Development of Flood Monitoring Information System in Kazakhstan

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Abstract – Comparative results of space monitoring of filling of Chardara reservoir and development of a high water in the Kyzyl-Orda oblast in the winter - spring 2003-2004 and 2004-2005 are given. Directions of space monitoring system development of high waters in Kazakhstan are discussed.

Keywords: Flood monitoring, remote sensing, flood zones, operative mapping, reservoir water surface.

1. INTRODUCTION

High waters and floods represent serious threat for inhabitants of some regions of Kazakhstan. Last years the situation in the Kyzyl-Orda oblast has especially become aggravated. During winter of 2004-2005 has been arisen real danger of overflow Chardara reservoir. The government of Kazakhstan hardly managed to convince Uzbekistan to open dump of water in Arnasai hollow and stabilize the situation.

In 2004-2005 conditions appeared even more difficult. The winter of 2003-2004 was not snowy with very early spring. Precipitations has been heavy in the winter of 2004-2005, it was much more norms. Plentiful snowfalls have created snow stocks in mountains. Besides, strong frosts have held down a thick layer of ice the shoaled river-bed of Syr-Darya. Later spring has shifted terms of active high water (melting of snow). Therefore the most dangerous situation has developed in the middle of March. Space Research Institute carried out space monitoring this territory. Results of monitoring are discussed below.

2. THE BRIEF ANALYSIS OF RESULTS OF FLOOD MONITORING IN THE KYZYL-ORDA REGION

The technology of space monitoring and operative mapping high waters in 2003-2004 was based on images EOS-AM TERRA MODIS (Spivak L.F. et al, 2004). On Fig. 1 is represented map of flood zones on average stream of Syr-Darya river, constructed on the base of data to the period of the maximum flood for February 8-12. Maximum rising of water was observed in 2005 during March 6-10 (see Fig. 2). Interest is represent comparison of the scales and arrangements of flood zones. They can be divided into three classes (see Fig. 3):

- First class it's zones flooded in 2003-2004 and in 2004-2005 (blue color).
- Second – in 2003-2004 (yellow color).
- Third – in 2004-2005 (magenta color).

Let's note, that the area of flood zones was more in 2003-2004. For explanation this phenomenon additional researches are necessary.

On Fig. 4 is represented dynamic of change of Chardara reservoir water surface in 2003-2004 and in 2004-2005. In 2003-2004 square of water surface has reached a maximum by February, 10th, and then became stabiles on level about 700 sq. km. For season 2004-2005 the big inflow of water has fallen to last decade February, when the area of water surface has increased almost for a quarter and has exceeded 800 sq. km.

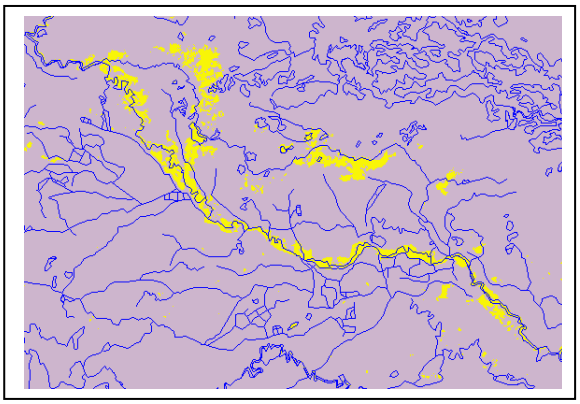

Figure 1. Kzyl-Orda region. Flood zones for February 10, 2004.

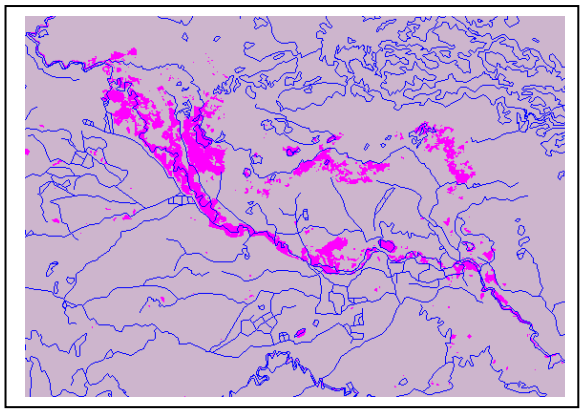

Figure 2. Kzyl-Orda region. Flood zones for March 14, 2005.

