CONVEYOR BELTS

In Week 1 you looked at why depressions happen in the mid-latitudes and what sort of weather they bring. You saw that latent heat is released when cloud droplets condense in the depression and that
this is the energy source that powers the storm. But where does the moisture come from to allow more cloud droplets to form? Without a constant input of warm moist air, a depression would soon lose energy and start to decay.

The feed of warm, moist air is brought by an airflow called the warm conveyor belt. It's found in the warm sector air, and brings air in just ahead of the cold front, before rising up the warm front. Some of the warm conveyor belt air rises up the cold front. You can see this illustrated in red in Figure 1.

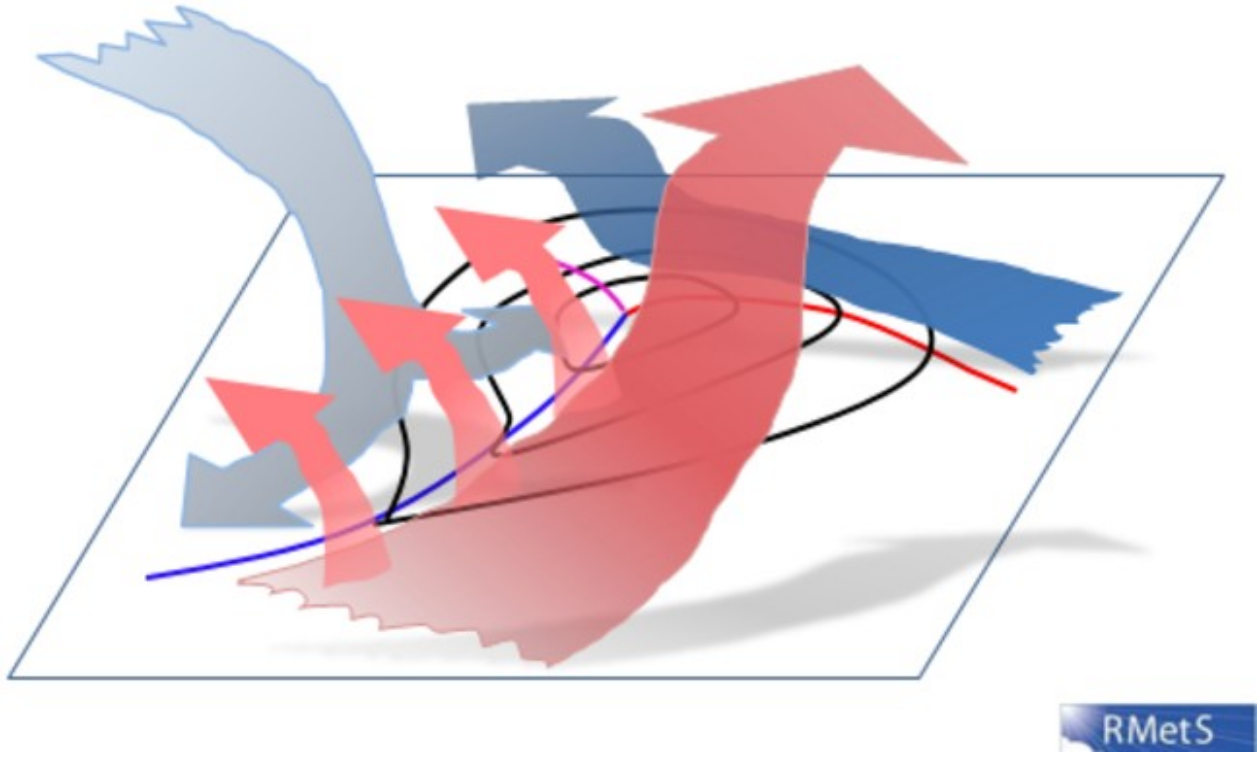

Figure 1: A depression showing the cold and warm conveyor belts © Dr Peter Inness

A cold conveyor belt, shown in darker blue in Figure 1, brings cold air in ahead of the warm front, which then passes under the warm conveyor belt and rises over the centre of the depression. In addition, there is a flow of very cold, dry air which comes from high up in the troposphere and descends behind the cold front, shown in lighter blue in Figure 1. It's the meeting of this very cold, dry air with the warm conveyor belt air at the cold front which produces the more dramatic weather on the cold front than on the warm front.

