Flash floods: innovative observation concepts for hydrometeorological process understanding and risk mitigation

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The management of flash flood hazards and risks is a critical component of public safety and quality of life. Flash-floods develop at space and time scales that conventional observation systems are not able to monitor for rainfall and river discharge. Consequently, the atmospheric and hydrological generating mechanisms of flash-floods are poorly understood, leading to highly uncertain forecasts of these events. An innovative flash flood observation methodology, coupling analysis of radar rainfall estimates and post-flood surveys, allows to derive unique observations concerning rainfall-runoff dynamics during flash flood events. Observations related to the 2003 Fella basin flood in the Eastern Italian Alps are examined in this paper. Results are presented concerning the impact of space-time precipitation variability, antecedent soil moisture conditions, soil/bed rock types on flood response and triggering of landslides and debris flows.