USING AMSR-E LAND PRODUCT TO MONITOR THE DROUGHT PROCESS IN CHINA

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1 INTRODUCTION

Drought is one of the most serious hydrous disasters in China. The monitoring and forecast of drought is badly needed in the agriculture and city management. In the past, people usually use weather stations or agriculture stations to monitor land surface condition (such as land surface temperature, sub-layer soil moisture etc.) and weather conditions (such as precipitation rate). In this way, the soil condition (drought or not) of the field that near weather stations or agriculture stations are evaluated. Although the method of station measurement is good and effective for the field that near stations, but for the field that far away from any stations this method is invalid. During the latest decades, drought monitoring by remote sensing is studied and used in many countries. Visible and infrared band can help people to get the information of crop growing condition, the land surface temperature, and even the precipitation (in limited weather condition)[1, 2]. People use such information to guess if the soil is wet or dry[3]. That is to say, in this way, people get the drought information indirectly.

Compared with visible and infrared remote sensing, microwave remote sensing is a better tool for soil moisture measurement[4]. The advantage of microwave for soil moisture is that microwave is very sensitive for the dielectric constant change, and the dielectric constant change of soil is dominated by soil moisture[5].

Both active microwave remote sensing (radar) and passive remote sensing (radiometer) can do the job of soil moisture measurement[6]. Radar has better resolution but it's more sensitive for surface roughness. Radiometer is more sensitive for soil moisture but the resolution is worth. In this study, we use passive remote sensing to do the drought monitoring.

2 METHODOLOGY

The data that we used in this study is the land surface product of AMSR-E (AMSR-E land product level 3). The period is 7-yeas (from Jun 2002 to now). As we know, the lowest frequency of AMSR-E is 6.925GHz (C band). Compared with L band or other low frequency band, this is not a good choice for soil moisture measurement. That means the accuracy of the absolute value of soil moisture is not very good (6% in volume also). But as we know, in the

drought monitoring and water management, the most important factor that we want to know is not the absolute soil moisture itself, but the soil moisture change. The difference of average soil moisture in different area is large, and the drought boundary in different area is also very different. Considering the water requirement of different crop, the scale of soil moisture change is a better factor for drought monitoring.

To get the scale of soil moisture change, we analysis the 7-years database (in China area) in the following steps:

1 Extract data of China area from the database;

2 Calculate the maximum value, minimum value and average value of each grid;

3 Calculate the drought index (describe following) of each grid;

4 Average the drought index every 10-days.

The drought index is:

$$D_{index} = 2 \times (Sm - \overline{Sm}) / (Sm_{\max} - Sm_{\min})$$

Where

D_{index} : Drought index;

Sm : Current oil moisture;

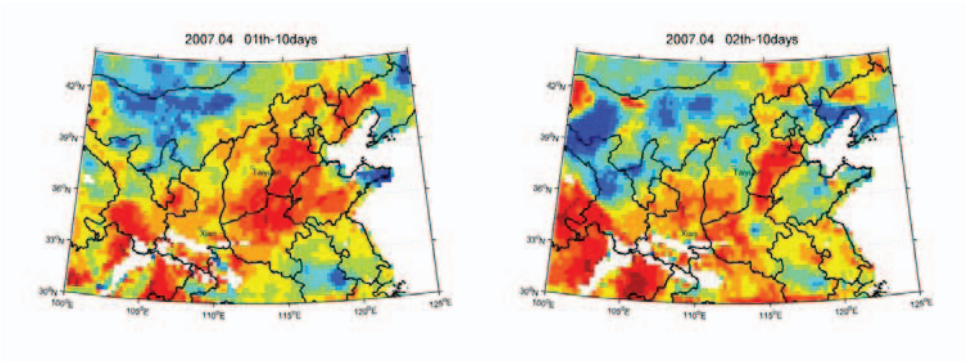
$\overline{Sm}$: Average soil moisture of the grid;

$Sm_{\max}$: Max soil moisture of the grid;

$Sm_{\min}$: Min soil moisture of the grid;

3 CONCLUSION

Using the drought index that we introduce in the former part, we do the drought monitoring test in the Sep-Dec, 2006, Huabei region, China drought event:



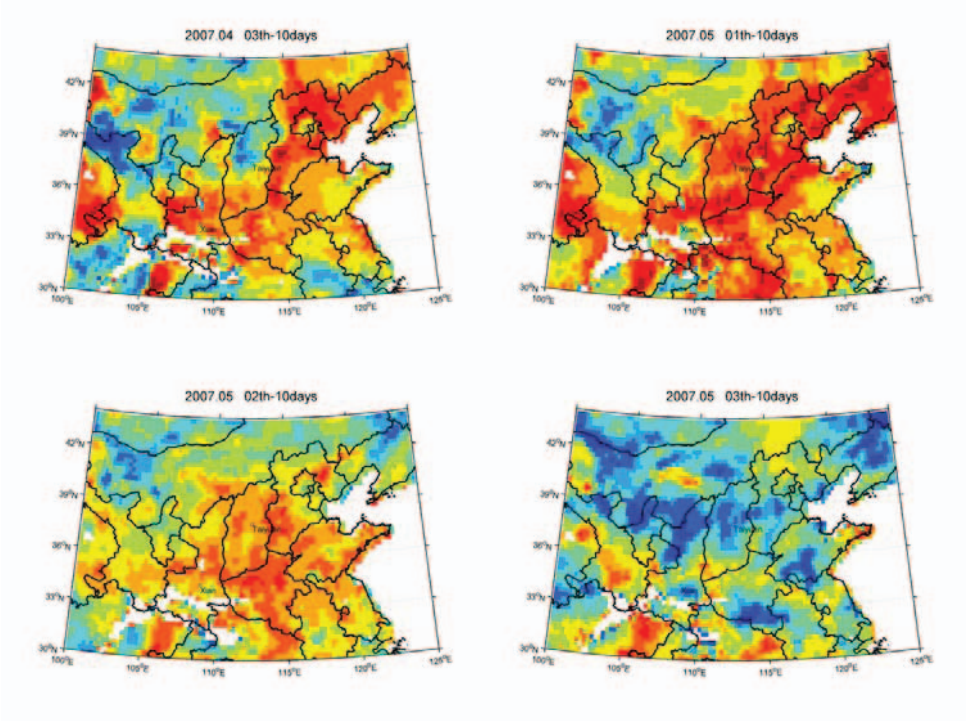


Figure1 Drought index map, Sep-Dec, 2006, Huabei region, China

From the drought maps that we draw (fig1), we can see that the AMSR-E has the ability to monitor the soil moisture in north China. The drought index method is also suitable for drought monitoring.

Key words: microwave; radiometer, soil moisture, AMSR-E; drought index

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