream - Heat Index

http://www.srh.noaa.gov/jetstream//global/hi.htm

Graphical charts and tables illustrate the combined effects of temperature and humidity.

The Cloud Appreciation Society

http://www.cloudappreciationsociety.org/gallery/

Marvel at this amazing collection of every imaginable cloud type.

The Killer Fog of '52

http://www.npr.org/templates/story/story.php?storyId=873954

Listen and view this in-depth look at London's "Killer Fog" of 1952.

Chapter 5

ADDS Icing

http://aviationweather.gov/adds/icing/

Monitor aviation icing conditions and warnings in near real-time.

About NEXRAD

http://www.wunderground.com/radar/help.asp

Read this in-depth explainer about Doppler radar from Weather Underground.

Avalanche.org

http://www.avalanche.org/

Find out about all aspects of avalanches, from how and where they form to where there are warnings.

Calculating the LCL

http://san.hufs.ac.kr/~gwlee/session3/lcl1calc.html

Use an interactive JavaScript to calculate the Lifting Condensation Level.

Explanation of Atmospheric Stability/Instability

http://www.piercecollegeweather.com/stability.php

Find out more about atmospheric stability from this well-illustrated explainion on the topic.

Introduction to High Impact Meteorology

http://severewx.atmos.uiuc.edu/index.5.html

Watch animated examples of diurnal changes in atmospheric stability.

Lifting by Convection

http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/cld/dvlp/cnvct.rxml

Walk through an excellent tutorial about cloud formation due to convection.

National Weather Service Doppler radar Images

http://radar.weather.gov/

Access the latest Doppler radar imagery from the official NWS NEXRAD site.

Rainfall Extremes

http://wmo.asu.edu/

Check out the official World Meteorological Organization archive of extreme precipitation events.

Science Daily Precipitation

http://www.sciencedaily.com/search/?keyword=precipitation

See the latest news and articles about precipitation.

Snow Flakes and Snow Crystals

http://www.its.caltech.edu/~atomic/snowcrystals/

Marvel at the myriad of beautiful snowflakes as well as in-depth snowflake physics.

Stability and Cloud Development

http://apollo.lsc.vsc.edu/classes/met130/notes/chapter6/index.html

Walk through step-by-step changes in stability.

TRMM Tropical Cyclones - Wind Tutorial

http://www.nrlmry.navy.mil/sat_training/tropical_cyclones/trmm/wind/index.html

Take this Navy NRL TRMM Tropical Cyclone Wind tutorial to see wind fields around tropical storms and hurricanes.

Weather Modification and Cloud Seeding Fact Sheet

http://www2.ucar.edu/news/weather-modification-and-cloud-seeding-fact-sheet

Find out the latest "state of the science" from UCAR.

Chapter 6

Beaufort Scale

http://ggweather.com/101/beaufort.htm

Estimate the wind speed on land or water using the Beaufort Scale.

Contour Analysis

http://itg1.meteor.wisc.edu/wxwise/contour/

Learn how weather maps represent data through a series of contouring exercises.

Coriolis Force and Noninertial Effects

http://www.physics.orst.edu/~mcintyre/coriolis/

Try a number of different animations to illustrate motion induced by the Coriolis Force.

Geostationary Satellite Server

http://www.goes.noaa.gov/WINDS/index.html

View high-density winds measured from satellites and plotted on satellite imagery.

Observe how the Coriolis effect influences wind direction.

http://www.classzone.com/books/earth_science/terc/content/visualizations/es1905/es1905page01.cfm?chapter_no=visualization

Explore the changes of wind direction due to the Coriolis Force.

Snow Roller Event

http://www.crh.noaa.gov/ilx/events/roller/roller.php

Find out how the fascinating phenomena known as snow rollers form.

Weather Maps

http://ww2010.atmos.uiuc.edu/(Gh)/guides/maps/home.rxml

Explore the basics of surface and upper air weather maps.

Wind Profiler Data

http://www.esrl.noaa.gov/psd/data/obs/

See PSD profiler winds from dozens of sites plotted on Google Earth.

Wind, Swell and Rouge Waves

http://www.srh.noaa.gov/jetstream//ocean/waves.htm

View this excellent NWS tutorial about "rogue" waves.

World: Maximum Surface Wind Gust

http://wmo.asu.edu/world-maximum-surface-wind-gust

Check out the new world record wind gust of 253 mph!

Chapter 7

ADD Turbulence

http://aviationweather.gov/adds/turbulence/

Check the latest aircraft turbulence maps and warning across the United States.

Average Global Wind Speed

http://www.climate-charts.com/World-Climate-Maps.html#wind-speed

See a global representation of average wind speeds across the world.

