RAINSTORM CHARACTERISTICS IN OMAN AND AUSTRIA

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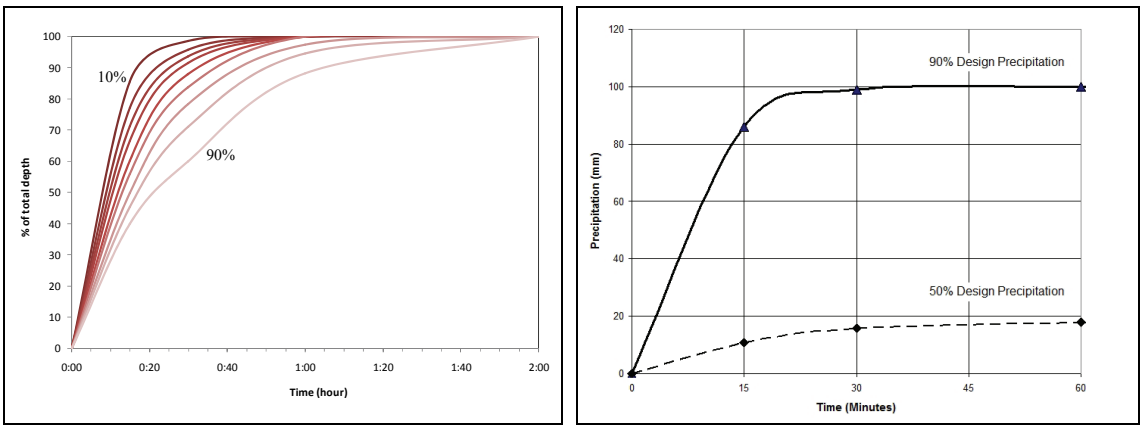
Oman is one of several countries located in an arid zone that is subject to flash flooding. Records show that major flash floods occurred in Oman in 1989, 1997, 2002, 2003, 2005, and 2007. Few flash flood studies in the literature have focused on the issue of flash flooding in an arid environment. Thus, this process affecting Wadis like in Oman, is poorly understood. A review of the research gaps demonstrates that rainstorm is a dominating factor on urban flash flood studies for an arid environment like Oman. It is known that the temporal distribution of rainstorms can vary between regions with different precipitation climate regimes. The main objective of this paper is to compare the rainstorm regimes in Oman with that in humid climate like Alpine regions in Austria (Europe). This will improve understanding of the hydrological processes governing flash floods in both regions of the world.
Data from 610 rainstorm events of duration less than or equal to 2 hours in the Rustaq watershed (Oman) were used to develop heavy rainfall temporal distribution curves characteristic of arid climates. Figure 1, (a) indicates that 10% of the storms at the station deliver 86% or more of the total rainfall within the first 15 min of the storm. Figure (b) indicates that within these 15 minutes in 90 % of all cases precipitation reaches 86 mm, and in 50 % it is less than 11 mm. In general, these curves display a very high intensity at the beginning of the storm, which is known to be a characteristic of storms in arid regions (see Al Rawas & Valeo, 2009).



a) Mountainous 2 hr probability curves b) Design precipitation in mountainous regions

Fig. 1 Oman's mountainous region rainstorm time distribution and design events

In spite of the great differences in climate, extreme values of precipitation intensity in Austria for events of half an hour duration are not so much different (see Fig. 2a). However, statistical analyses of the precipitation regime in Austria do not show such a clear behaviour of the temporal distribution of precipitation (Fig. 1a) like in Oman. In Alpine regions extreme events can be brought forth by convective or frontal precipitation or by a mixture of these types. Thus, a great variety of design precipitation events (e.g. Fig. 2b) must be accounted for when calculating design floods with rainfall

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runoff models, depending on the natural features (soils, vegetation, hydrogeology, geology, topography, catchment size, …) of the catchment.

