New Geosphere article examines massive 2014 Colorado avalanche

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Head of the West Salt Creek rock avalanche near the end of the 2015 spring snowmelt season. The sag pond was nearly full, with a water-level rise of less than 1 m needed for water to begin to spill over the rock-slide slump block. On 25 May 2014, movement of the rock-slide slump block mobilized the rock avalanche that traveled down the West Salt Creek valley. Rock falls and rock slides from headscarp are ongoing. Ongoing threats to areas downstream include: a large rock slide from the headscarp into the sag pond, another failure of the rock-slide slump block, a rapid release of water from the sag pond, and rapid or

slow movement of the avalanche deposit (shown in Photo 2). The maximum height of the active headscarp on the left is ~100 m. View is to the northwest toward the town of Collbran, Colorado. Photo taken by Jeff Coe on 7 June 2015.

On 25 May 2014, a rain-on-snow-induced rock avalanche occurred in the West Salt Creek valley on the northern flank of Grand Mesa in western Colorado (United States). The avalanche mobilized from a preexisting rock slide in the Green River Formation and traveled 4.6 km down the confined valley, killing three people.

The 54.5 million cubic meter slide traveled those 4.6 km in about 3.5 minutes, with average velocities ranging up to 36 meters per second. The mobility of the avalanche was likely enhanced by liquefied valley-floor sediment.

This type and size of avalanche happens only rarely in the United States. To study the dynamics of the avalanche, Jeffrey A. Coe and colleagues from the U.S. Geological Survey used a novel combination of large-scale field mapping, unmanned aerial system (UAS) imagery, eyewitness accounts, and data from seismic stations located at distances up to 650 km away from the avalanche.

Photograph taken from a Colorado National Guard helicopter looking north down the West Salt Creek rock avalanche deposit. On 25 May 2014, the central core of the rock avalanche deposit continued to move for 1-2 hours after the main rock avalanche deposit had stopped moving. Shallow landslides on the steep valley flanks continued for at least several days after the catastrophic failure on 25 May. The length of the avalanche deposit visible is about 3.5 km. The width of the avalanche deposit in the foreground is about 500 m. Photo taken by Jeff Coe on 30 May 2014.

Their research shows that the avalanche had a complex series of movement phases, starting with a cascade of landslide/debris flow beginning about 10 hours before the catastrophic rock slide-avalanche phases, and ending with rock slides and rock falls from an oversteepened headscarp. These rock slides and rock falls are ongoing.

The results of this study can be applied to rock avalanche modeling and warning, monitoring of ongoing hazards at the site, and interpreting the emplacement velocity of paleo-landslide deposits.

More information: Rock-avalanche dynamics revealed by large-scale field mapping and seismic signals at a highly mobile avalanche in the West Salt Creek valley, western Colorado *GEOSPHERE* (2016). DOI: 10.1130/GES01265.1

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