UNITED STATES MARINE CORPS

LESSON PLAN

ATMOSPHERIC SCALES

INTRODUCTION:

1. Gain Attention. By now, we should be well aware that maps can aid a person in a variety of ways. For example, when you are traveling long distances, one might use a map to determine their current location, or to see how far they have traveled. Can you think of any other instances when map or scale might be of benefit?

2. Overview. This period of instruction provides a detailed look at the different atmospheric scales that are used in the field of Meteorology, the different size scales, and how they may be effectively used.

3. Introduce Learning Objectives.

a. Terminal Learning Objective. In accordance with this period of instruction, but without the aid of references, correctly identify the appropriate atmospheric scale needed to analyze a given topic.

b. Enabling Learning Objective(s). Without the aid of references, but in accordance with instruction:

(1) Define the sizes, in kilometers, of the following scales: Macroscale/Global, Synoptic, Mesoscale, and Microscale.

(2) Define the time scale in minutes for each atmospheric scale of motion.

(3) Provide an example of an atmospheric element or process that would classify each scale.

4. Method/Media. This period of instruction will be taught using the lecture method with aid of QMMCBT-001 "Introduction to the Dynamics of the Atmosphere".

5. Evaluation. You will be evaluated by physically demonstrating the Terminal Learning Objective.

TRANSITION. Atmospheric scales provide a way to classify various weather phenomena. There are four (4) different atmospheric scales that we will be discussing.

BODY:

1. Defining the Scales of Motion. An atmospheric scale of motion is defined as the hierarchy of motion from tiny gusts to large storms to air currents meandering across the globe. There are four (4) scales of motion, macroscale, synoptic scale, mesoscale, and microscale (Figure 1).

a. Macroscale. The macroscale is defined as the largest scale of atmospheric motion. This scale is also referred to as the planetary scale or global scale. This scale, at times, also includes the synoptic scale.

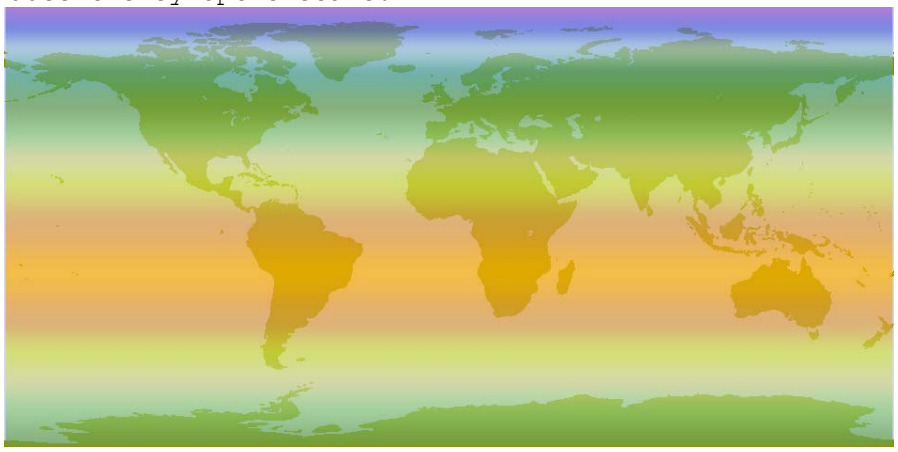

Figure 1 - Temperature distribution.

(1) The macroscale is defined as the normal meteorological synoptic scale for obtaining weather information (globally). It can cover an area ranging from the size of a continent to the entire globe (commonly also referred to as "Global" or "planetary" Scale).

(2) The size of the macroscale ranges from 1000 kilometers (km) to 40,000 km. The typical time scale is several weeks or longer. Some examples of macroscale phenomena would be the global wind circulation or temperature distribution patterns across the world.

b. Synoptic scale. Synoptic scale is defined as the typical weather map scale that shows features such as high and low pressure areas and fronts spanning a distance over a continent. This is also sometime referred to as the "cyclonic" scale.

(1) The distance size range for the synoptic scale varies from 100 km to 5000 km. Notice how the distance range for the synoptic scale overlaps with the macroscale.

