CHINA METEOROLOGICAL SATELLITE FY – 2 CLOUD DRIFT WIND PROCESSING METHOD

Chen Jin E， Lu Yao Qiu, Zhang Xiu Hua

National Satellite Meteorological Center
China Meteorological Administration ,Beijing,China

ABSTRACT

In 1994 , China will launch a geostationary meteorological satellite (FY – 2), which will be located at 105°E, and will produce various products including cloud drift wind.

After the launch of FY – 2 satellite, the FY – 2 cloud drift wind product will be regularly prepared 2 times a day at 00z, and 12z, with a range of 55° E – 155° E and 60° N – 60° S. After quality test The product will be transmitted through GTS.

This paper is a brief describtion of the FY – 2 cloud drift wind processing method which is currently being tested with GMS satellite data, and an analysis to some test results.

1. INTRODUCTION

In 1994 , China will launch a geostationary meteorological satellite (FY – 2), which will be located at 105°E, and will produce various products including cloud drift wind.

After the launch of FY – 2 satellite, the FY – 2 cloud drift wind product will be regularly prepared 2 times a day at 00z, and 12z, with a range of 55° E – 155° E and 60° N – 60° S. After quality test The product will be transmitted through GTS.

For Low - level cloud drift wind, a processing with automatic target selection, automatic correlation calculating and man-machine interactive quality control is utilized, while for height-level cloud drift wind, a man-machine interactive processing method is employed. Recently, the programs for automated processing low-level cloud drift wind has been accomplished, and the software for man-machine interactive process is being tested. Some test results with GMS data is performed.

2. FY–2 CLOUD DRIFT WIND PROCESSING METHOD

The processing method of FY – 2 cloud drift wind consists of four major steps: image preprocessing, wind vector derivation, quality control and product dissemination.

2.1 PREPROCESSING

In this step, four infrared cloud pictures are candidated. First of all, We examine the quality of the pictures and choose a pair of pictures whose quality meets the requirement of wind derivation. We demand that the sequnce numbers of scan lines in the pictures are increment and successive ,and the image data are complete. The smaller time interval of the picture pair the better, but it must be between 30 to 90 minutes. In addition, the time of selected picture pair should close to the time of the synoptic chart analysis.

We then navigate each image of the picture pair selected and registrate the central point of picture pair in order to increase the accuracy of cloud drift wind.

2. 2 WIND VECTOR DERIVATION

There are a lot of jobs have to be done in this step.

(A) TARGET CLOUD SELECTION

We choose 32x32 pixel elements as a tracer region from a grid field with 2.5x2.5 degree interval (latidude/longitude) in the T_0 picture. If more than 30% of temperture values in this region fall within a predetermined temperature threshold of low - level wind, we consider this region is accepted as the target for low-level cloud and can perform low-level wind derivation.

(B) TARGET CLOUD TRACING

After selecting target cloud in the T_0 picture, we determine the target's location in the T_1 picture through a predicted wind vector field from numerical weather prediction. We call this location as the first guess location.

When we have the first guess location, we try to obtain the optimum match location by using a seconary match method. The way we carry out is as follows: by picking one out of two elements we extract 16x16 pixel elements from 32x32 elements of target region in the T_0 picture, and similarly extract 32x32 pixel elements from 64x64 elements of search area centred on the first guess location in the T_1 picture. With the tracing area we move on the search region to obtain a location where the maximum correlation coefficient is found. We call this location as the seconary guess location. Then we calculate correlations for the whole matrix of 32x32 elements in the T_0 target region and 48x48 elements matrix centred on the second guess location in the T_1 picture. After 17x17 times of correlation calculating we obtain the position where the maximum correlation value has been calculated and we define this position as the optimum match position for the target tracer cloud.

(C) WIND VECTOR DERIVATION

We can get a vector value accroding to the optimum match position in the T_1 picture and the initial position of the target cloud in the T_0 picture. Reducing the corresponding misregistration value of picture pair from the vector value. We can get the displacement vector of the tracer cloud.

Based on the time interval between two pictures we will get the direction and speed of cloud motion.

(D) CLOUD HEIGHT DETERMING

To correctly determing the cloud height is a key factor for improving the accuracy of the wind vector. We choose 850mb for low-level wind. At present we based on brightness tempretures histogram analysis on infrared image and use tempratures of NWP as the threshold value.

2. 3 **QUALITY CONTROL**

In the wind vector process the quality control is very important and consists of automated quality control and man-machine interactive quality control. In the automated process of correlation calculate for the wind vector whenever it is neccessary we set certain threshold values, for example, brightness tempreture, correlation coefficient, wind direction and speed separately to perform automated quality control. The man-machine interactive quality control is conducted in SUN workstation.

