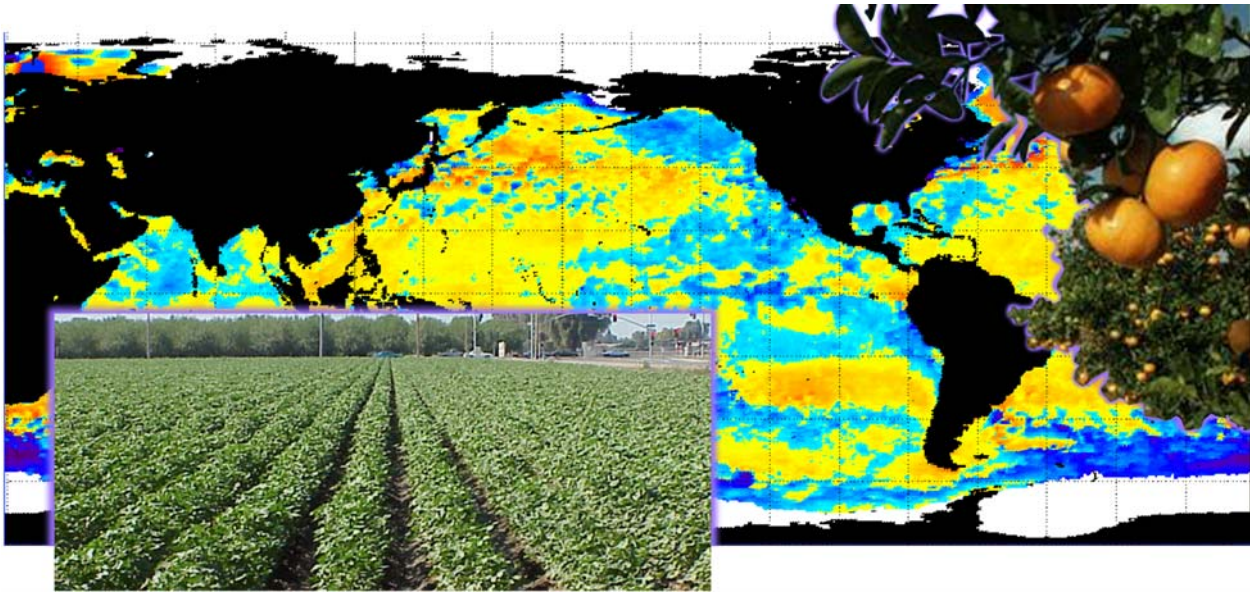
Workbook

Using Climate Forecasts in Agriculture



SART Training Media

Using Climate Forecsts in Agriculture

Workbook

Prepared by: Clyde Fraisse, Climate Extension Scientist, University of Florida, Gainesville
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SART Training Media are available for download from the Florida SART Web site <www.flsart.org>.

Development of *Using Climate Forecasts in Agriculture* was supported by a grant from USDA Risk Management Agency.

Contents

About Florida SART

SART is a group of governmental and private agencies dedicated to effectively communicating and planning for animal and agriculture emergencies and disasters in Florida.

SART operates at the local level through county SART organizations.

SART combines the skills and resources of many agencies, organizations and individuals.

SART supports the county, regional, and state emergency management efforts.

SART Mission

Empower Floridians with training and resources to enhance animal and agriculture disaster response.

SART Goals

- Promote the establishment of a coordinator in each county responsible for all agriculturally related incidents
- Provide assistance in the development and writing of county ESF-17 plans
- Promote the establishment of a County SART for each county
- Provide annual training for all SART and agriculturally-related personnel
- Identify county resources available for an emergency or disaster
- Promote counties to work at a regional level for mutual aid

Subject:	**Introduce basic concepts about climate, specifically the El Niño and La Niña phenomena and their impact on the southeastern United States. Introduce participants to the AgClimate Web site and the tools it provides.**

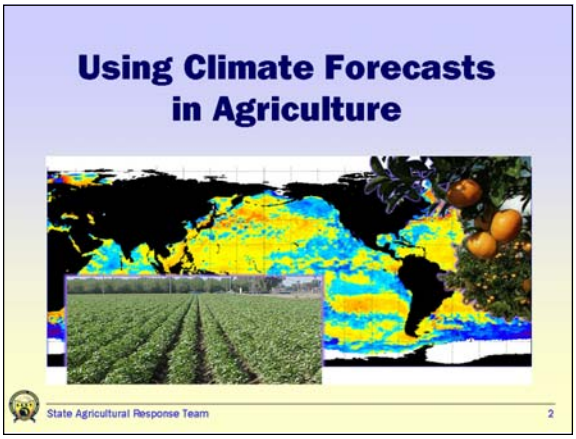
Specific Learning Objectives

At the end of this training module, participants will be able to:

1. Explain **climate** and how it is different from **weather**.
2. Explain the value of climate forecasts to agriculture.
3. Explain **El Niño** and **La Niña events** and how knowing about these climate events helps agriculture.
4. Explain how El Niño and La Niña events affect **rainfall**.
5. Explain how El Niño and La Niña events affect **temperatures** in the Southeast U.S.
6. Explain how El Niño and La Niña events affect **freezes**.
7. Explain how El Niño and La Niña events affect the chance of **hurricanes** hitting the U.S.
8. Explain how El Niño and La Niña events affect the risk of **wild fires**.
9. Explain how El Niño and La Niña events affect **crop production** in the Southeast U.S.
10. Explain **degree-days**, **growing degree-days** and **heat-stress degree-days**.
11. Describe the **AgClimate Web site**.

Slides 1-3


STATE AGRICULTURAL RESPONSE TEAM
S. A. R. T.
FLORIDA


Using Climate Forecasts in Agriculture
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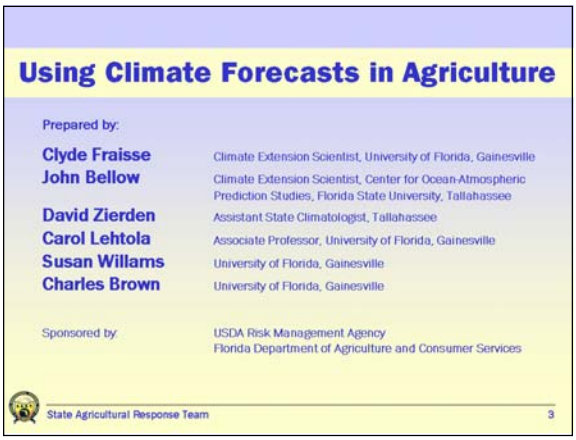
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Sponsored by:
USDA Risk Management Agency
Florida Department of Agriculture and Consumer Services
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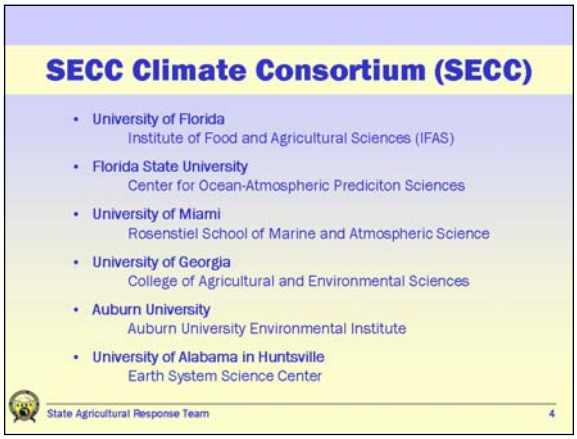
Slides 4-6