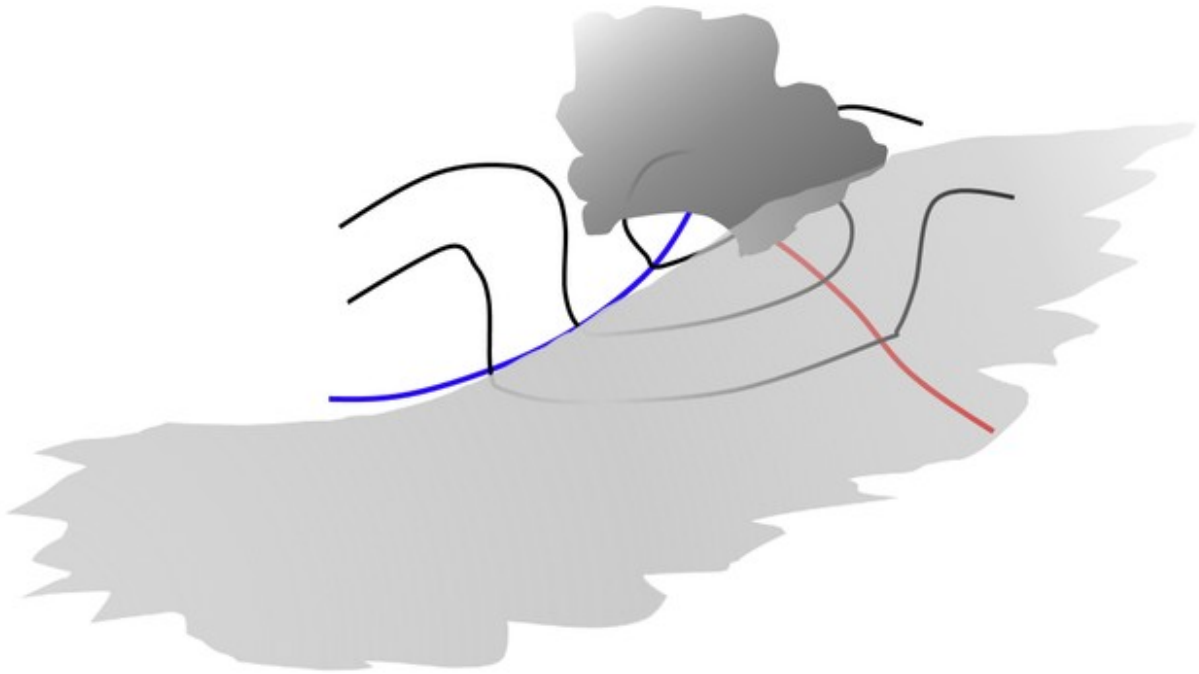

Figure 2: The distinctive cloud patterns associated with the cold and warm conveyor belts © Dr Peter Inness

The clouds associated with the two conveyor belts are distinctive (Figure 2). The warm conveyor belt cloud has a sharply defined poleward edge and a more ragged equatorward edge. The cold conveyor belt cloud is a hook of cloud over the centre of the depression, also known as the 'emerging cloud head'.

