



HELLENIC REPUBLIC
National and Kapodistrian
University of Athens

Faculty of Geology & Geoenvironment
Department of Tectonics, Dynamics
& Applied Geology



Extreme storms in regions of steep morphology: The case of the 2016 Messenia flood event

**Emmanuel Skourtsos, Michael Diakakis, Christos Filis,
Haralambos Kranis, Spyridon Mavroulis and Efthymios Lekkas**



Introduction



During the late afternoon and early morning hours of September 7, 2016, an intense storm hit the wider area of the Kalamata Municipality, Greece, affecting large parts of SW and SE Peloponnese. The storm caused three deaths, dozens of homeless people, damages to hundreds of homes and cars, huge losses in agricultural production and livestock, as well as effects on the road network, on schools and water and electricity utilities. The settlements of Pidima and Thouria and the city of Kalamata itself, situated on the interface between the flat and mountainous terrain of Messenia region were particularly affected by the overflow of local streams.

Rainfall characteristics

Rainfall height reached up to 162.2mm in one and a half hour at Arfara station of the National Athens Observatory, 15 km north of Kalamata City, while Kalamata and Kardamili stations received 102 mm and 107.8 mm in 50 minutes respectively.

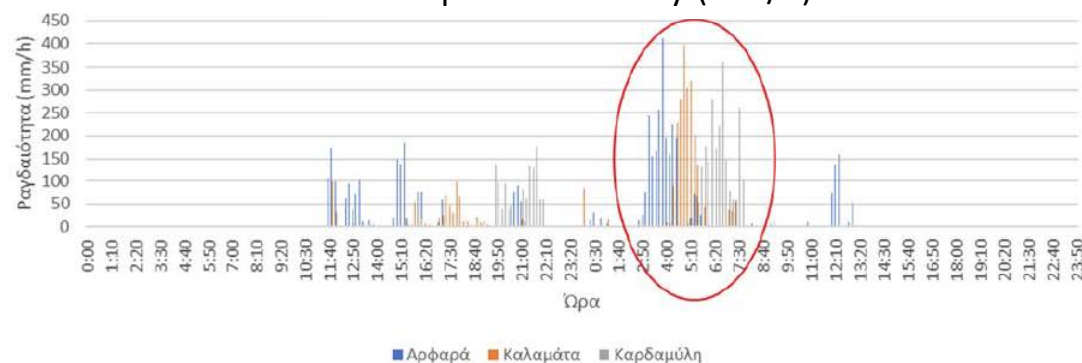
The rainfall that had preceded the storm the previous day had been two to three times the average monthly values of the stations for September.

This event caused the saturation of the surficial part of the geological formations, which combined with the high intensity of precipitation of the second day of rainfall and the high morphological gradients of the mountainous area, led to an increase in surface runoff with high proportion of solid materials.

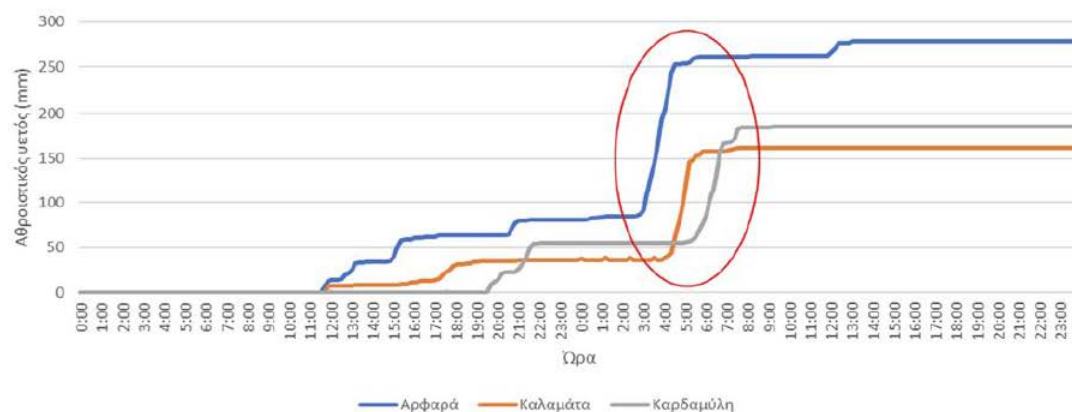
Participation height (mm)



Participation intensity (mm/h)