SECC Climate Consortium (SECC)
• University of Florida
Institute of Food and Agricultural Sciences (IFAS)
• Florida State University
Center for Ocean-Atmospheric Prediciton Sciences
• University of Miami
Rosenstiel School of Marine and Atmospheric Science
• University of Georgia
College of Agricultural and Environmental Sciences
• Auburn University
Auburn University Environmental Institute
• University of Alabama in Huntsville
Earth System Science Center
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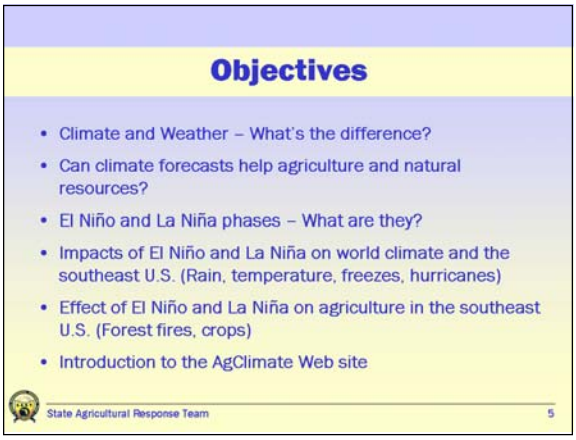
Objectives
• Climate and Weather – What's the difference?
• Can climate forecasts help agriculture and natural resources?
• El Niño and La Niña phases – What are they?
• Impacts of El Niño and La Niña on world climate and the southeast U.S. (Rain, temperature, freezes, hurricanes)
• Effect of El Niño and La Niña on agriculture in the southeast U.S. (Forest fires, crops)
• Introduction to the AgClimate Web site
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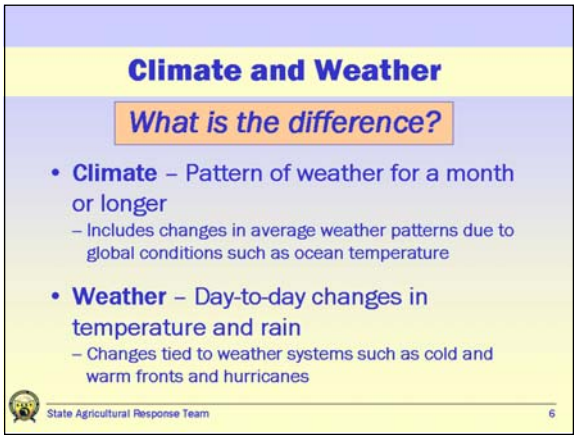
Climate and Weather
What is the difference?
• Climate – Pattern of weather for a month or longer
– Includes changes in average weather patterns due to global conditions such as ocean temperature
• Weather – Day-to-day changes in temperature and rain
– Changes tied to weather systems such as cold and warm fronts and hurricanes
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Slides 7-9

How do climate forecasts help Florida agriculture?

- Decide how to deal with the climate ahead of time
- Deciding ahead of time helps minimize risks to agriculture that may come with seasonal climate variability
- Examples: Climate forecasts can help producers choose which varieties to plant, how much crop insurance to buy, or what chemicals they will need.

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El Niño and La Niña: What are they?

- Caused by changes in sea surface temperature (SST) in the equatorial Pacific Ocean
- Strongly influence climate around the world
- Return every 2 to 7 years but do not always follow each other
- Affect production of winter vegetables and other crops in the southeast U.S.

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El Niño and La Niña Phases

- El Niño Phase – Warmer than normal sea surface temperature in the Pacific Ocean near the equator

  Example: Strong El Niño phases in 1982-83 and 1997-98 caused excessive rainfall on the West Coast and the Gulf coast
- La Niña Phase – Cooler than normal sea surface temperature in the Pacific Ocean near the equator

  Example: 1998-99 and 1999-2000 La Niña phases caused drier and warmer winters in Florida. *Result:* increase forest fires; drier and warmer than usual temperatures in other parts of the U.S.

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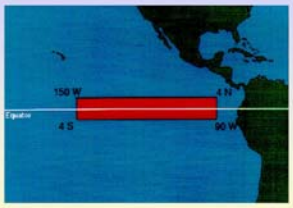
Slides 10-12

Track El Niño and La Niña

Changes in water temperature in this red-shaded area of the Pacific Ocean on the equator near South America are monitored to track El Niño or La Niña phases



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Neutral Years

- Neither El Niño nor La Niña phases exist
- Surface water temperatures (SSTs) normal or near normal; SSTs are different at different times of the year but are usually from 75˚F to 80˚F in December through February
- Neutral phases are twice as likely to happen as either El Niño and La Niña

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El Niño and La Niña – Impact on SE US

- ✓ Rain
- ✓ Temperature
- ✓ Freezes
- ✓ Hurricanes
- ✓ Wild fires
- ✓ Crop production

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Slides 13-15

El Niño and La Niña and Rain

- El Niño Phase – Increase in average rain November to March; 30% more rain than normal amount
  - Extra El Niño winter rain can lower harvest of winter vegetables due to excessive moisture and low solar radiation
- La Niña Phase – Less than average rain November to March; 10% to 30% less than normal amount lasting from fall through winter and spring

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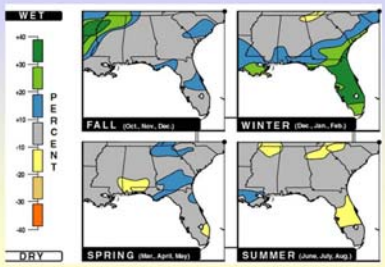
El Niño Rain Changes