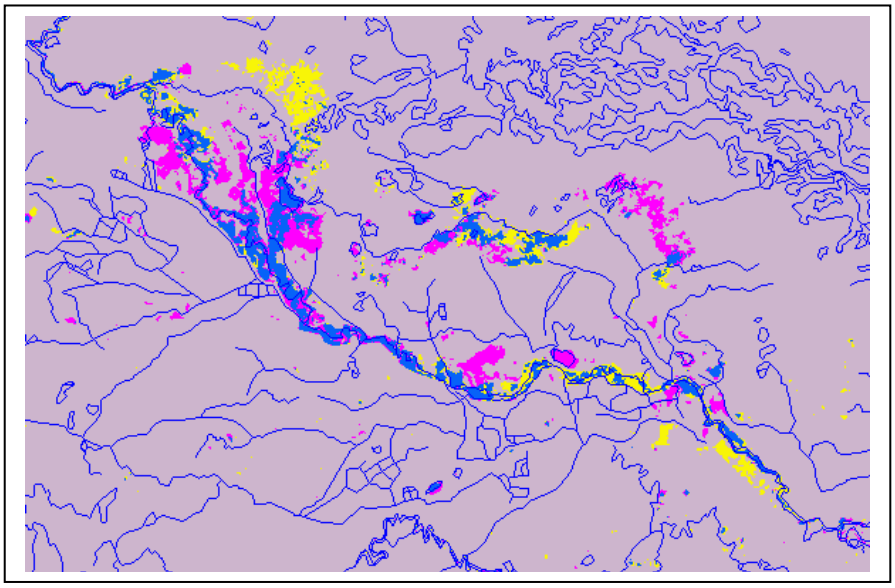

Figure 3. Kzyl Orda region. Overlapping of flood zones for different seasons.

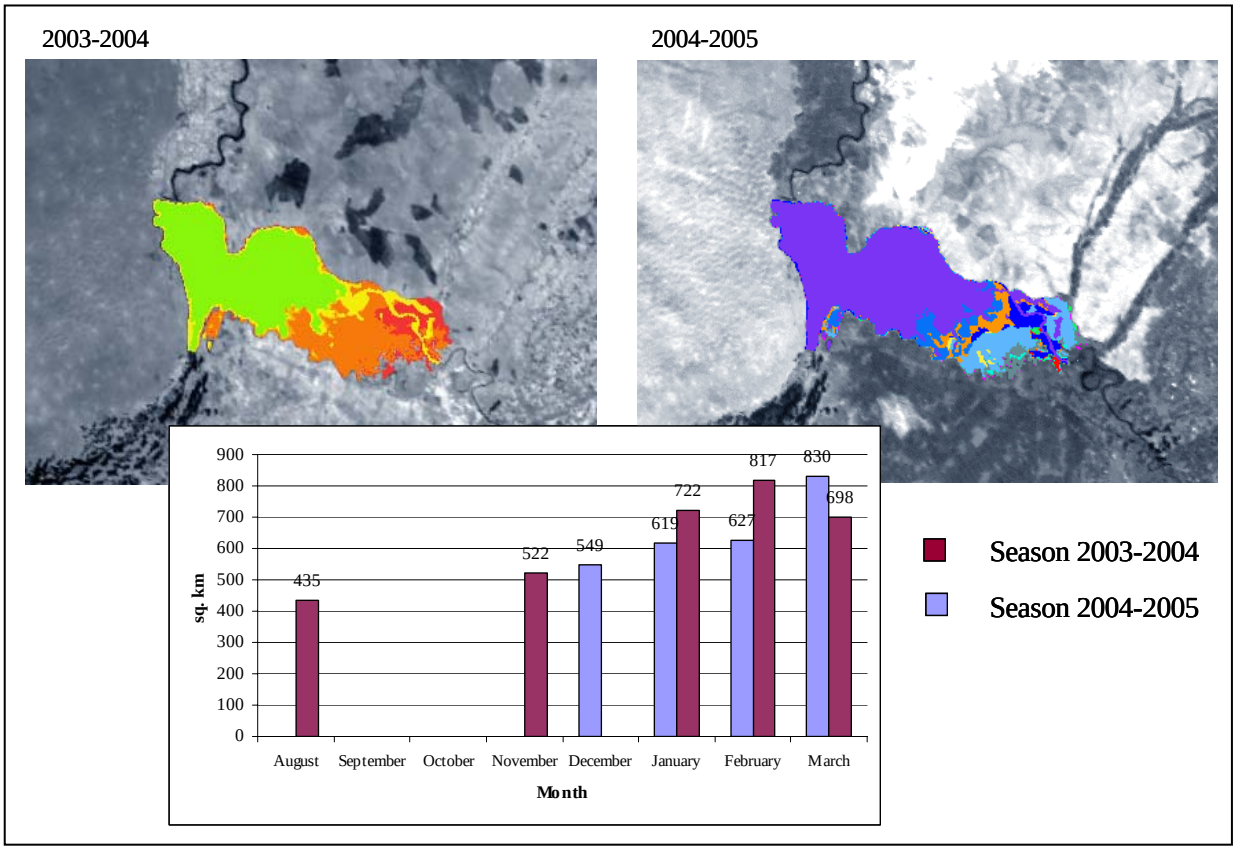

Figure 4. Dynamic of Chardara reservoir's water surface.

