

## **LOCATING WATER ACCUMULATED IN TÊTE ROUSSE GLACIER (FRENCH ALPS) USING LARGE-SCALE MAGNETIC RESONANCE IMAGING**

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In 1892, about 80000 m<sup>3</sup> of water accumulated within Tête Rousse glacier (Massif of Mont Blanc, French Alps) rushed down from the altitude of 3200 m to Saint Gervais village, causing death of 175 people. In 2007, a study carried out by French glaciologists and geophysicists suggested that the glacier may contain dangerous amount of water.

The Magnetic Resonance Sounding (MRS) is a geophysical method that allows estimating water volume in the subsurface without expensive drilling. However, water within glacier represents 3D target and we used a further development of MRS: the large-scale 3D magnetic resonance imaging (LSMRI) method. We present results of fieldwork carried out in September 2009 and in September 2010.

In 2009, we performed nine soundings with 80×80 m<sup>2</sup> square loop that covered the major part of the glacier. 3D inversion of field data allowed us to locate the principal reservoir in the central part of the glacier. This result was confirmed by twenty boreholes drilled following LSMRI survey. Estimated with LSMRI volume of accumulated water was not less than 45000 m<sup>3</sup>. In September 2010, water was pumped out the glacier. In the mid-point of the pumping, LSMRI was applied for locating possible non-connected sub-reservoirs. The volume of remaining water was estimated as about 20000 m<sup>3</sup>.

Following pumping revealed 16000 m<sup>3</sup> of water pumped out. The total volume of pumped water was about 48000 m<sup>3</sup>. Taking into account that some amount of water rested in the glacier we consider that LSMRI predictions were fully confirmed.