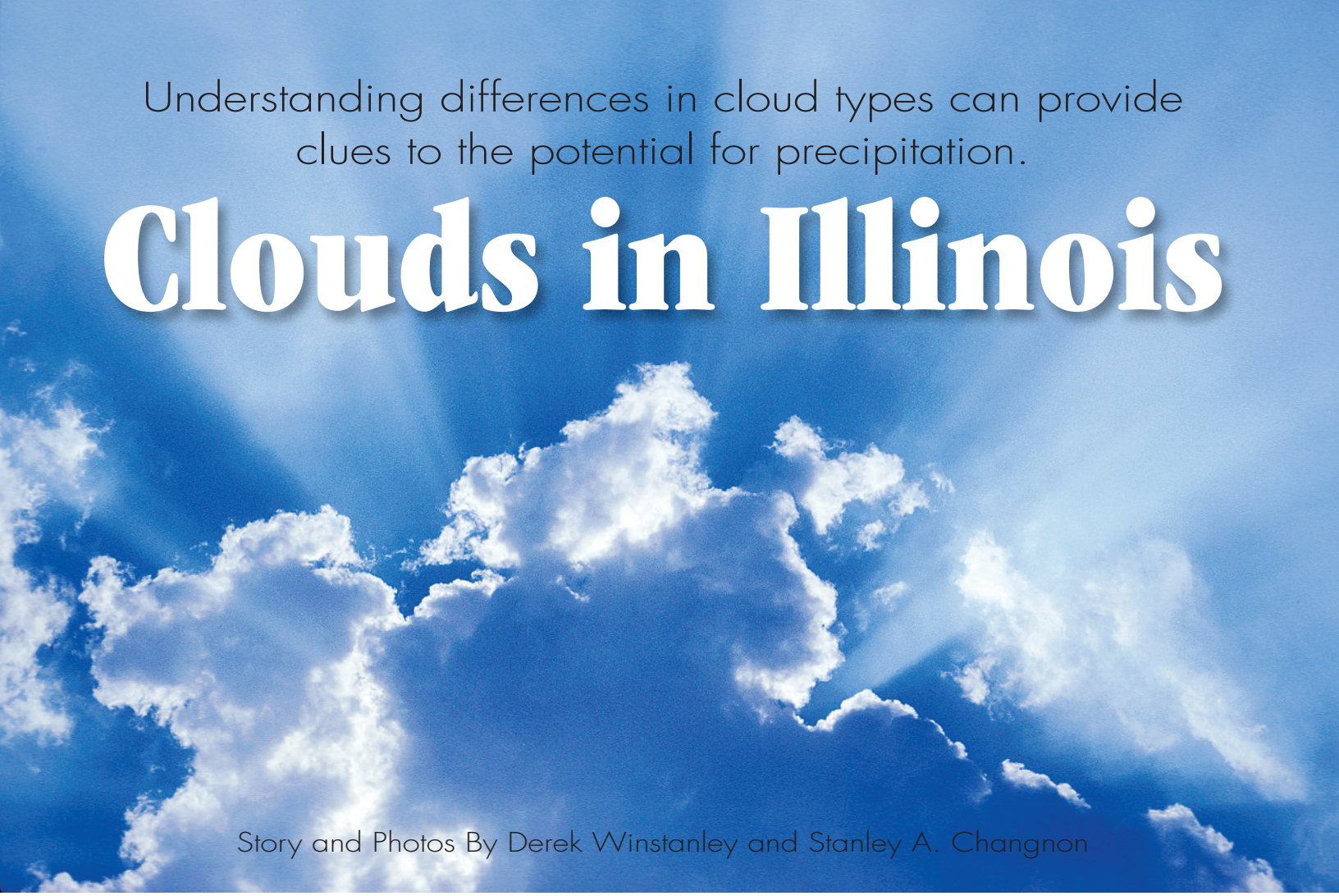
Understanding differences in cloud types can provide clues to the potential for precipitation.

Clouds in Illinois



Story and Photos By Derek Winstanley and Stanley A. Changnon

Where can you see lions, tigers, dragons, cats and dogs in the same place? In the clouds, of course. Everybody who enjoys the great outdoors has been in awe at the majesty of the sky and clouds. A myriad of shapes and colors leads a wild eye to fantasize all things exotic and beautiful.

But nature is exotic and beautiful. Some days the clouds drift overhead harmlessly like balls of cotton caught up in a breeze. Other days, the sky is angry and chaotic. Storm clouds extending miles-high release lightning bolts and sometimes deadly tornados.

