Abstract

In this thesis I describe the conceptual model of three kinds of instability in terms of precipitation. I describe ways of evaluating their presence in the atmosphere. They are: conditional instability, potential instability and symmetric instability. I have selected three events with strong precipitation in the Czech Republic so that the formation of each of them is with high probability involved in just one of the three kinds of instability. Events are first described using distance and station measurements. Through the NWP model COSMO are created prognostic fields of precipitation and several derived thermodynamic quantities for each event. On the horizontal (for the whole country) and vertical (for selected areas of the Czech Republic) distribution of these variables are demonstrated favourable conditions for the occurrence of the types of instability in the atmosphere. In the event of conditional instability the rainfall occurs in areas with high CAPE and negative or very small positive vertical lapse rate of potential temperature. The event with the potential instability is characterized by the occurrence of negative vertical lapse rate of equivalent potential temperature in the broad layers. The occurrence of symmetric instability suggests a number of indicators. The necessary occurence condition is fulfilled in more areas and in a large part of the atmosphere.

Keywords: conditional instability, potential instability, symmetric instability, heavy rains