Which Side of a Front Does the Precipitation Fall?
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Looking at several different books and web pages on fronts, each seem to show a slightly different location for where precipitation will fall with respect to a front, especially the cold front, see Fig. 1. So which side, warm, both, or cold does precipitation fall? One answer is artistic license, especially as in Figures 1a and 1b. However, the answer for Fig. 1c is completely different. In order to explain why Fig. 1c has the precipitation completely behind the front we will first look at the standard explanation for how precipitation forms near fronts and then we will look at why some fronts to do not follow this explanation.

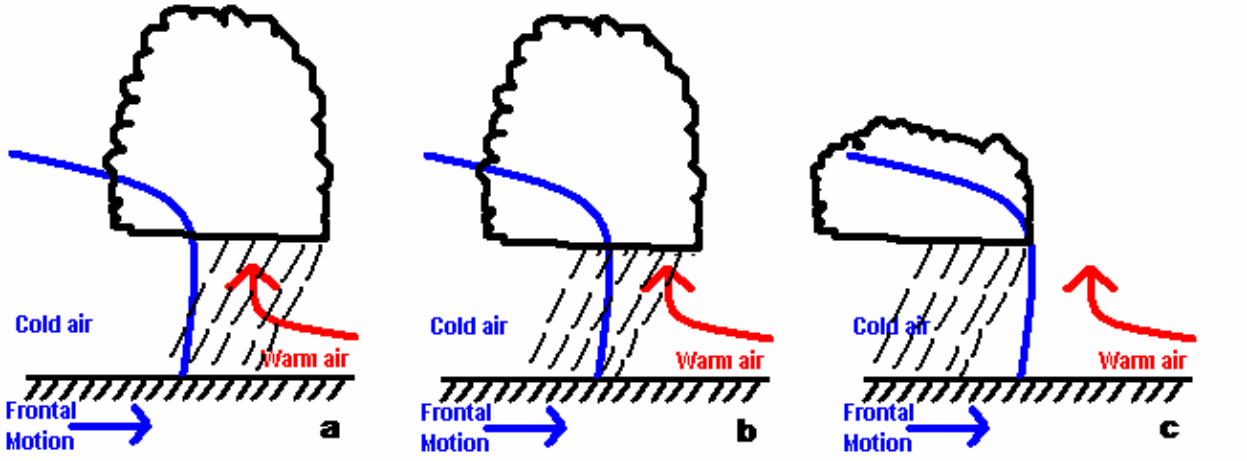

Figure 1. Different depictions of a cold front.

"Fore"ground on Fronts

A front is the boundary between two air masses. Air masses are named for where they "developed" or the location that modified the air into there current state, for example, the tropical Pacific (a maritime Tropical airmass) or Siberia (a continental Polar airmass). These airmasses move across the world and the boundaries between them are referred to as fronts as each side of the front will have different characteristics of temperature and/or moisture.

When one air mass moves faster than another the warmer air will be lifted up over the cold air and precipitation will form, if there is enough moisture. The name of the front depends on whether warmer air is over taking colder air (a warm front, Fig. 2) or cold air is over taking warmer air (a cold front, Fig. 1a).

A typical profile of a warm front (Fig. 2), which has the warm air over taking the cold air, has a large area of precipitation. The intensity of the precipitation is steady along a warm front. The precipitation of a warm front is always ahead of where the surface front is located.

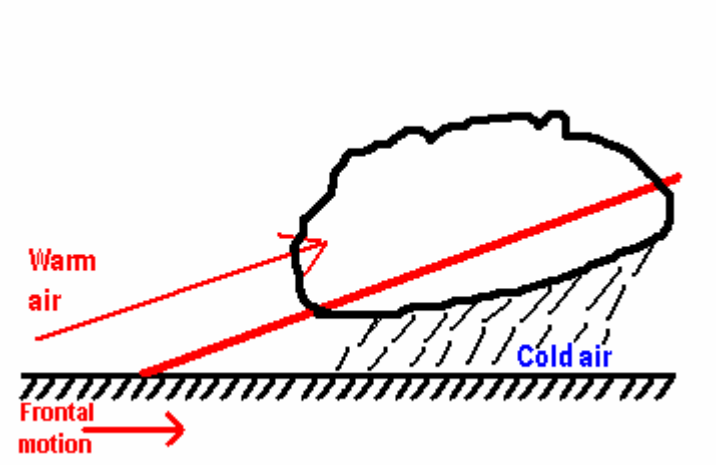

Figure 2. Depiction of a warm front.

The cold front (Fig. 1a), which has the cold air over taking the warm air, has a narrow area of precipitation. The intensity of the precipitation can change rapidly and a large amount of precipitation can fall in a short time. In Fig. 1a, the warm air is rising up ahead of the cold air. However, there may be some precipitation on both sides of the front as shown in Fig. 1b, however, most will be ahead of the front as Fig. 1a depicts.

Non-Standard Fronts

In Figures 1a, 1b, and 2 the warm air is rising throughout the atmosphere and the clouds are able to grow to great heights. In Fig. 1c, the warm air is rising near the surface, however, the air above the front is actually sinking, as shown in Fig. 3. The sinking air limits the growth of the clouds. Thus if the air is sinking aloft it will limit the growth of the clouds and moves the precipitation behind the front where there is the "most" lift.

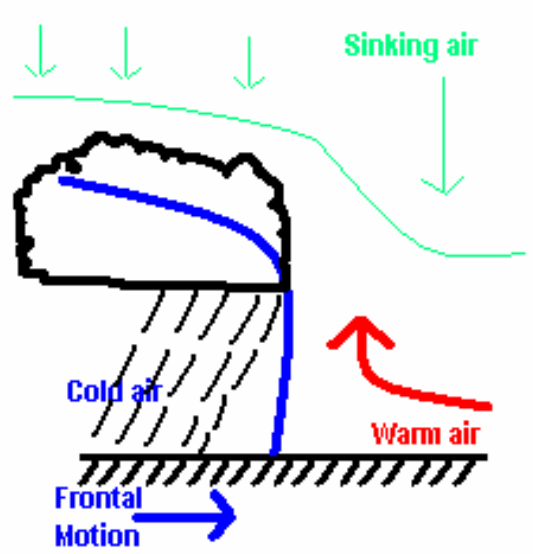

Figure 3. Depiction of a non-standard cold front with sinking air aloft.