El Niño Southern Oscillation

http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/enso.shtml

Learn about El Niño and La Nino plus their impacts worldwide.

Evaluation of global wind power

http://www.stanford.edu/group/efmh/winds/global_winds.html

Browse this up-to-date study of global wind energy potential.

Global Circulation

http://www.atmosphere.mpg.de/enid/3sj.html

Study this 3-D representation of the global circulation model.

Modeling Date: ENSO Impacts

http://www.cpc.noaa.gov/products/analysis_monitoring/ensostuff/ensoyears.shtml

Track past and present El Niño and La Nina events using the Oceanic Nino Index.

North American Winter Wind

http://www.cpc.noaa.gov/products/analysis_monitoring/ensocycle/nawinter.shtml

Compare the winter jet stream during El Niño or La Nina.

Seasonal ENSO Impacts

http://www.cpc.ncep.noaa.gov/products/predictions/threats2/enso/elnino/

See the impact of El Niño on the temperature and precipitation of individual states.

The Pacific Decadal Oscillation (PDO)

http://jisao.washington.edu/pdo/

Take an in-depth look at the Pacific Decadal Oscillation and its impact on global weather.

The Santa Ana Winds

http://www.atmos.ucla.edu/~fovell/ASother/mm5/SantaAna/winds.html

Study this detailed UCLA analysis of Santa Ana winds in Southern California.

Chapter 8

Air masses and Fronts

http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/af/home.rxml

Explore this online UIUC tutorial about the basic types of air masses.

Cyclogenesis - The Development of Mid Latitude Cyclones

http://msx4.pha.jhu.edu/ssip/asat_int/cyclogen.html

Discover the processes of cyclogenesis in the middle latitudes.

Ice Storm Hits the United States

http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=36886

View the impact of a historic ice storm across the upper Midwest in 2009.

Lake Effect Snow

http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=17770

Observe high-resolution satellite imagery and explanation from NASA.

Lake Effect Snow

http://www-das.uwyo.edu/~geerts/cwx/notes/chap10/lake_effect_snow.html

Read this in-depth look at what causes and the impacts of lake effect snow.

Nor' Easters

http://www.noaa.gov/features/03_protecting/noreasters.html

Study the impact of Nor'easters on New England.

Oregon Windstorms

http://www.wrh.noaa.gov/pqr/paststorms/wind.php

Explore a variety of severe Oregon storms, including the Columbus Day Storm of 1962.

Superstorm 1993

http://ww2010.atmos.uiuc.edu/(Gh)/arch/cases/930312/home.rxml

Take a detailed look at the infamous March 1993 "Storm of the Century".

The Perfect Storm 1991

http://www.ncdc.noaa.gov/oa/satellite/satelliteseye/cyclones/pfctstorm91/pfctstorm.html

Check out this scientific look at the "Perfect Storm."

Winter Storms

http://www.nesec.org/hazards/winter_storms.cfm.html

Rank storms in the Northeast US with the NESIS, the NE Snowstorm Impact Scale.

Winter storm - Deceptive Killers

http://www.nws.noaa.gov/os/brochures.shtml#winter

Check out winter storm information and safety tips for you and your family.

Chapter 9

AWS - International Satellite Imagery

http://aviationweather.gov/obs/sat/intl/

View mosaics of satellite imagery from around the globe.

Climate Prediction Center

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

See the latest weekly, monthly and seasonal forecasts plus expert assessments from these forecasts.

HPC Quantitative Precipitation Forecasts

http://www.hpc.ncep.noaa.gov/qpf/qpf2.shtml

See the latest forecast rainfall amounts from the Hydrologic Prediction Center.

Interpreting Weather-Satellite Images

http://funnel.sfsu.edu/satlab/

Walk through this online tutorial of basic satellite imagery interpretation from SFSU.

MODIS Rapid Response System Gallery

http://rapidfire.sci.gsfc.nasa.gov/gallery/

Zoom in on the very latest high-resolution satellite image that is updated daily.

NASA Earth Observatory

http://earthobservatory.nasa.gov/

Get the latest satellite imagery from NASA with in-depth explanation and an extensive archive.

NCEP Ensemble Products

http://www.emc.ncep.noaa.gov/gmb/ens/

View explanations plus operational ensemble model forecasts.

NCEP Loops page

http://ggweather.com/loops/ncep_loops.htm

Check out a wide variety of weather forecasts models from NCEP.

NWS/SPC Watch, Warning, Advisory Display

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

View a graphical Display of all NWS Watches, Warnings and Advisories.

National Centers for Environmental Prediction

http://www.srh.noaa.gov/srh/jetstream/nws/ncep.htm

Follow links to all nine of the National Center for Environmental Prediction national centers.

