



EGUsphere, author comment AC3
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Reply on RC3

Michael Dietze et al.

Author comment on "More than heavy rain turning into fast-flowing water – a landscape perspective on the 2021 Eifel floods" by Michael Dietze et al., EGU sphere,
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We thank all three referees for assessing the manuscript and the constructive and provoking suggestions. We have implemented needed and valuable changes, and explain in this letter where we have implemented changes and why. Please find below the comments and the corresponding replies.

Referee 3

Comment 3.1) The manuscript focuses on the "boundary conditions" that lead to damages in the July 2021 flood in the Eifel region. The paper is very interesting, well written and well organized. I have just a minor comment. In my opinion, in order to better appreciate the figures, in figure 1 the hillshade and slope map must be divided from the 3-day precipitation map, the intensity-duration-frequency curve must stand alone in a single figure and, in the figures 2 and 4, it is necessary to add a map with the locations of the pictures with star signatures that must be deleted from figure 1. For these reasons I suggest to modify the figures as follows:

Reply 3.1) We have replaced the slope map with just the hillshade map to avoid thematic content overlap. However, separating it from the precipitation map would decorrelate the spatial coherence we want actually to show. We have now separated Fig.1 a and b. Note the respective changes to the labels of all other figures. We do not see the benefit in removing the location indicators of the depicted focus sites for two reasons: first, the pictures in old figures 2,3,4 and 5 do in principal stand-alone without spatial reference needed because they illustrate representative process impacts across the affected wider region. Second, old Fig. 1a would lose substantially in map content if it would just show the two river systems and their topographic impression within a sub-region of Germany. We used that map to plot the star symbols as cross-link to the other figures. Hence, if possible, we would prefer to keep the content (apart from the slope map) of the original Fig. 1a.

Comment 3.2) Figure 1. Case study and meteorological measurements. a) two of the most

affected river systems, Erft and Ahr (line width indicating stream order), on top of a hillshade and slope map (red colours). Inset shows the location of the map within Germany. b) 3-day precipitation accumulated for 12–15 July 2021 from RADOLAN data (CDC, 2022).

Reply 3.2) As expressed above, the spatial distribution of precipitation needs to be linked to the topography and, more essentially to the river systems conveying the resulting discharge. Thus, we simplified the map in old Fig. 1a by removing the explicit slope information and show old Fig. 1b now as a separate figure, as suggested in the comments above and below.

Comment 3.3) Figure 2. Intensity-duration-frequency (IDF) curve for the weather station Weilerswist-Lommersum. Observations of 14 July precipitation are added in black based on different measurement intervals. Coloured lines depict different non-exceedance probabilities, respective shadings indicate 90 % confidence intervals.

Reply 3.3) Done as suggested.

Comment 3.4) Figure 3. Landscape features emerging from the flood. a) Locations of the pictures with star signatures. b) Focussed discharge along the hillslope causing deep and fast flow and thus efficient drainage in the background. However, the provided water is not routed downslope in the foreground but ponded by infrastructure, and released at selected spots with increased erosive stream power. c) Deposition area of the debris flow shown in (d), injecting massive debris into the main channel (Trierbach), temporarily blocking the stream and causing severe reorganisation of the hydraulic geometry. d) Lateral deposits of the debris flow at the end of the valley confined section. Inset shows upstream knickpoint formed by overspill and erosion of clogged drainage pipe (50 cm diameter). e) Old slope instability (yellow line) above a 20 m high engineered terrace with industrial infrastructure on it. The terrace just east of the town of Antweiler had been undercut by the Ahr river during the flood.

Reply 3.4) The point with adding a map of the broader area to figures 2–5 is that it adds much redundant information, hence cutting off space for text and graphical information. As explained in reply 3.1, we propose that each of the figure panels (2–5) in principle holds, even without a direct link to the location within the Eifel area, because it depicts the process impacts of the flood event. We thus prefer to remain with the initial figure constellation.

Comment 3.5) Figure 4. Debris mobilisation features, Ahr valley near Müsch (cf. Fig. 1a) Aerial image (BBK-DLR, 2022) taken one day after the flood. The light green outline depicts the tree limit before the flood. Blues lines illustrate the pre-flood course of the Ahr river. b) View from the green star in (a) towards the eroded right bank, which had activated a 16 m high rockslide (persons for scale). Note flood impact mark on a remaining tree at 5 m above current water level.

Reply 3.5) Done as suggested.

Comment 3.6) Figure 5. Effects of large woody debris. a) Locations of the pictures with star signatures. b) Pair of clogged bridges near Altenahr, bypassed along the left and right bank. Note the bipartition of the collected debris with woody material caught by the downstream road bridge and anthropogenic debris collected later by the upstream railway bridge. Note two remaining standing trees in the river depicting the width of the Ahr river before the flood. Aerial image by (BBK-DLR, 2022). c) Huhnenbach near Aremberg about 2 km from its source (see Fig. 1). Note clogging by woody debris at riparian trees and the resulting ejection of coarse bed material out of the channel. d) Another clogging of the Huhnenbach some 20 m upstream of (c), with both ejected coarse debris and deposition of fine sediments in front of the obstacle.

Reply 3.6) See replies 3.4 and 3.1.

Comment 3.7) Figure 6. Aerial image (BBK-DLR, 2022) of the town of Blessem. a) Situation shortly after the flood event, with annotated features. The top right inset (b) shows conditions before the flood. The break in slope along the margin of a gravel pit (red dashed line) had started to erode towards the town by fluvial erosion (yellow line) that formed three individual clusters. The erosion was fuelled by overbank discharge of the Erft river, evading the town of Blessem and moving down the main street as well water flowing over the field west of the town margin, following the line of steepest descent. Water flow directions are indicated by blue arrows where visible from aerial imagery. The four numbered blue triangles depict sites of increased water input towards the pit.

Reply 3.7) Done as suggested.