It mainly includes vertical and horizontal consistence checks for wind vector and filling to blank areas, where our automated process of cloud drift wind is unsuccessful.

2. 4 PRODUCT DISSEMINATION

Based on calculated wind vector data, various products in different forms such as printed grid field charts, plotted wind vector maps, code maps and facsimile charts will be prepared and transmitted to local meteorological offices and stations at all levels in China.

Some experimental results from GMS data are shown in figure 1 and 2. These results are not done man-machine interactive quality control. They have some irreasonalbe vectors.

3. FUTURE PLAN

The FY – 2 geostationary meteorological satellite will be launched in the first half year of 1994. In order to process the data came from FY – 2 satellite, a data receiving and processing center of National Satellite Meteorological Center in Beijing has been estalished.

In the coming years we will make more efforts to enhance the cloud drift wind method and do more research work on cloud height assignment and height level cloud drift wind process. We expect that we can get a better result later.

References

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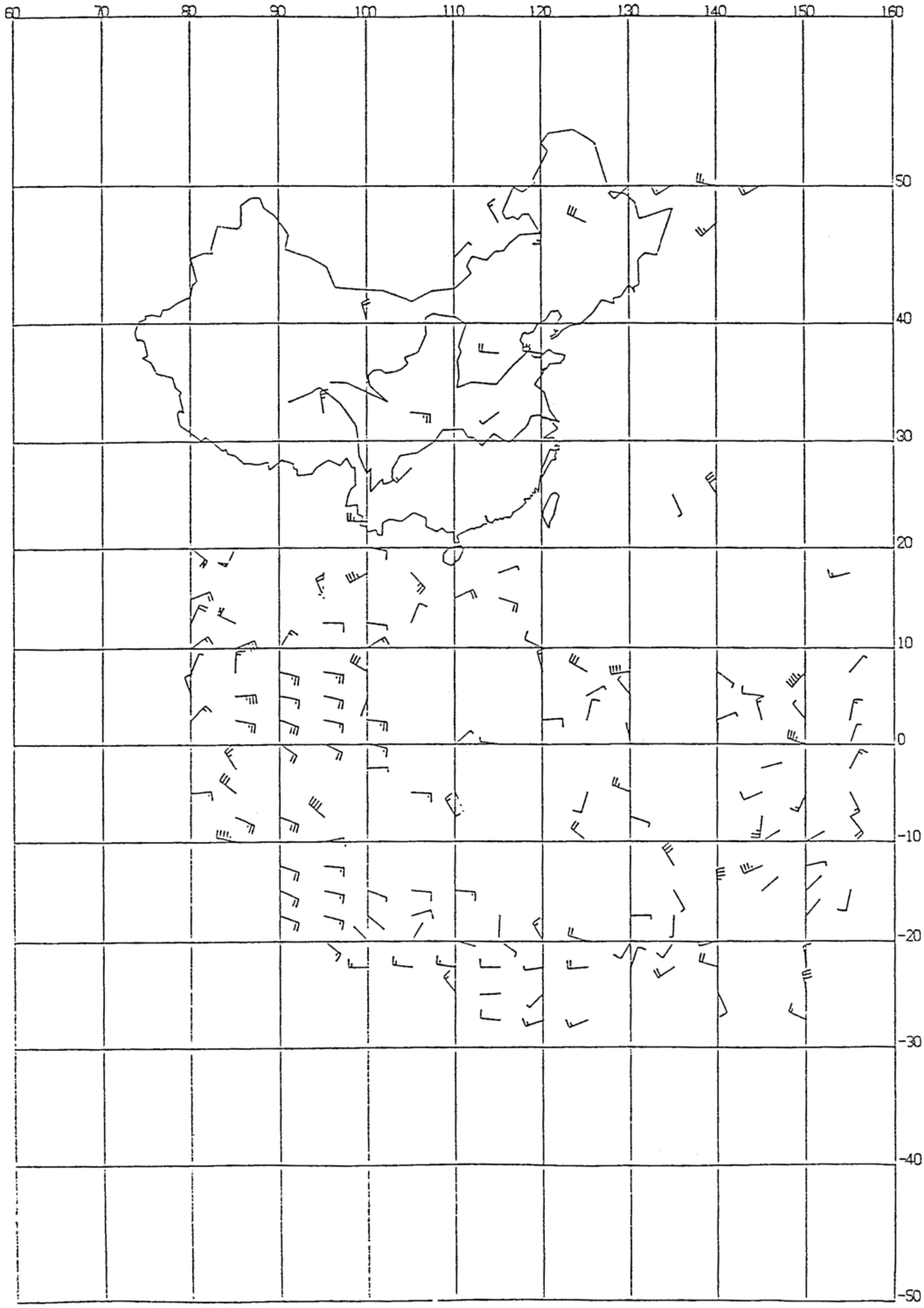

