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# Runoff and sediment yield in Nahal Oren Basin, Mt. Carmel Israel – a comparison between pre and post 2010 forest fire (preliminary-results)

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Nahal Oren basin is 35 km2 in area located in Mt. Carmel – a triangular-shape structure with an elevation of up to 540 m asl, located at the northwestern coast of Israel. The climate is typical Mediterranean with rainy winter – mean annual rainfall of about 550 mm along the coast, increasing to about 750 mm at the top and dry, hot summer. The carbonate rocks which compose the basin are mainly limestone, dolomite, chalk and marls and therefore the nature of the basin is karstic. The soils are usually shallow mountainous terra Rossa and Brown Rendzina, less than 50 cm deep.
The vegetation include maqui forest with pine and oak as major species, which covers >70% of the basin area.
Rainfall, flows and sediment yield in the ephemeral mountainous stream of Nahal Oren basin is monitored using 7 rain-gauges and 3 hydrometric stations, during the period 1957-1964 and 2001-2010. One of the hydrometric stations was active also in 1991-2000. Suspended sediment concentrations (SSC) and sediment yield is monitored and calculated since 2001. The laboratory analyses include chemistry and mineralogy of both sediment and water.
Floods in Nahal Oren are generated after a cumulative rainfall amount of 120-150 mm. Large floods result from rainstorms larger than 100 mm. The peak discharge of the largest flood on record in Nahal Oren basin - 90 m3/s occurred in 1969 and was estimated at the outlet. The largest flood during the last 20 years occurred in 1991 - 20 m3/s (drainage area of 25 km2). The largest flood during the last 10 years occurred in 2001 - 17 m3/s and had a volume of 530,000 m3. The recession of the floods are long and are related to the increasing discharge of 2 springs located at the upper parts of the basin which feed a base flow that can last up to 2-3 weeks following large floods.
Two main flow patterns were documented: during large and moderate floods discharges increase downstream owing to additional runoff contribution from tributaries whereas during small flow events discharges decrease downstream due to flood attenuation and transmission losses into the jointed bedrock channel. Floods with a discharge of < 0.14 m3/s completely disappear along the channel.
Suspended sediment yield was assessed using sampling during flows and analysis of sediments which accumulate in a reservoir at the upper part of the basin. Maximum SSC during peak discharges exceeded 3-4 gram/liter and mean annual sediment yield for the upper parts of the basin was about 21 ton/km2/yr. These low rates in comparison to other coastal streams are related to the intensive vegetation cover of the forest (71% of the basin area). The other land-uses such as agriculture (12%) mainly in the form of terraces and urban (17%) contribute very little sediment.
Until present, Nahal Oren basin was not disturbed by the recurrent forest fires in Mt. Carmel. The fire of Early December burnt < 3000 hectar, about half of which within the Nahal Oren basin. The total burnt area in the basin is about 40%, all of which is forested.
The first flood after the fire (12-13.12.2010) with a relatively small discharge (1 m3/s), generated after rainfall amount of about 70 mm only. High concentrations of ash, organic material and SSC were documented in the floodwaters and the reservoir was filled with large amount of sediment >110 m3, most of which composed of organic material. Nevertheless, the majority of the sediment and ash is still on the burnt slopes and only starting to erode into the stream system.