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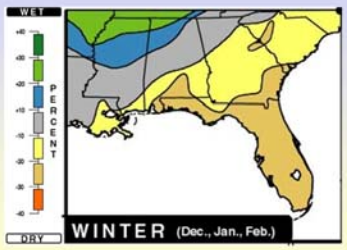
La Niña Rain Changes



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Slides 16-18

El Niño and La Niña and Temperature

- El Niño Phase – Temperature 2˚F to 3˚F below normal in Florida and Gulf Coast during the winter
- La Niña Phase – Temperatures 2˚F to 4˚F above normal December through April and increase farther north in Florida
  - La Niña phase average daily minimum temperatures June through August likely to be lower than normal in south Florida

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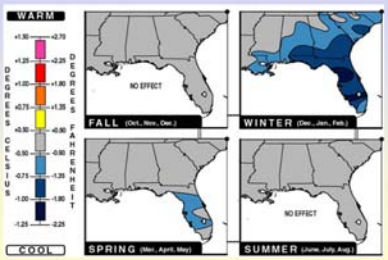
El Niño Temperature Changes



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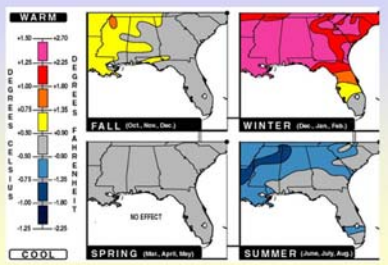
La Niña Temperature Changes



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El Niño and La Niña and Freezes

- More likely to happen in Neutral phases
- 11 of the 12 freezes that seriously damaged southeast agriculture in the last 103 years occurred in Neutral phase winters
- El Niño and La Niña phases do not appear to affect when first and last frost happen

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Freezes

Last 12 severe freezes in Central Florida were all during Neutral years

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El Niño and La Niña and Hurricanes

- El Niño Phase – Fewer hurricanes because upper level winds over Atlantic Ocean are not suitable; chance of a hurricane striking the U.S. is less likely
- La Niña Phase – Helps hurricanes develop in the Atlantic Ocean; greater chance that a hurricane may hit the U.S.

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Hurricanes

Chance of 2 hurricanes hitting the U.S.:

- 28% in El Niño
- 48% in Neutral
- 66% in La Niña

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La Niña and Wild Fires

In La Niña Phase –

- Below normal rain from fall into April, one of driest months of the year
- Soil and forests extremely dry; Increased risk of fires in spring and summer, especially in South Florida

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Wild Fires

- In El Niño Phase – Wet winters seem to lower the risk of wild fires
- Wild fires usually not a problem in western Panhandle – this area gets more rain than rest of state

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Weather Forecasts...

Help you decide when to

- Plant
- Spray
- Fertilize
- Irrigate

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Climate Forecasts...

Help you decide about

- Crop varieties
- Acreage allocation
- Crop insurance
- Marketing strategy

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Using Climate Forecasts

EXAMPLE:

During La Niña, central Florida strawberry growers plant varieties suitable for increased solar radiation

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Using Climate Forecasts

EXAMPLE:

During El Niño, potato growers crown fields and maintain drainage

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Climate Forecasts

EXAMPLES:

- Citrus growers irrigate to maintain soil moisture during La Niña winters
- Farmers decide on crop insurance and how much coverage to buy

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Degree-days and Development

Developmental stages and Required Degree-Days for Cotton*

Developmental Stage	Heat Units or Degree-Days	Approx. Days
Planting	0	0
Seedling emergence	55	12
Add nodes to main stem	45-65 per node	3 days/node
First square	500	48
First bloom	850	68
Cutout	1300-1450	90-104
First open boll	1700	118
Harvest	2150-2300	148+

*Based on information from University of Missouri Extension

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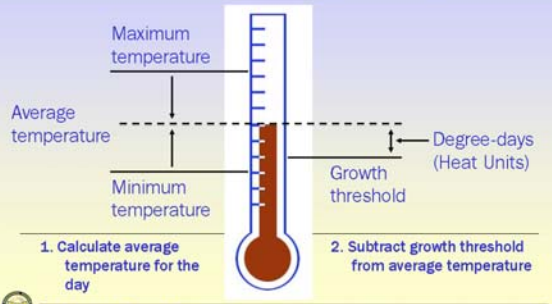
Calculating Degree-days



