

Study on Urban Projections Based on the Characteristics of Doppler Radar Array Front and Urban Microclimate

Zhao Keqi

Nanjing NRIET Industrial Co., Ltd., Radar System Engineering Center, Nanjing, Jiangsu, 211106, China

email: zhaokeqi@glarun.com

Keywords: Freezing, Forecasting Equation, Zoning Classification, Forecasting Factors

Abstract: Through field investigation, historical statistics and so on to determine the frequent occurrence point of freezing weather, and then carry on the division classification, respectively establish the forecast equation, make the freezing weather forecast. It includes the following aspects: determining the frequent occurrence point of freezing weather and zoning; finding out the critical value of temperature of different freezing weather grades; selecting the forecast factor of freezing weather and establishing the forecast equation; testing in practice and making further revision of the forecast equation; establishing the basic information database and the early warning and issuing platform of freezing weather forecast.

1. Introduction

During the winter monsoon, the cold air in the north and south strengthens the quasi-static front in the southwest. Honghe Prefecture of Yunnan Province, especially in the eastern part of the state, is prone to cool down and rain. When the surface temperature is below 0°C, the precipitation becomes supercooled raindrops in front of the ground, and then forms the common meteorological disaster freezing in the eastern mountainous area. Frozen, also known as freezing rain, is one of the disastrous weather in the winter of Honghe Prefecture. Serious freezing weather can destroy wired communication, affect electric power transmission, interrupt traffic and transportation, freeze dead livestock, freeze damaged crops and so on, so it is of good guiding significance to take corresponding measures in advance and do a good job of prevention [1].

2. Analysis of Temporal and Spatial Distribution Characteristics of Condensate

According to the occurrence degree and frequency of freezing weather, 133 villages and towns in Honghe Prefecture are divided into four districts according to the occurrence degree of freezing weather. It can be seen from figure 1 that about 85% of Honghe Prefecture will have freezing disaster, and the northern and eastern regions are more important than the western and southern regions.

2.1. Frozen Weather Prone Areas

Through statistical analysis, Luxi and Maitreya are the regions with high frequency of freezing weather, which accounts for more than 60% of the whole state [2]. From the frequency of the occurrence of villages and towns, the Xiangyang, Santang, Old City, Yipu, Jinma, Baishui, County and Maitreya Dongshan of Luxi are extremely prone to occur.

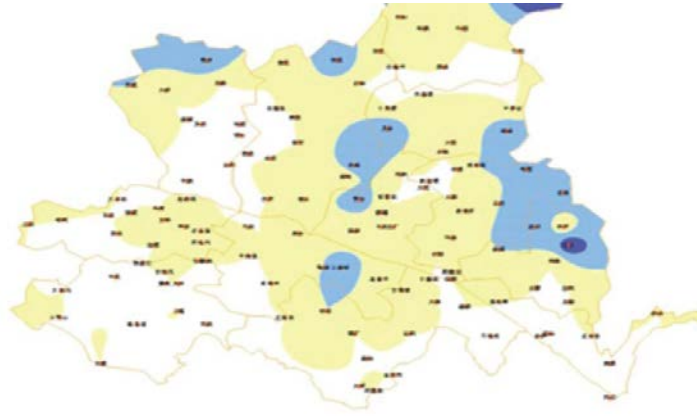


Figure 1 Meteorological chart

2.2. Areas Prone to Freezing

From the regional statistics, Mengzi, Jianshui, Kaiyuan, screen edge for the more prone area. From the township point of view, Maitreya Xiyi, Mengzi Laozhai, Gejiu Jasha, Kaiyuan Ma sentry post, tablet lattice, Lingquan, Jianshui Puxiong, Limin, Shi Ping sentry, Pingbian new Huawei is more prone to occur.

2.3. Precipitation Weather Prone Areas

From the regional statistics, Gejiu, Shiping, Jinping, Honghe, Yuanyang are prone to occur. From the township point of view, Maitreya County, West three, five mountains, West two, Hongxi, Mengzi Lengquan, Ka Fang, Zhi Village, Ming vulture, Northwest Le, Luxiwu Street, Jianshui Po Tou, Gejiu Old Factory, Shiping Longwu, Jinping watershed, Shayipo, Yingpan, Red River Baohua, Jiayin, Aza River, Pingbian Xinxian, Baiyun, Yuan Yang GanNiang for prone areas [3].

2.4. Frozen Weather not Easy to Occur

From the regional statistics, green spring, estuary is not easy to occur.

