Quantifying Snowmelt Contribution to Streamflow and Flood Generation in Major High Atlas River Basins
(Oral)

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ABSTRACT

The High Atlas Mountains constitute Morocco's principal water tower, providing a substantial share of the country's surface water resources. Seasonal snow accumulation represents an important natural reservoir that sustains river flows during dry periods. However, rapid snowmelt episodes may also enhance runoff generation and contribute to flood events. Despite its importance, the contribution of snowmelt to streamflow and flood dynamics remains insufficiently quantified at the regional scale.

This study aims to assess the role of snowmelt in streamflow generation across five major High Atlas river basins during the period 2020-2026. The analysis combines hydroclimatic information derived from remote sensing and other high-quality environmental datasets with hydrological modeling to investigate the seasonal evolution of snow storage and its influence on river discharge.

Particular attention is given to quantifying the contribution of snowmelt to annual runoff, identifying periods of accelerated snow depletion, and evaluating their relationship with observed discharge peaks. A comparative analysis is conducted across the different basins to explore how climatic and topographic conditions influence snow-driven hydrological processes.

Preliminary findings indicate substantial spatial variability in snow contribution across the High Atlas region. High-elevation catchments show a stronger dependence on seasonal snow storage, while lower and more arid basins are more influenced by rainfall-driven runoff. Results also suggest that rapid snowmelt can contribute significantly to streamflow increases and may amplify flood peaks under favorable hydroclimatic conditions.

This work provides new insights into the role of mountain snow in regulating water resources and flood generation in North Africa. The proposed framework contributes to improving hydrological understanding in data-scarce mountain environments and supports future water management, flood forecasting, and climate adaptation efforts in the High Atlas region.

Keywords: Snowmelt; Streamflow; Floods; Mountain Hydrology; Remote Sensing; High Atlas; Morocco.