National Environment Satellite

http://www.ssd.noaa.gov/

Find the latest satellite imagery and remote sensing data from the NOAA.

Project Datastreme

http://www.ametsoc.org/amsedu/dstreme/index.html

View real-time weather maps and charts used as part of the AMS Datastreme project.

SSEC - Images and Data

http://www.ssec.wisc.edu/data/

Explore the vast resources of satellite imagery and related data from the University of Wisconsin.

Weather Forecasting Online Guide

http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/fcst/home.rxml

Take this online tutorial that shows the various elements used in making a weather forecast.

Chapter 10

About Derechos

http://www.spc.noaa.gov/misc/AbtDerechos/derechofacts.htm#bowecho

Check out everything you ever wanted to know about derechos.

About Thunderstorms

http://www.nssl.noaa.gov/research/thunderstorms/

Read the Severe Storms Lab's comprehensive FAQ about thunderstorms.

About Tornadoes

http://www.nssl.noaa.gov/research/tornadoes/

Find out about the basics of tornadoes in this FAQ from NSSL.

Center for Analysis and Prediction of Storms

http://www.caps.ou.edu/

Learn about the Oklahoma University Center for Analysis and Prediction of Storms (CAPS)

Components of Thunderstorms

http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/svr/comp/home.rxml

Examine the components of thunderstorm development.

Enhanced Fujita Scale

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

Learn about how tornadoes are ranked with the Enhanced Fujita Scale.

Flash Floods and Hail

http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/svr/dngr/flood.rxml

View the variety of dangers from thunderstorms.

Lightning FAQ

http://www.nssl.noaa.gov/faq/faq_ltg.php

Browse this in-depth lightning FAQ produced by the National Severe Storms Lab.

May 1999 Tornado Outbreak

http://www.nssl.noaa.gov/news/may3rd/outbreak.html

View this analysis of one of the deadliest tornado outbreaks in recent history

Microburst Handbook

http://www.cimms.ou.edu/~doswell/microbursts/Handbook.html

Take an in-depth look at microbursts and downdrafts at this web version of the NOAA handbook.

National Severe Storms Laboratory

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

Check out the National Severe Storms Laboratory and the products they issue.

Severe and Hazardous Meteorology

http://severewx.atmos.uiuc.edu/index.17.html

View the elements of thunderstorms as a part of high impact meteorology.

Squall-Line/Bow echoes

http://www.crh.noaa.gov/lmk/soo/docu/bowecho.php

Study the structure and development of squall lines and bow echoes.

Storm Prediction Center Product & Report Archives

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

Check out the Storm Prediction Center archive of past thunderstorms

Stormtrack

http://www.stormtrack.org/

Monitor the latest activities of storm chasers looking for tornadoes.

Structure and Dynamics of Supercell Thunderstorms

http://www.crh.noaa.gov/lmk/soo/docu/supercell.php

Discover the dynamics of supercell thunderstorms.

The Basics of Storm Spotting

http://www.srh.noaa.gov/oun/?n=stormspotting-basics

Learn the basics about thunderstorms and storm spotting.

Tornado Project Online

http://www.tornadoproject.com/

Browse information about tornadoes, storm chasing and oddities.

U.S. Tornado Climatology

http://www.ncdc.noaa.gov/oa/climate/severeweather/tornadoes.html

Peruse the NCDC database of tornado climatology.

Vortex 2

http://www.vortex2.org/home/

Chase tornadoes with the latest and largest tornado research project.

Chapter 11

FAQ: Hurricanes, Typhoons, Tropical Cyclones

http://www.aoml.noaa.gov/hrd/weather_sub/faq.html

Read the official NOAA FAQ about tropical storms and hurricanes.

Glossary of NHC Terms

http://www.nhc.noaa.gov/aboutgloss.shtml

Browse the National Hurricane Center's Glossary of tropical storm terminology.

Hurricane Katrina

http://www.ncdc.noaa.gov/special-reports/katrina.html

Read this in-depth analysis of the meteorology and impact of Hurricane Katrina in 2005.

NAVY NRL Tropical Cyclone Page

http://www.nrlmry.navy.mil/tc_pages/tc_home.html

Keep track of tropical cyclones worldwide with satellite imagery and storm tracks.

National Hurricane Center

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

Monitor the latest hurricane and tropical storm positions and forecasts.

Saffir-Simpson Hurricane Wind Scale

http://www.nhc.noaa.gov/sshws.shtml

Evaluate hurricanes, typhoons and tropical storms using the Saffir-Simpson Scale.

Tropical Meteorology Project

http://typhoon.atmos.colostate.edu/forecasts/

Check out the latest seasonal forecasts for the number of hurricanes and tropical storms in both the Atlantic and Pacific.

