CHAPTER 1 INTRODUCTION TO CLIMATOLOGY

The earth-ocean-atmosphere system may be divided into a number of zones with each traditionally studied by a separate scientific discipline.

The atmosphere is the component of the system studied by climatologists and meteorologists.

Meteorology and Climatology.

- Meteorology studies changes in weather, the state of atmospheric properties for a given location, while climatology examines weather properties over time for a location
    - Weather is described through the direct measurement of particular atmospheric properties such as temperature, precipitation, humidity, wind direction, wind speed, cloud cover, and cloud type
- Climatology is a holistic science in that it involves understanding the interaction of the atmosphere with other aspects of the earth-ocean-atmosphere system using many different spatial and temporal scales
- Three properties of the climate include “normals,” “extremes,” and “frequencies” and are used to gauge the state of the atmosphere over a particular time period
    - “Normals” refers to average weather conditions at a place
    - “extremes” are used to describe the maximum and minimum measurements of atmospheric variables
    - “frequencies” refers to the rate of incidence of a particular phenomenon at a particular place, over a long period of time

Scales in Climatology

- Climatology involves the study of atmospheric phenomena along many different spatial scales
    - The micro-scale represents the smallest of all atmospheric scales and operates along a spatial scale smaller than 0.5 km (0.3 mi)
    - The local scale operates from about 0.5 km to about 5 km (0.3 – 3 miles)
    - The meso-scale involves systems that operate over areas between about 5 and 100 km (3 - 60 mi)
    - The synoptic scale functions over spatial scales between 100 and 10,000 km (60 – 6000 mi)
    - The planetary scale encompasses atmospheric phenomena on the order of 10,000 to 40,000 km (6,000 to 24,000 miles)

Subfields of Climatology

- There are many interlocking sub-disciplines of climatology
    - Boundary-layer climatology is primarily concerned with exchanges in energy, mass, and momentum near the surface
    - Physical climatology emphasizes the nature of atmospheric energy and matter at climatic time scales
    - Hydroclimatology involves the processes (at all scales) of interaction between the atmosphere and near-surface water in all of its forms
    - Dynamic climatology is primarily concerned with general atmospheric dynamics – the processes that induce atmospheric motion
    - Synoptic climatology studies the relationships between the atmospheric circulation and the surface environment of a region
    - Regional climatology, the description of climate of a particular region of the surface
    - Paleoclimatology and involves the extraction of climatic data from indirect sources

    - Bioclimatology is a very diverse sub-discipline that includes the interaction of living things with their atmospheric environment
    - Applied climatology is primarily concerned with the effects of climate on other natural and social phenomena

Climatic Records and Statistics

- Because climatology deals with aggregates of weather properties, statistics are used to reduce a vast array of recorded properties into one or a few understandable numbers especially normals, extremes, and frequencies