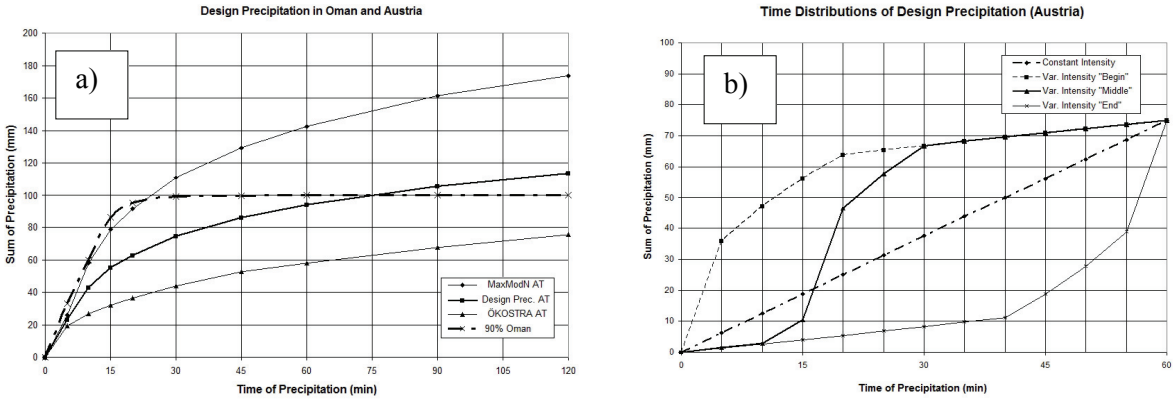

Fig. 2: a) Design storms in Oman (Fig. 1b) and in Austria (BMLFUW) b) Possible design precipitation events (Kirnbauer (2000), modified)

Generally, in convective storms high rainfall intensity is concentrated on a limited area (3 to 10 km in diameter), so that it is necessary to introduce an areal reduction of the design precipitation dependent on the size of the catchment and on the duration of the design storm (see Fig. 3).

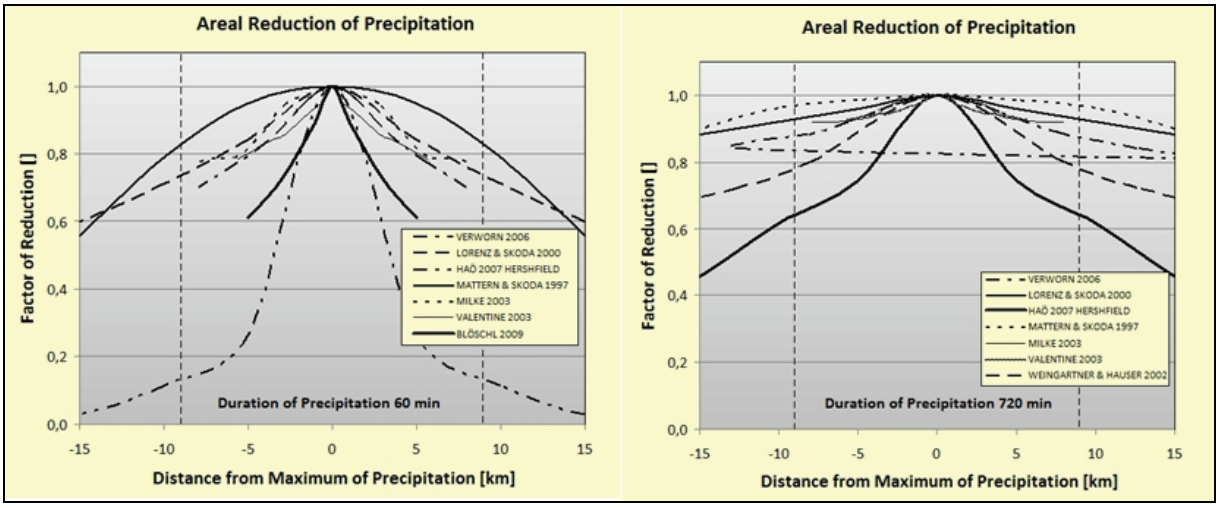

Fig. 3: Areal reduction of design storms following different authors (from Kohl, 2011, modified)

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