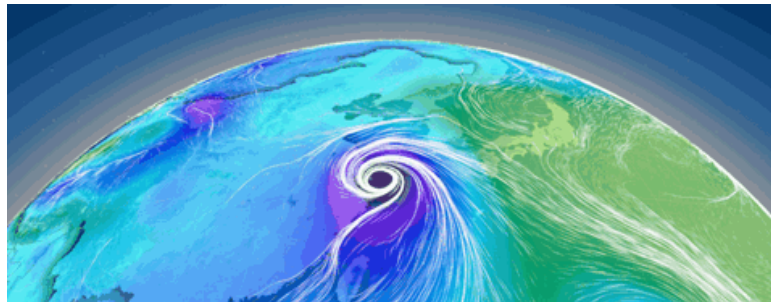


Figure 2 Meteorological chart

3. Freezing Weather Forecast

Based on the statistical analysis of the data of the township stations in Honghe Prefecture (2008-2013), a total of 1 was selected as the related factors of freezing 055 samples.

Coagulation is a weather phenomenon that occurs when the air temperature is below 0°C and accompanied by rainfall, so it can be judged according to the lowest temperature and precipitation. Considering that the harm degree of freezing is not only related to the occurrence of freezing, but also to the altitude of the station, whether or not freezing occurs in the early stage, the duration date and duration are very related, the meteorological factors of the lowest temperature, precipitation, freezing duration day and maximum temperature are selected as the index of freezing disaster, and the influence of altitude on freezing weather is considered [4].

The formula for calculating the freezing hazard index is as follows:

$$I = Ti + Ri + Ni(1)$$

The T_i is the disaster index corresponding to the lowest temperature, the R_i is the disaster index corresponding to rainfall, and the N_i is the disaster index corresponding to the number of freezing days in the previous period (Table 1).

The freezing hazard grade was further determined according to the freezing hazard index (Table 2).

Temperature thresholds are mainly through 5-year data 1 The results showed that $^{\circ}\text{C}0$ was mild freezing, $-1\sim-0.1^{\circ}\text{C}$ was moderate freezing, $-3\sim-1.1$ was moderate severe freezing, and -3.1 was especially severe freezing.

4. Forecasting Equations

Using stepwise regression to 1 055 samples for stepwise regression analysis, First, the least square method was used to perform the best linear fitting of the six factors affecting the freezing disaster grade. The coefficient b_i , corresponding to the x_i is obtained The standard error S_i , of b_i is calculated Then calculate the t test value of each independent variable coefficient: $t_i=b_i/s_i$ ($i=1, 2, \dots, m$), t critical value in the checklist $t_f=1.962$, Finally, the number of pre-freezing days and the mean temperature of the two factors that did not pass the test were eliminated. Left behind four factors that passed the 95% significance test: minimum temperature (x_1), maximum temperature (x_2), rainfall (x_3), altitude (x_4), Establish forecasting equations:

$$y=1.4776-0.442x_1-0.0090x_2+5.00207x_3+0.0002x_4(2)$$

In practice, x_1 , x_2 , x_3 replace it with the next 24 h, 24 h If there's a rain forecast of 5, Small to moderate rain for 10, Rain 15, Take 20 in the middle of the rain, Rain 25, Take 50 above the storm, No precipitation takes 0.

This system forecast according to the conclusion of the next 24 h villages and towns forecast in Honghe state, because the forecast inevitably has inaccuracy, so the forecast grade that brings the forecast of the next 24 h villages and towns forecast issued daily into the forecast equation will still have some error, and the artificial experience revision will make the output image and text more reasonable and practical.

5. Problems and Discussions

(1) The selection of weight of each factor in the freezing equation has yet to be further revised.

(2) The forecast of freezing depends on the forecast of villages and towns in the next 24 h, so the accuracy of forecast of villages and towns also plays an important role in early warning of freezing, so it is necessary to improve the accuracy of forecast of villages and towns continuously.

(3) In practical applications, forecasts for the next 24 h can also be replaced by forecasts for the next 12,6,3 h or less, and the statistical forecasting equations temporarily extend the conclusions drawn above. More accurate short-time forecast for freezing disaster statistical prediction equation also needs to be a long time to collect and analyze the frozen data samples, constantly revised and improved the prediction model [5].

(4) The forecast grade model of freezing disaster is only a preliminary result, and it needs to be revised step by step in the future practice. With the improvement of technical means, the accuracy of freezing weather forecast and early warning needs to be further improved.