As the sun's rays diverge from behind a cloud, beams of light can create crepuscular rays.

Meteorologists see much order in the clouds. They are trained to do so. Back in 1802, a British amateur meteo-

Low-level clouds are composed of water droplets, but also contain ice crystals and snow drops when temperatures are cold enough. Low clouds include cumulus (left), stratus, stratocumulus (below) and nimbostratus.

Middle clouds are composed mainly of water droplets, but can contain ice crystals when temperatures are cold enough. Clouds in the middle level group are altostratus (left) and altocumulus (above).

rologist, Luke Howard, building on the work of a Frenchman Jean-Baptiste Lamarck, proposed a classification of clouds and was one of the first to bring order to observing and recording clouds. His classification was based on the appearance of clouds and how they were formed. Details of the cloud classification have been revised over the years, but the foundation remains.

Clouds form when the temperature of the air cools to the condensation point, which is the point at which water vapor (an invisible gas) becomes a liquid or solid (ice). When it reaches this point, the liquid or ice collects on microscopic dust particles in the air and becomes visible as cloud particles. When air descends below the condensation level, clouds disintegrate back to clear air.

A common labeling of clouds is based on their height above the earth. Meteorological measurements reveal that clouds come in three classes based on their elevations above the ground. These classes are labeled as low clouds, middle clouds and high clouds. The bases of low clouds range from just a few hundred feet above the ground up to 6,500 feet. Middle clouds heights range from 6,500 feet to 20,000 feet above the ground, and high clouds are above 20,000 feet. Within each of these three classes are a number of cloud forms including heaped clouds, layered clouds and precipitating clouds. There are 10 basic cloud types.

On some days just one cloud type is present in the sky, but on other days several cloud types are visible at different heights. Often it appears that low clouds are skipping across the sky faster than high clouds, but high wind speeds in the upper atmosphere can move the high clouds at great speed.

Precipitation comes mainly from low clouds, and most of it falls from cumulus clouds. Nimbostratus clouds also produce precipitation, and sometimes in winter, stratus clouds produce drizzle. Some clouds are seasonal. For example, middle level clouds are most common in the fall and winter, whereas cumulus clouds are most frequent in the warmer months.

The types and amounts of clouds are determined largely by atmospheric conditions including the types of air masses present and activities along the frontal boundaries between air masses. However, some surface features also affect cloud development. The Shawnee Hills of southern Illinois generate cumulus clouds in summer, and the influence of Lake Michigan on the

High cirrus clouds are composed of ice crystals and can be light wisps, denser patches (right), a thin veil of cirrostratus or cirrocumulus with ripples high in the sky (below).

When unstable cumulus clouds rise and mushroom out they become cumulonimbus clouds. Thunderstorms associated with cumulonimbus clouds give Illinois 75 percent of its total annual precipitation. Cumulonimbus clouds have low bases, but can extend to 40,000 feet or higher altitudes and spread out like an anvil. Ice crystals formed in the cold upper atmosphere can reach the earth's surface as hail.

lower atmosphere often creates bands of low clouds along the shore or a few miles inland.

Humans also have an effect on cloud cover. Studies of clouds over Chicago and St. Louis found that these large cities, due to their heat islands and pollutants, sometimes create local clouds, mainly cumulus. Jet aircraft create sufficient contrails to add to the amount of cirrus over the state on some days. The crossing of contrails often is interpreted as "kisses from heaven."

For more than 100 years clouds have been measured at all official weather stations across the nation. In Illinois these include Chicago, Rockford, Moline, Peoria and Springfield, where cloud measurements are made every six hours. At each measurement, the amount of sky covered by a given cloud type is recorded, such as 24 percent cumulus and 15 percent cirrus. These records have given us a long record of cloud types and serve as a useful measure to help ascertain whether the climate is changing.

Parcels of moist and unstable air rise to great heights and often produce thunder, lightning, hail, heavy rainfall and sometimes tornadoes.

Derek Winstanley recently retired as chief of the Illinois State Water Survey and has a D.Phil. in Climatology from Oxford University. While at Oxford, Winstanley also served as the chief observer at the Radcliffe Meteorological Station where weather observations started in 1767.

Stanley A. Changnon is chief emeritus of the Water Survey and has been a climatologist at the Survey since 1955. He has directed projects that dealt with clouds and their modification.