



The 2002 Kolka glacier disaster: could it be predicted?

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We have analysed for the first time the series of Terra ASTER and Landsat 7 ETM+ satellite images for July 2, July 18, August 19, September 4, and September 20, 2002 to assess the state of the Kolka glacier cirque in the Caucasus Mountains shortly before the planetary-scale disaster on September 20, 2002. On that day a sudden collapse of Kolka glacier resulted in the transport of over 130 million m³ of ice and debris for 19 km downstream in several minutes, destroyed several villages and killed 125 people.

Large ice and rock failures on the northern slope of the Mt. Dzhimarai-khokh began in late July – early August 2002. Ice failures from hanging glaciers have mostly finished before September 20, while rock failures were continuing for a long time after the disaster. We have estimated the total area (0.34 km²) of the hanging glaciers that fell onto the Kolka glacier in the weeks before the disaster, and the areas of the failed rock and ice debris on the Kolka glacier surface. There were no signs of the Kolka glacier activation in the images up to September 4, 2002, but in the image of September 20 an activated zone can be seen in the rear part of the glacier. Kolka glacier terminus was quasi-stationary from July 2002 to the morning of September 20, 2002 (8.5 hours before the disaster).

Although rock and ice failures are normal feed mechanisms for Kolka glacier, in summer 2002 they reached an unusual intensity in the two months before the disaster, and this was registered in the satellite imagery. We conclude that such disasters could be predicted using reasonable, not very expensive ground and remote sensing monitoring activities.