Alaska Science Forum

BY NEIL DAVIS

"Why are raindrops sometimes large and sometimes small?" –Another one of those seemingly simple questions that can be difficult to answer, this particular one is asked by reader Jennifer Jolis of Fairbanks.

Drop size in rain seems to be directly related to the upward speed of the air from which the rain falls. Clouds tend to dissipate and no longer release rain when the cloud layer decreases in altitude. Clouds form and produce rain as they rise in altitude.

Horizontally stratified clouds--the kind that sometimes stretch for hundreds or thousands of kilometers--produce raindrops of small size when the air containing the clouds is caused to ascend slowly at speeds less than 20 centimeters per sec. [one kilometer per hour (kmph)]. Gentle, drizzle-like rains are common along the coast and interior Alaska and Yukon Territory when air masses are being moved from lowland to upland areas. The drop size of such gentle, wind-less rain is near one-half millimeter (mm), roughly the diameter of a straight pin. Fallying at a speed of about 6 kmph, those tiny drops are still far larger than the 0.02 mm sized particles in a non-precipitating cloud.

Large raindrops evidently grow mainly through collision of smaller drops when there is sufficient updraft and turbulence to keep the drops circulating in the cloud and in various directions so that they will collide. The very largest raindrops, those up to 4 mm in diameter, fall at a speed of about 30 kmph. However, updrafts in thunderclouds can be twice this fast, so even these very large raindrops can be supported within the cloud. The 4-mm maximum diameter of raindrops probably results because raindrops larger than this size tend to break up when colliding with other large raindrops.

The appearance of large raindrops always signals strong updrafts and turbulence. When one feels that sudden cool gusty wind that experience tells often comes just before the rain, one should expected to be pelted with big raindrops. The gusty wind is a downdraft wind positioned just outside the updraft containing the big raindrops.

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