Runoff and sediment yield from Judean Desert wadis draining into the Dead Sea

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Introduction: The main component of the sediment yield of upland ephemeral channels (wadis) is suspended sediment, though bedload fluxes are also very high (Cohen and Laronne, 2005; Alexandrov et al., 2009). Most of our knowledge on sediment transport derives from studies undertaken in humid environments. Monitoring water discharge and sediment in drylands is highly complex due to the spasmodic nature of desert flood flows, requiring continuous and automatic monitoring. Our interest is directed to the relationship between suspended sediment concentration/yield and water discharge, synoptic rainstorm characteristics and topographic-geologic variability between catchments.

Methods: The study is based on water and sediment data from monitored flood events in Judean Desert wadis draining towards the Dead Sea. Five hydrometric water sampling stations on wadis Og, Arugot, Ze'elim, Rahaf and Qanna'im have been deployed to characterize water and sediment. The basins vary in topography, drainage area, rock type, soil and size of urban area. The stations include automatic 24-bottles water samplers, pressure sensors for monitoring water stage as well as turbidity and electrical conductivity sensors. Flow velocity is measured by portable radar velocimetry and other means to calculate water discharge (Q). Channel topography and roughness are measured after each major runoff event. Data were telemetered during the 2012-2013 winter and radar cloud backscatter data are to be available in 2013-2014, thereby representing local Judean Desert rainfall patterns for each flow event.

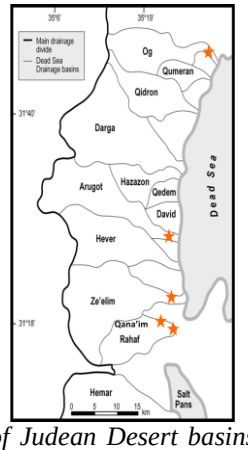

Fig. 1: *Map of Judean Desert basins draining into the Dead Sea.*

Results and Discussion: During the winter of 2011-2012 six flood flow events were monitored on Wadi Arugot. These had a rapid rise and steep hydrographs; all but one short-lived hydrographs. Suspended sediment concentrations (SSC) were high, values between 9,500-75,000 mg/L. Considerable changes in SSC occur during each flow event and between events. The highest suspended sediment concentration (93,800 mg/L) was measured in the first flush of the first flood event of the season, which may indicate the effect of a much localized rainfall cell or the flushing of fine-grained sediment which accumulated during the dry season. Record high SSC occurred in the first flow event, and the lowest SSC values were obtained in last flow event, the latter flow having a much longer duration, larger flood volume and flood peak and it was multi-peaked. This hydrograph shape is not characteristic of flash flows in arid regions, though it does recur in Mediterranean winter storms. All the flow events and the individual rises with one exception exhibited clockwise hysteretic SSC-Q relations. This demonstrates that some of the fine grained sediments are more available at the onset than at the end of events

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References [1] Alexandrov, Y., Cohen, H., Laronne, J.B. and Reid, I. (2009)." Total water-borne material losses from a semi-arid drainage basin: a 15-year study of the dynamics of suspended, dissolved and bed loads, *Water Resources Research*, 45, W08408, doi:10.1029/2008WR007314. [2] Cohen, H. and Laronne, J.B. (2005**).** "High rates of sediment transport by flashfloods in the Southern Judean Desert, Israel", *Hydrological Processes*, 19, 1687-1702.