3. DIRECTIONS OF DEVELOPMENT FLOOD MONITORING INFORMATION SYSTEM (FLOMIS)

Main task of FLOMIS consists in operative reception of satellite data territories where it is observed high hazard of flood, mapping zones of flood and forecasting of flood development. FLOMIS consists of three principal blocks: operative mapping, forecast and verification.

Last year in Astana city was installed station "UniScan" for receiving high resolution Remote Sensing data IRS 1C/1D (PAN-5,8 m; LISS - 23 m). On Fig. 5 is adduced map constructed on IRS 1D data (LISS).

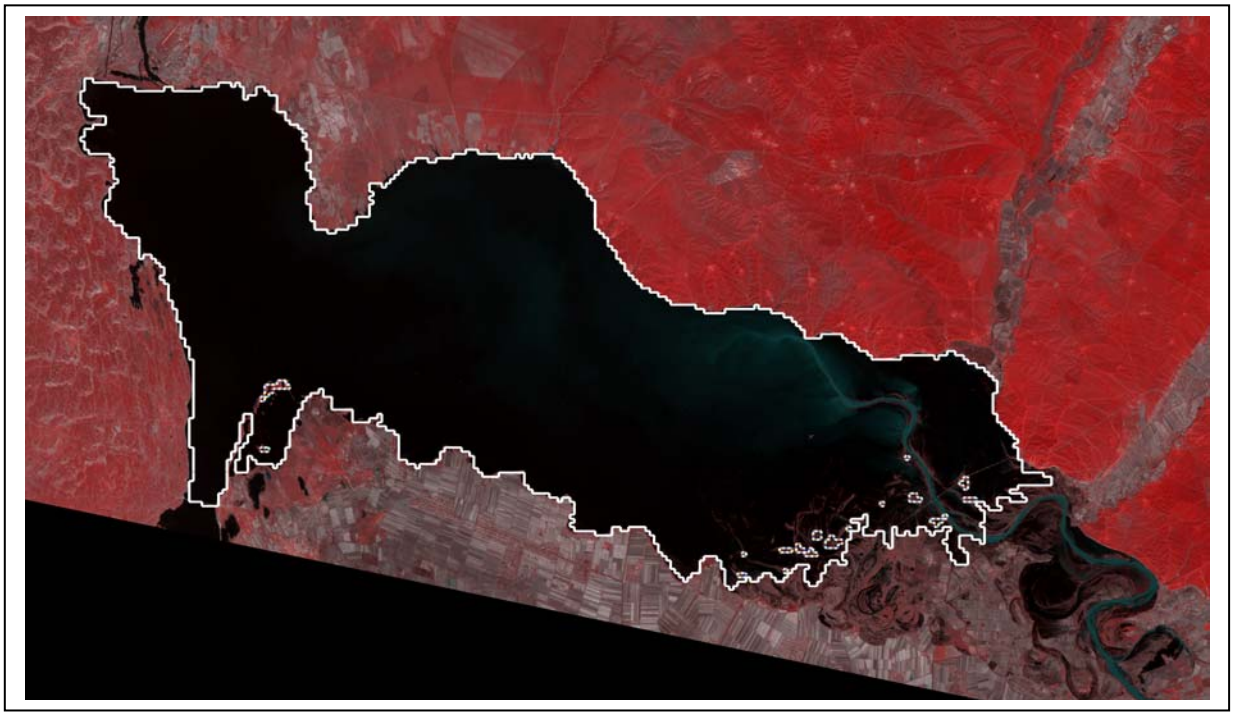

Figure 5. Chardara reservoir. IRS 1D (LISS), March 5, 2005.

It is necessary to note, that the main problem in use data from optical sensors for monitoring high waters connected with often cloud cover of the territory at this period. For a filtration of a cloudy cover it is necessary to use special programs. Now calibrated scale by the Remote Sensing data with using 3D model of Chardara reservoir is created. It will allow restore all water surface by a visible part of territory.

At present SRI finishes certification of receiving station for RADARSAT data. Operative reception RADARSAT data is planned to begin in May, 2005. Application RADARSAT data will allow essentially raising efficiency Flood Monitoring in Kazakhstan.

The further developing of system is planned in a direction of the forecast hazard flood for living areas, roads and railway, lines of the electric system, oil and gas lines and other important objects. Using GIS it is possible to estimate potential threat and preliminary estimate putting damage. One more perspective task is ranging Kazakhstan territories on a frequency of flooding on the basis of many years remote sensing data.

4. REFERENCES

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