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Mudflows phenomena in the piedmont areas of Uzbekistan

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Motivation

Mudflows present major threat to the human life and objects of human activities along with other rock-destructive processes such as landslide, collapse, snow avalanches etc.

In this presentation the conditions of mudflows appearance in the mountain and piedmont areas of Tashkent Region (Chirchik-Akhangaran River Basin) and Fergana Valley of Uzbekistan, where mudflows are very high activity in that territory of the country are considered.
The Syrdarya River Basin (30/05/2008 NOAA–17)
Causes of forming mudflows in Uzbekistan (%)

<table>
<thead>
<tr>
<th></th>
<th>Shower</th>
<th>Shower with hail</th>
<th>Hail</th>
<th>Snow melting</th>
<th>Snow melting with shower</th>
<th>Outbreak of dams of lakes and water reservoirs</th>
<th>Outbreak of ice feeding lakes</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>84,0</td>
<td>4,4</td>
<td>0,7</td>
<td>6,0</td>
<td>3,5</td>
<td>0,9</td>
<td>0,4</td>
<td>0,1</td>
<td>100</td>
</tr>
</tbody>
</table>

(1-shower, 2-shower with hail, 3-hail, 4-snow melting, 5-snow melting with shower, 6-outbreak of dams of lakes and water reservoirs, 7-outbreak of ice feeding lakes, 8-others)
## Distribution of mudflows in Uzbekistan in a year (%)

<table>
<thead>
<tr>
<th>Month</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>VIII</th>
<th>IX</th>
<th>X</th>
<th>XI</th>
<th>XII</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.38</td>
<td>1.91</td>
<td>3.29</td>
<td>26.24</td>
<td>34.58</td>
<td>23.49</td>
<td>7.96</td>
<td>1.84</td>
<td>0.08</td>
<td>0.08</td>
<td>0.15</td>
<td>-</td>
<td>100</td>
</tr>
</tbody>
</table>

![Distribution of mudflows in Uzbekistan in a year (%)](chart.png)

The table and chart above illustrate the distribution of mudflows in Uzbekistan across different months in a year. The data is presented in percentages, with the highest mudflow activity occurring in the summer months (June, July, and August).
Map of repeatability of Mudflows
There had been checked 145 events of mudflows in the period of 1950-2009 in Chirchik-Akhangaran River Basin. The notion “case” means a day when the phenomena was observed in many rivers and tributaries, which were located in the different part of Chirchik-Akhangaran Basin. It should be noticed that majority of mudflows are formed by the falling of intensive precipitation with shower character.
Number of days with mudflows and repeatability (%) of them in Chirchik-Akhangaran River Basin during the months in the period of 1950-2009

<table>
<thead>
<tr>
<th>Month</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>VIII</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of days with mudflows</td>
<td>20</td>
<td>73</td>
<td>32</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>145</td>
</tr>
<tr>
<td>%</td>
<td>13,8</td>
<td>50,3</td>
<td>22,1</td>
<td>6,2</td>
<td>4,1</td>
<td>3,4</td>
<td>100</td>
</tr>
</tbody>
</table>
Prediction of mudflows in the piedmont and mountain areas, as prediction of passing of mudflows in a concrete basin is one of the important tasks of the service of the warning the dangerous phenomena of the nature.

Mudflows prediction with prevailing shower character is based on radiosonde data. Unfortunately, there was reduction of the radiosonde network in Uzbekistan, so it was necessitated to apply to other sources of information, especially satellite images of cloudiness and radar observations.
For analysis of mudflows situation five year data which had been received by radar and satellite observations had been used. While the analyzing of situation the following characteristics of radar observations were noticed:

- monthly average height of the cloud base, particularly in the period of April-June;
- fluctuation of height of the upper bound of radar-echo of convective clouds;
- vertical extent of convective clouds;
- maximum height of clouds in days with mudflows.
Specific characteristics of convective clouds by satellite data, such as:

- synoptical processes and the type of cloudiness according to the satellite images;
- brightness data of cloudiness on visible and infrared spectra;
- dimension of cloudiness by latitude and longitude (especially the hearth of Cb);
- direction of cloudiness movement at 500 hPa geopotential were identified.
Convective clouds
23/05/2009 09:10 GMT
NOAA-18 IR (a) VIS (b)
Convective clouds
31/05/2008 09:28 GMT
NOAA-18 IR (a) VIS (b)
Cloudiness system of South Kaspiyan Syclone
03/05/2009 09:14 GMT
NOAA-18 IR (a) VIS (b)
Identifying of South Kaspiyan Syclone in Synoptical charts

03/05/2009 00 GMT
In the result

an ensemble of representative parameters which included the defined category of mudflows phenomena was produced. Meanwhile the range of specific parameters which, in particular, deals with intensive mudflows processes that causes the extensive damage to the economy was explored.
Conclusion

The research enabled to work out a very short-range forecast 3-5 hours in advance, the application of which in a practice could allow minimizing of damage caused by intensive mudflows.
References:

Obrigada
Thanks
Спасибо
Rahmat