Figure1. TEST CLOUD WIND ANALYSIS 1993/3/22/12 GMT

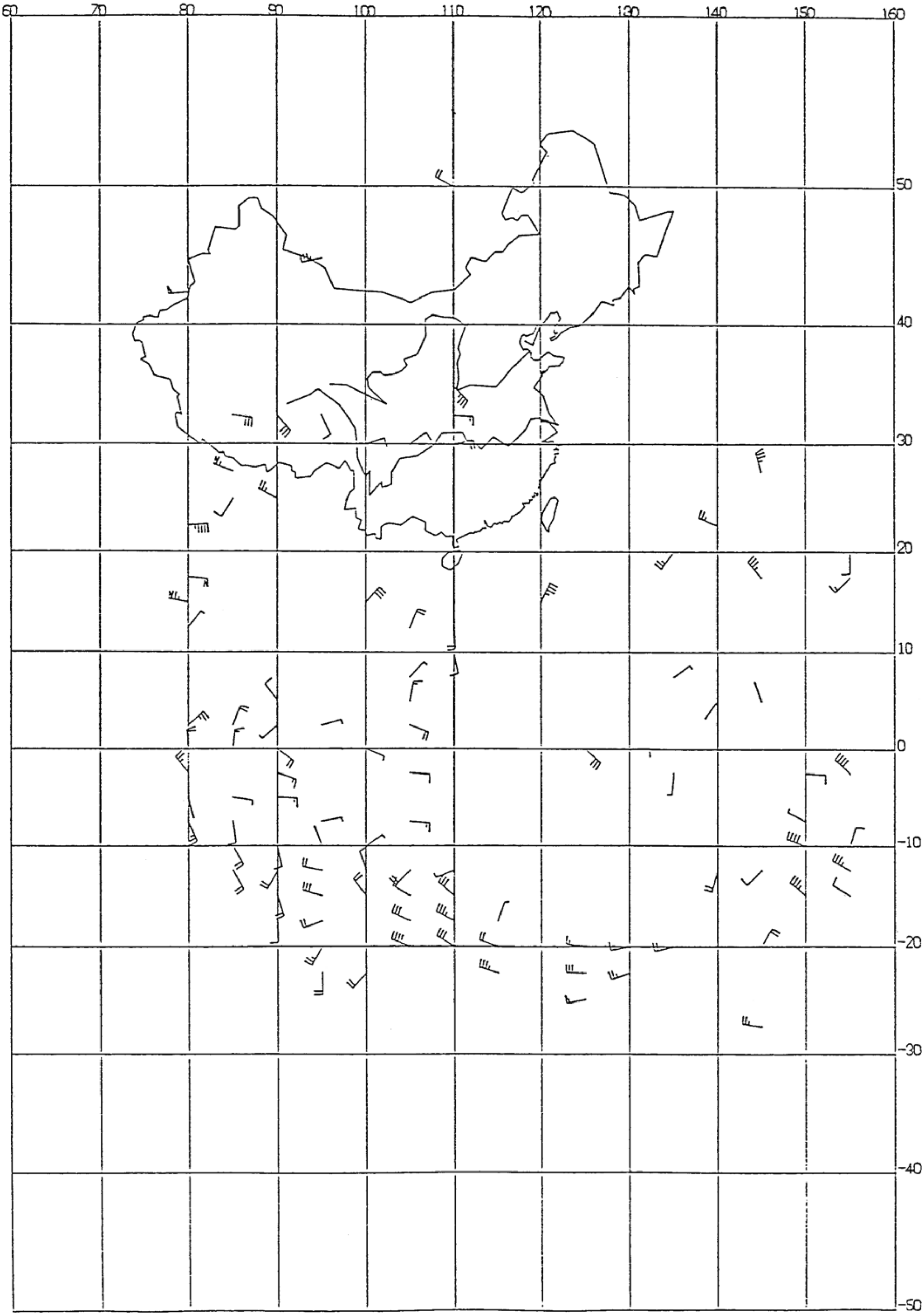

Figure2. TEST CLOUD WIND ANALYSIS 1993/10/04/06 GMT