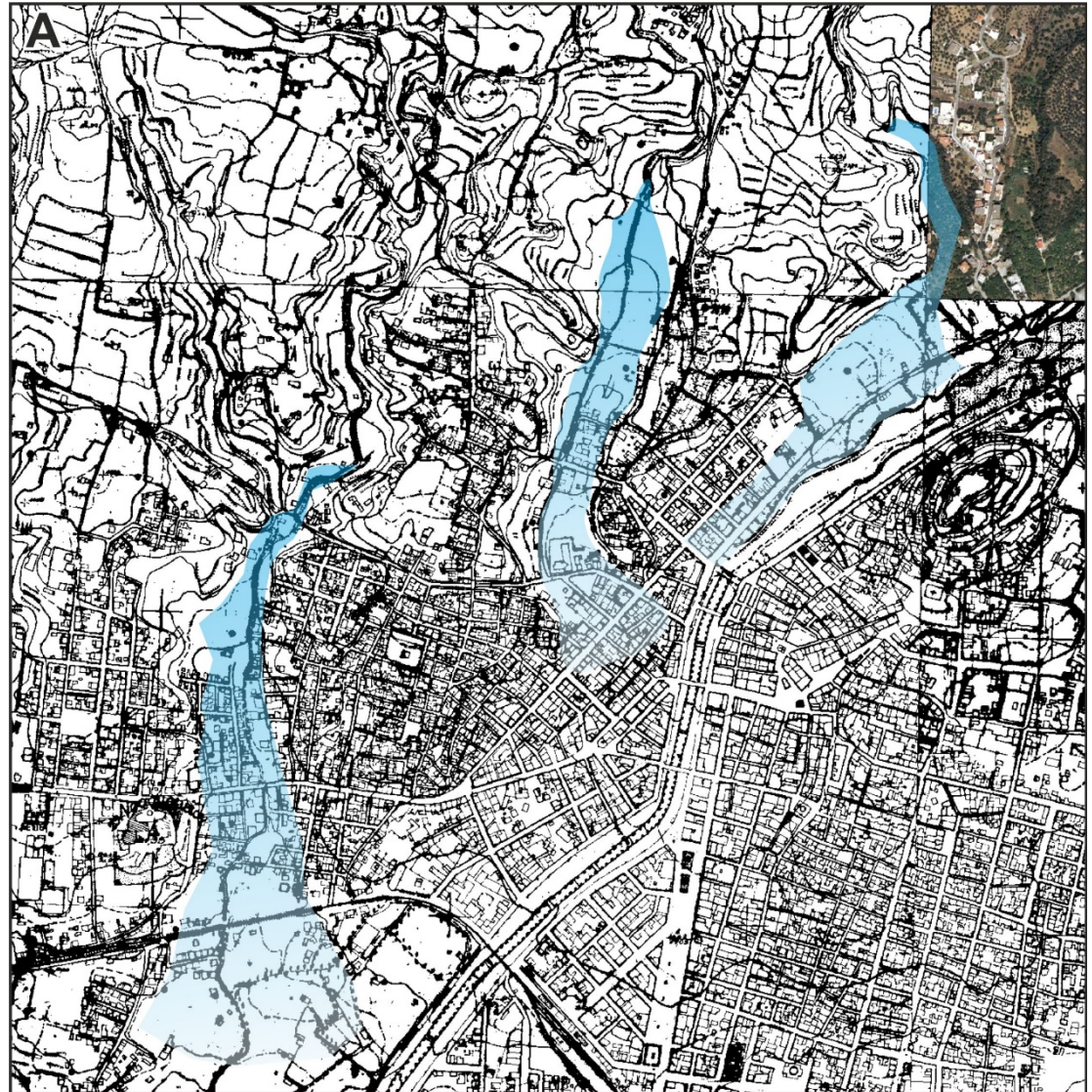
Cumulative participation September 6 & 7 2016(mm)



The storm caused multiple flash floods in the region affecting mostly small catchments drained by ephemeral torrents that caused flooding and severe damages in the city of Kalamata as well as the settlements of Pidima and Thouria and others.

The phenomena and their impacts clustered notably near the border between the mountainous and flat terrain affecting heavily the towns situated along it. Larger rivers in the area (Ari and Pamisos Rivers) as well as the formerly swampy areas were affected but phenomena and impacts recorded notably less intensity.

Small debris flows triggered by the storm were also limited to the border between the two types of terrains and caused damages mostly on the infrastructure developed there.



Conclusion

Overall, the distribution of impacts as well as the characteristics of the floods and debris flow phenomena showed that regions on the interface between mountainous terrain with steep slopes and flat regions present particularly high levels of hazard at the border between the two, whereas the intensity tends to reduce gradually downstream.

