THE CLIMATOLOGICAL CHARACTERISTIC OF INSTABILITY OF ATMOSPHERE OVER EUROPE

Thunderstorms and severe weather phenomena appearance are connected with special meteorological conditions. One of them is instability of atmosphere which creates the vertical air mass motion and develops the thunderstorm parcels. The investigation of thunderstorm frequency over Western Europe shows privileged area with high thunderstorm events probability. The highest frequency of thunderstorms is observed over southern Germany, Po Valley and Gulf of Genoa. It means that it is possible to find European regions with high instability conditions.

In this work the investigation of instability conditions is based on 41 stations radiosounding measurements taken at 00 UTC, from the period 1973–2007. In the next step of research there is an analysis of change of instability conditions under projected global climate change in XXI century. The assessment of instability conditions is based on selected instability indices: vertical totals (VT), total totals (TTI), KI index (KI) and CAPE index (Connective Available Potential Energy).

This analysis shows that instability conditions are characterized by a clearly annual cycle. The maximum values of selected instability indices are observed during the summer and annual minimum is reached in winter. In the case of VT and TTI indices the maximum is observed in May while the annual cycle of CAPE and KI indices shows maximum in July or August. The most interesting feature is that high KI and TTI values appear in the Alpine area and the Carpathian basin (monthly means KI > 22, TTI >44). Orography, especially the Alp Mountains, clearly plays an important role in this structure. The Alpine area induces marked instability conditions. Cold fronts approaching the Alps meet warm air from the Africa block in the Po river valley, creating an increase of instability. The CAPE field shows that mean monthly values decrease from south to north and from west to east. The highest monthly averages (above 350 J/kg) are observed over Po Valley, Western Ukraine and west Turkey. The performed research into instability conditions shows a clear differentiation of atmospheric instability over the European continent. A lengthwise zone is clearly visible starting from the Alpine region and the adjacent areas (Po Valley) to the Carpathian Basin. The area is characterized by the highest monthly means of the investigated indices and the highest frequency of high values of these indices meaning a high probability of the occurrence of severe weather. On the other hand, northern Europe characterized by the stations Valentia, Stavanger, Orland, Jokioinen is an area with the lowest values of the discussed indices. Thus, atmospheric instability is marked by regional differentiation and the examined stations, grouped according to the similarity of values of instability indices are a basis for distinguishing these regions. As a result of using Ward's procedure, a dendogram was obtained. On this basis, two groups were separated, and in either of them two subgroups were distinguished.