6. Wind Field Characteristics of Convective Weather —— Convective Storm

Strong convective weather is often accompanied by convective storm, and the occurrence of convective storm is the characteristics of strong convective weather wind field. The formation of convective storm is mainly composed of one or more convective monomers, which can be divided into two types: common monomer and super monomer.



Figure 3 Meteorological chart

6.1. Development of Convective Cells

The development process of convection storm, mainly the development process of convection single body, will cause convection in the process of vertical motion of convection single body. When there are different changes in the environment around the convection cell, it will directly affect the development of the convection cell, which will determine the development of the convection cell with the temperature change of the environment, the moving speed and other factors. The vertical velocity of convective cells in cumulus clouds can be analyzed and predicted accurately by Doppler weather radar system [6]. The Doppler weather radar system will analyze and predict the lightness of the echo and the radial velocity when the convection unit gradually changes from the tower cumulus stage to the mature stage and the extinction stage. However, there are only 25-45 min, in the life history of the convective cell, and the formation of a convective storm will contain several convective cells, and in the process of the development of the convective cell, the convective cell will continuously expand the cold air flow outwards, and finally, under the influence of the environment, the convective storm will last for several hours.

6.2. Factors Affecting the Development of Convective Storm

In the course of the development of convective storm, we should grasp the factors that affect the formation of strong convective weather in time, so that we can analyze and forecast the strong convective weather in time and accurately, and also improve the forecasting time and efficiency of the strong convective weather. The key factors affecting the development of convective storm in severe convective weather include thermal instability, vertical wind shear and water vapor content in storm clouds. Thermal instability will directly affect the development type of convection storm, and vertical wind shear will affect the intensity of convection development, and the water vapor content in storm cloud will lead to the formation of hail. However, when the water vapor content in the lower layer is too large, there will be a large amount of water vapor condensation in the early stage of convective cloud development, which will hinder the development of updraft. This is also the cause of more convective rainstorms in the tropics but less hail.

It points out the accuracy of weather forecast and some other forecast in psychology and perception, and has a limitation of directional thinking. In the general impression, the weather forecast is to be accurate, otherwise there is no need to forecast. And accurate forecast is taken for granted, in turn, inaccurate weather forecast, in people's view is the dereliction of duty of the meteorological forecast department, the partial inaccuracy expands and rises to most or all inaccuracies.

It is common sense that all forecasts will not be 100% accurate. However, with the deepening of scientific research and the increasingly advanced technical means of forecasting weather, the accuracy of weather forecasting will be greatly increased. This can be seen from the development of weather forecast.

we now employ a high-resolution run model and input multiple variables into the prediction, handle more weather-related data, create more accurate tables of atmospheric graphs, and do the closest to actual predictions. Even so, there are butterfly effects in weather forecasting, and 2×10^{44} molecules in the atmosphere are moving at random, making it impossible to predict 100 percent

accurately. Therefore, in the treatment of weather forecast, the public one is to have a common mind, the other is in the pursuit of higher accuracy, need to do more homework. For example, the Central Meteorological Station proposed to look at the near weather forecast and learn to look at the weather radar map.

References

- [1] Guizhou Meteorological Science and Technology Service Center. Early Warning Study on Frozen Disaster in Guizhou. Beijing: Meteorological Press, 2007.
- [2] Zhang, Yanmei., Gu, Xin., Chen, Haitao., et al. Characteristics of Temporal and Spatial Changes of Frozen Rain in Northwest Guizhou Plateau. *Resource Science*, vol. 33, no. 3, pp.477-482, 2011.
- [3] Xu, Bingnan. A Study on Prediction Signal and Prediction Model of Winter Frozen in Guizhou. *Guizhou Meteorology*, no. 4, pp.8-12, 2001.
- [4] Xu, Aihua., Liu, Bo., Zheng, Jing., et al. Analysis of the climatic characteristics of freezing rain in Jiangxi Province and discussion on the genesis of frequent occurrence zone. *Rainstorm Disaster*, vol. 30, no. 1, pp.6-10, 2011.
- [5] Gu, Xin., Liang, Ping., Zhou, Yan. Assessment and Analysis of Climate Change Characteristics and Disaster Indexes in Southern Qiandongnan. *Anhui Agricultural Sciences*, vol. 37, no. 35, pp. 17658-17661, 2009.
- [6] power. Multivariate analysis in meteorological research and forecasting. Version 2. Beijing: Meteorological Press, 2002.