

Formation of rain-bearing clouds

Hurrah for the monsoon! But just how do these rain-bearing clouds get up there, asks S.Ananthanaryanan.

Air carries water vapour

Warm air can hold more vapour when it is cool. Hence, if air that already has all the vapour it can hold is cooled, then the excess vapour condenses back into water. We can see this in the wetness on the outside a glass of cold water – it is the vapour in the air condensing when the air cools near the glass.

Much the same thing happens when a cloud laden with water vapour cools high up in the atmosphere.



Cumulus clouds

First, the sun warms the earth, and air near the ground get warm and expands. When it expands, it gets less dense and rises. Now the atmospheric pressure keeps getting less as we go higher, and this make the rising air expand some more. Now, while air expands when it is warmed and gets energy, if it expands without being heated, then it uses up its own energy and cools! And so, air that expands on rising gets cooler!

As the air cools, the quantity of vapour that it can hold reduces and at some height the air becomes saturated with water vapour. The vapour then begins to condense as tiny droplets. It is this fine spray of water droplets that is visible as the body of a cloud.

Now the vapour state is one of greater energy than the liquid state. So, when vapour condenses, it gives off some heat, which warms the air and makes it rise! When it rises it cools and again some vapour condenses!

This series of condensation and rising builds up 'billows' above the cloud, much like a loaf of bread rising in the oven, and we get the classic 'cumuliform' look.

Sometimes the air rises too fast and the cumulus cloud cannot get started. In these cases, clouds form in layers, as the 'stratiform' clouds, where the layers can stand many kilometers thick. These clouds are formed in areas of general lifting and high humidity and are more stable than cumulus clouds. Cirriform clouds are even higher and so cold that they contain tiny particles of ice!



cumulus



Cirrus



stratus

Weather forecasting

Observing clouds is the traditional way of guessing approaching weather. Increasing cirriform clouds that evolve into thickening and towering cloud layers are ominous. But if cumulus clouds become ragged at the edges and show no dome formation, rainfall is unlikely.

A more exact way is to observe the temperatures and levels of humidity at different altitudes. The meteorological department sends up instruments with the help of a rapidly rising balloon. As the instruments rise and send data, ground computers plot the conditions at different heights. Tracking the balloon by radar also shows the direction and speed of the wind at different altitudes.

Met centers countywide help create a map of the met status at any time. The data is shared internationally and helps advise fishermen and sailors and even land populations of possible storms.

