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Natural dam failure in the eastern slope of the Central Andes of Argentina. Numerical modelling of the 2005 Santa Cruz river outburst flood

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In the Central Andes of Argentina, ephemeral river blockage due to landslides deposition are common phenomena. During the first fortnight of January 2005, $11.5 * 10^6 m^3$ of rock collapsed from the east slope of the Santa Cruz valley (San Juan province, Argentina). The rock mass displaced from 4300 m a.s.l., down to the valley bottom, at 2900 m a.s.l., and ran up the opposite flank of the valley. This produced the blockage of the Santa Cruz river and generated the Los Erizos lake. The rapid snow melting during the spring season caused the increase of the water level of the reservoir, leading to a process of overtopping on November 12th of 2005. $30 * 10^6 m^3$ of water were released from the reservoir and the consequent outburst flood displaced along 250 km. From local reports of arrival times, we estimated that the outburst flood reduced its velocity from around 40 km/h near the source area to 6 km/h in its distal section. A road, bridges, and a mining post where destroyed. 75 tourists had to be rescued from the mountains using helicopters, and people from two localities had to be evacuated. Near its distal part, the flood damaged the facilities of the Caracoles power dam, which was under construction, and its inauguration had to be delayed one year due to the damage. The outburst flood produced changes in the morphology of the valley floor along almost all its path (erosion of alluvial fans, talus and terraces, and deposition of boulders). The most significant changes occurred in the first 70 km, especially upstream narrow sections, showing the importance of the backwater effects due to hydraulic ponding. In this work we carried out numerical simulations to obtain the velocity patterns of the flood, and compared them with those obtained from local reports. Furthermore, we analyze the relationship between the dynamics of the flood with the patterns of erosion and deposition near the source area.