Worldwide Tropical Cyclone Names

http://www.nhc.noaa.gov/aboutnames.shtml

Look through the lists of names used for naming tropical storms.

Chapter 12

Camelot Climate Index

http://ggweather.com/camelot.htm

Do you live in the ideal climate?

Climates of the World

http://lwf.ncdc.noaa.gov/oa/documentlibrary/pdf/climatesoftheworld.pdf

View these climate summaries for over 1000 locations worldwide.

Global Climate Maps

http://www.fao.org/sd/EIdirect/climate/EIsp0002.htm

See how many climate parameters are visualized.

National Climatic Data Center

http://lwf.ncdc.noaa.gov/oa/ncdc.html

Explore the climate archives for not only the United States but also the world.

State of the Climate

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

Monitor real-time information about world-wide climate trends.

US Drought Monitor

http://droughtmonitor.unl.edu/

Monitor the latest nationwide drought conditions.

World Climate Index

http://www.climate-charts.com/world-index.html

Check out over 4000 climate charts and tables for locations around the world.

Chapter 13

AMS Information Statement on Climate Change

http://www.ametsoc.org/policy/2007climatechange.html

Read this concise analysis of climate change from the American Meteorological Society.

Bad Greenhouse

http://www.ems.psu.edu/~fraser/Bad/BadGreenhouse.html

Look at why some explanations of the greenhouse effect are full of hot air.

Climate Change - US EPA

http://www.epa.gov/climatechange/

Read through this expansive array of climate change information from the EPA.

Climate Watch Magazine

http://www.climate.gov/#climateWatch

Follow the latest events related to climate change plus the Climate Change Dashboard.

Intergovernmental Panel on Climate Change

http://www.ipcc.ch/

See the official reports from and news about the Intergovernmental Panel on Climate Change

National Climate Data Center

http://lwf.ncdc.noaa.gov/oa/ncdc.html

Browse the archives of past weather observations, maps, imagery and forecasts.

Paleoclimatology

http://earthobservatory.nasa.gov/Features/Paleoclimatology_Evidence/paleoclimatology_evidence_2.php

Explore the concept of rapid climate change using paleoclimatology.

The Ice Ages

http://earthguide.ucsd.edu/virtualmuseum/climatechange2/01_1.shtml

Look at the impact of Ice Ages on climate change through history.

Understanding Climate

http://www.climate.gov/#understandingClimate

Read in-depth explainers about climate and climate change from the US Climate Service.

Volcanoes - Climate Change

http://earthobservatory.nasa.gov/Features/Volcano/

See how volcanic eruptions can influence climate in both the long and short term.

Chapter 14

AQI - Air Quality Index

http://www.airnow.gov/index.cfm?action=aqibasics.aqi

Monitor the latest real-time air quality data and Air Quality Index.

Acid Rain Program

http://www.epa.gov/airmarkets/progsregs/arp/index.html

Find out in-depth information about acid rain in this backgrounder article.

Air Trends

http://www.epa.gov/airtrends/sixpoll.html

Track the long-term changes in a variety of atmospheric pollutants.

AirNow

http://airnow.gov/

Track ozone in real-time and its impact on the Air Quality Index (AQI).

Clean Air Act

http://www.epa.gov/air/caa/

Read the details and background of the US EPA Clean Air Act.

Ozone Hole Education Resources

http://ozonewatch.gsfc.nasa.gov/education/index.html

This NASA site is an in-depth look at the causes of the ozone as well as its past, present and future.

The Killer Fog of '52

http://www.npr.org/templates/story/story.php?storyId=873954

Listen and view this in-depth look at London's "Killer Fog" of 1952.

Chapter 15

An Introduction to Green Flashes

http://mintaka.sdsu.edu/GF/index.html

Solve some of the mysteries of this elusive phenomenon.

Atmospheric Optical Photography

http://www.weatherscapes.com/gallery.php?cat=optics

Gaze through this collection of beautiful optical effects.

Atmospheric Optics

http://www.atoptics.co.uk/

Check out the preeminent site on the web related to atmospheric optical phenomena.

Atmospheric Optics Concepts

http://hyperphysics.phy-astr.gsu.edu/hbase/atmos/atmoscon.html#c1

Follow this concept map to the various branches of atmospheric optical phenomena.

Aurora FAQ

http://odin.gi.alaska.edu/FAQ/#color

Peruse this extensive FAQ about the Northern Lights.

Geophysical Institute Aurora Forecast

http://www.gedds.alaska.edu/auroraforecast/

Monitor the latest effects of the solar wind in creating the Aurora Borealis and Aurora Australis.

Light and Optics

http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/opt/home.rxml

Learn the basics of light and optics in the atmosphere with this UIUC tutorial.