Thunderstorm Gale Identification Method Research based on Support Vector Machine

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The thunderstorm gale recognition model is established by using support vector machine based on radar based data from the southern suburb observatory of Beijing and automatic stations. The specific algorithm is: firstly, 9 forecast factors are selected by analyzing 18 thunderstorms in Beijing area in 2010-2014 quantitatively using the statistical method, which are respectively the height of the echo top, the maximum albedo, the height of the maximum reflectivity, the vertical integral liquid water content, the time rate change of vertical integral liquid water content, the vertical integral liquid water content density, the height of the maximum reflectivity factor, the storm moving speed and the width of the velocity spectrum. 451 non high wind samples and 425 high wind samples are selected by matching the time and place of the automatic stations with the value of the quantitative index of the PUP storm monomer recognition product in all the cases. Secondly,the probability distribution of the prediction factors in the wind and non wind samples is calculated, and the degree of the corresponding forecast factors of the thunderstorm is obtained, then the sample data are normalized by the obtained membership function. Finally, the kernel function and model parameters are established, and the thunderstorm gale recognition model is established by using support vector machine. Two typical cases in Beijing Province are analyzed and tested, one caused by a line thunderstorm which happened on 7 July 2017, and the other caused by an isolated single-cell storm which happened on 19 May 2012.The results show that the identified wind range is consistent with the real one, and the hit rate, the false alarm rate and the critical success index are 92.0%,22.1%,73.0% and 99.1%,40.5%,59.2%,respectively. It will help to improve the accuracy of thunderstorm gale warning and forecasting.