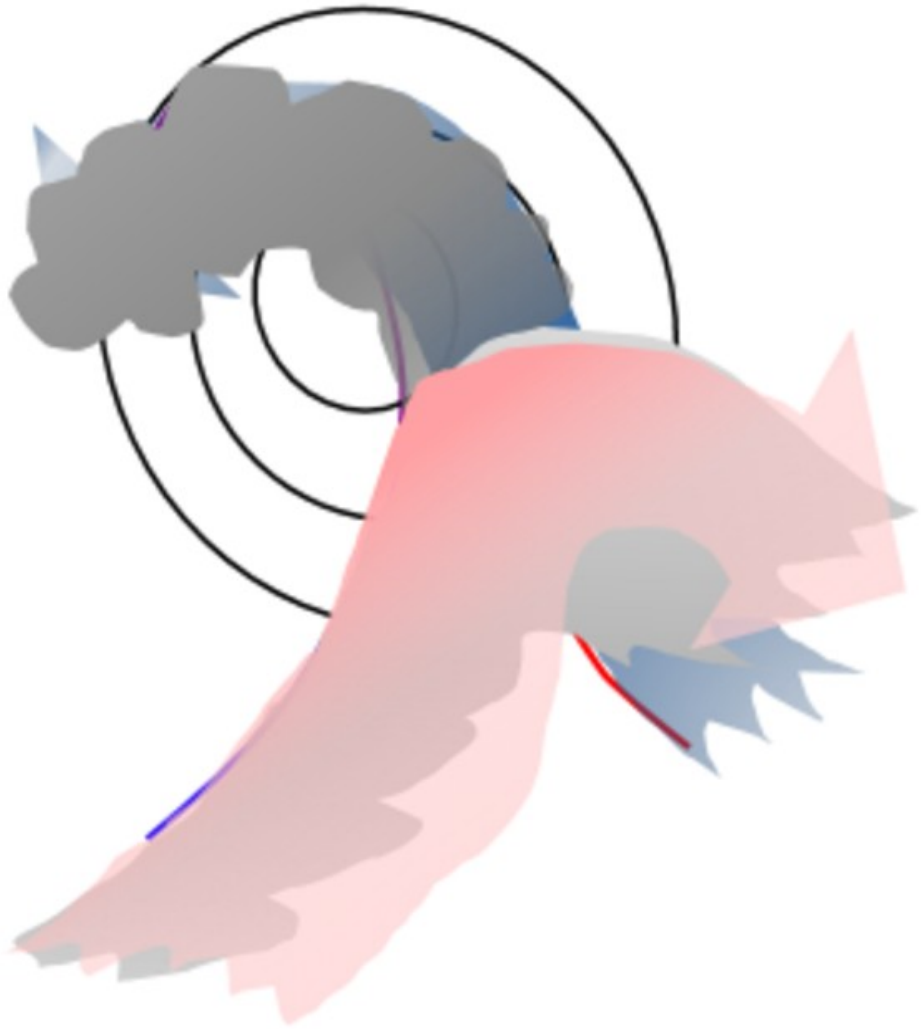

Figure 3: The cold and warm conveyor belt cloud later in the lifecycle of the depression © Dr Peter Inness

As the depression develops, the two conveyor belts get wrapped around (Figure 3). The warm conveyor belt turns to the east as it emerges, whereas the cold conveyor belt gets wrapped back around the depression. Eventually, the cold conveyor wraps around so far, that it intercepts the warm conveyor and stops the flow of warm, moist air into the depression (Figure 4).

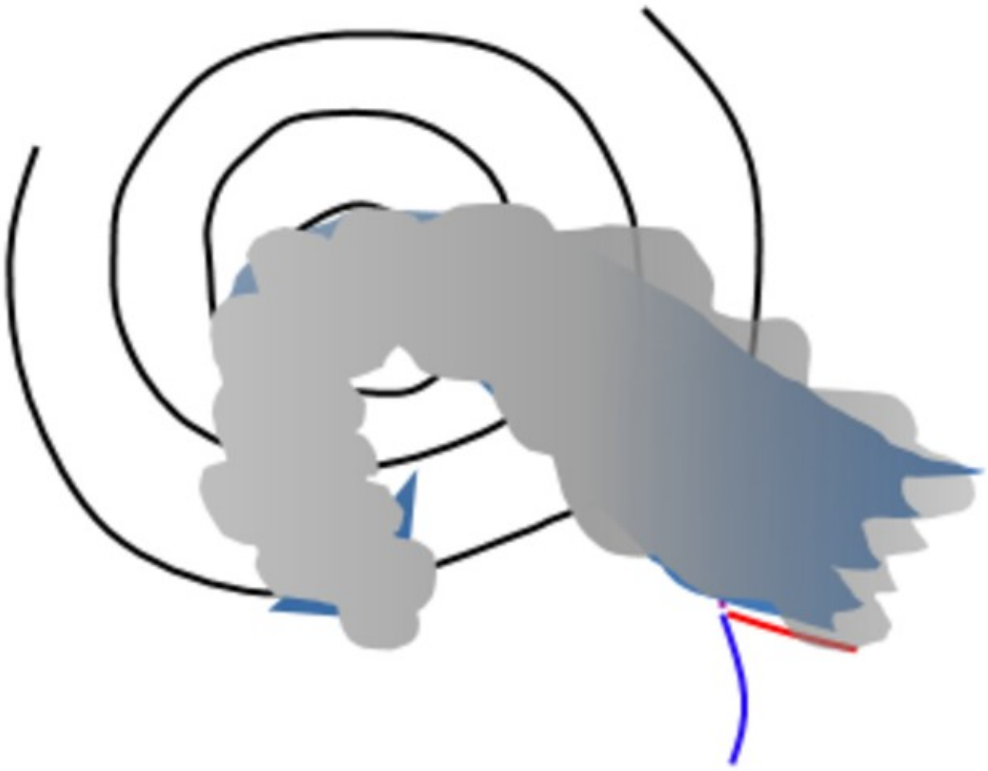

Figure 4: The cold conveyor belt cloud at the end of the depression's lifecycle © Dr Peter Inness

All that is left is the cold conveyor belt cloud. There is no longer an energy source for the depression and it quickly decays and disappears.