1. Calculate average temperature for the day
2. Subtract growth threshold from average temperature

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Cumulative Degree-days

A Month

			1 1.1	2 0.9	3 0.6	4 0.7
5 1.1	6 1.5	7 2.1	8 2.0	9 1.3	10 1.2	11 1.1
12 0.9	13 0.9	14 1.0	15 1.1	16 1.4	17 1.5	18 1.4
19 1.4	20 1.3	21 1.4	22 1.2	23 1.1	24 0.9	25 0.8
26 0.7	27 0.8	28 1.0	29 1.2	30 1.3	31 1.2	. .

Add all the degree-days (in red) for this sample month to find the total degree-days

Total degree-days
36.1

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Heat Stress Degree-days

- Heat stress degree-days are calculated like degree-days
- Often used to determine the stress on livestock
- Remember to use the correct threshold – often around 75˚F

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www.AgClimate.org

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With AgClimate you can...

- Check climate forecast and expected conditions for your county
- Link to national and international climate forecast Web sites
- Learn about the influence of climate on crops, pasture and livestock
- Monitor forest fire risk levels
- Link to other Web sites for more information

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AgClimate in the Future

Soon, AgClimate will also have decision aids to help you:

- Forecast growing degree days (GDD) and chilling units (CU)
- Analyze seasonal irrigation costs and amounts
- Analyze the impact of climate on historical yield patterns

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AgClimate Main Menu

AgClimate Tools
Forecasts
Crops
Forestry
Pasture
Livestock
Climate & El Niño
Your Feedback
About

- Climate and crop yield risk tools
- Climate forecasts
- Crop yield risk, management, links
- Forest fire risk, forestry management
- Pasture management
- Livestock management
- Climate information, links
- Web survey
- Who we are

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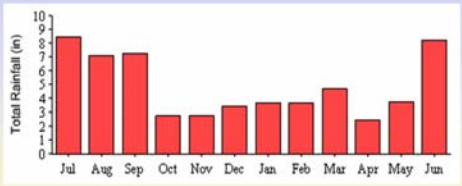
AgClimate Tool – Climate Risk



Expected average monthly rainfall during El Niño events in Polk County, Fla.

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AgClimate Tool – Yield Risk

Figure out the yield risk for:

- Peanuts
- Potatoes
- Tomatoes

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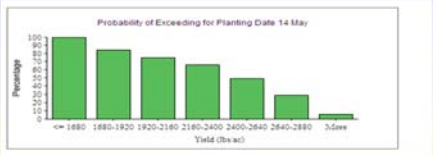
AgClimate Tools – Yield Risk Tool



Chances of increasing peanut harvest
Jackson County, FL during Neutral years

Summary 1

- Climate is a long-term pattern of weather.
- Climate is an important influence on agriculture.
- Patterns of warming in the equatorial Pacific have a strong effect on climate and weather in the southeast U.S.
- Degree-days are a useful way of measuring how much energy for growth is available.

Summary 2

- Degree-days can also be used to determine heat stress on livestock.
- The AgClimate Web site provides information and decision-making tools based on climate research.
- The AgClimate Web site can be found at:
  <www.AgClimate.org>

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Resources

The following are sources of additional information about the subjects mentioned in this introduction.

AgClimate Web Site
Climate information, climate forecasts, and decision-making tools for agriculture tailored for producers in Alabama, Florida, and Georgia. Information is available on a county-by-county basis.
http://www.agclimate.org

Risk Management Agency
Complete information related to producers' crops insurance needs. RMA administers the Federal Crop Insurance Corporation.
http://www.rma.usda.gov/

Southeast Climate Consortium (SECC)
This research consortium is a collaboration of six universities in Alabama, Florida, and Georgia. SECC develops the information supplied through the AgClimate Web Site.
http://secc.coaps.fsu.edu/

So, What is El Nino Anyway?
A non-technical description of the El Nino phenomenon from the Scripps Institute of Oceanography.
http://meteora.ucsd.edu/%7Epierce/elnino/whatis.html

FAWN: The Florida Automated Weather Service
Real-time weather information from weather stations throughout Florida.
http://fawn.ifas.ufl.edu

Georgia Automated Environmental Monitoring Network
Real-time weather information from weather stations throughout Georgia.
http://www.GeorgiaWeather.net

Notes

Notes