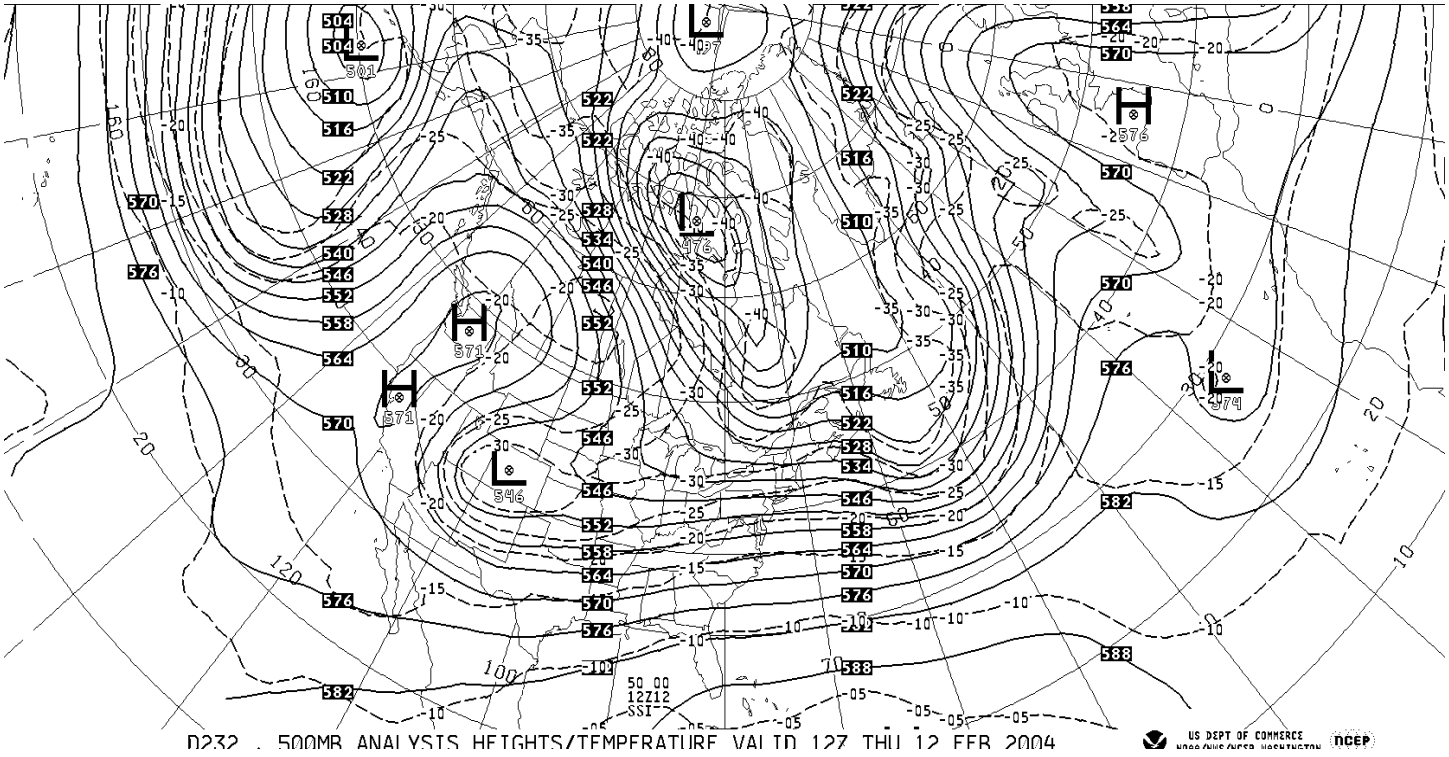

Figure 2 - 500mb Synoptic chart.

(2) The time span for the synoptic scale ranges from several days to weeks. Some examples of synoptic scale phenomena include, but are not limited to, pressure systems, frontal systems, large mountain ranges (North American Rockies) or fingers of the jet stream.

c. Mesoscale. The mesoscale is defined as the middle scale. It is the scale of meteorological phenomena that ranges in size from 1 to 100 km with a time span of several minutes to hours. This scale would include local wind patterns, thunderstorms, and tornadoes.

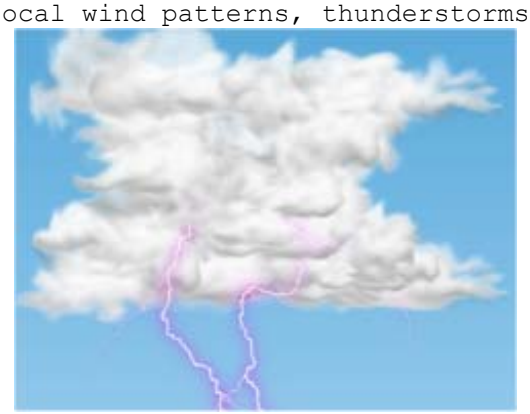

Figure 3 - Mesoscale thunderstorm.

d. Microscale. The microscale is the smallest scale of atmospheric motions. The distance size range is less than 1 km. Microscale phenomena is short lived and possesses a typical duration of a few seconds to a few minutes. Microscale phenomenon

include, downbursts or microbursts, lee-side mountain eddies, dust devils, or convective surface gusts.

Figure 4 - Convective currents.

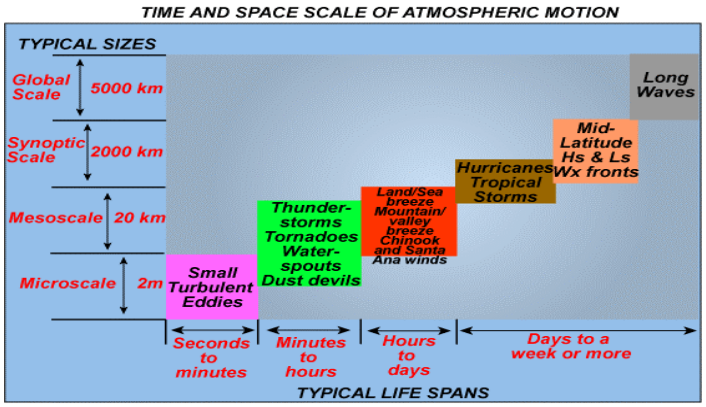

Figure 5 - Atmospheric motion scale.

TRANSITION: Use of the atmospheric scale of motion are used regular in the study of the atmosphere. These scales provide an easy way to classify common weather phenomena.

OPPORTUNITY FOR QUESTIONS:

1. Questions from the Class. At this time are there any questions pertaining to the material that was just presented to you?

2. Questions to the Class.

a. QUESTION. What is the size range of the "mesoscale"??

b. ANSWER. The mesoscale ranges in size from few kilometers to 100 kilometers.

c. QUESTION. Provide an example of "macroscale" phenomena.

d. ANSWER. Global wind circulations, or world temperature patterns.

e. QUESTION. State the time scale of "Synoptic Scale" features.

f. ANSWER. Several days to weeks.

SUMMARY: During this period of instruction, the different atmospheric scales were introduced. Each scale was discussed and examples of size ranges, time spans, and phenomena were provided.

REFERENCE.

Ahrens, Donald C. Meteorology Today. 4th Edition. West Publishing Company, 1991.

Atkins, Nolan Dr. Lyndon State College Survey of Meteorology. http://apollo.lsc.vsc.edu/classes/met130/.