Authors' response to discussion comments by referee Y. -O. Kim

The authors thank Prof. Kim for providing very useful comments on the manuscript.

< Major Comment >

RC1: The impact of LU on streamflow seems surprisingly small, ranging from 0 to 7% in Table 6 in spite of authors' explanation from the bottom of page 2220 to the top of page 2221. One possible reason for this small impact may be because the measure ($Q\_{climate/LU}$) is based on the total amount of streamflow. It seems that LU affects the peak discharge and timing rather than the total volume. Therefore, if authors had investigated smaller time scales, there might have been a larger impact on the peak flow characteristics. Since the simulation ran on a daily basis, the smaller time scale examination may be possible. Even a monthly time-step examination (like the hydrograph analysis in page 2215) may reveal more meaningful findings.

AR: The authors agree with the reviewer. Since LU is observed to affect peak discharge rather than the total streamflow amount, analysis on the smaller time scale may provide deeper insight into the contribution of LU to streamflow response. Considering this, similar analysis as presented in the paper on annual scale (Table 6 of the manuscript) is now carried out on a monthly scale. The results pertaining to the JJAS (monsoon) months, during when peak flow occurs in the region, are presented in Table A1 in this discussion.

Results from the Table A1 suggest that climate is the major contributor to the streamflow across all the three regions at monthly scale. The rather negligible contribution of LU to streamflow can be attributed to the low spatial extent of the sensitive LU category (urban area) in the three regions. However, when compared with the results of analysis at annual scale, contribution of LU to streamflow is slightly higher for upstream and midstream regions during JJAS months which emphasizes the fact that LU affects the peak discharge from the basin. For the downstream region, in addition to the low spatial extent of the urban area, streamflow response is observed to be moderately sensitive to the changes in this LU category (Table 4 of the manuscript). This could be the plausible reason for the negligible contribution of the LU to streamflow from the downstream region. This observation is consistent with the results obtained from the analysis on the impact of land use change on streamflow under invariant climate (Sect. 3.3.1), wherein negligible change in the discharge for the downstream region is noticed during the time period 1971 to 2011. On assessing the contribution of LU to streamflow across different time periods, it is observed that contribution during period P4 is higher for upstream and midstream regions compared to the contribution during period P1, indicating the influence of gradual increase in the urban area over the peak flows across the regions.

< Minor Comment >

RC2: L20 P2220: Is Q_$_{\text{climate/LU}}$ correctly defined?

AR: Yes, it is correctly defined. Since we are trying to compute the percentage contribution of climate or LU to the integrated streamflow, the following expression is used:

$$Q_{c\text{lim}/LU}\ (\%) = \frac{Q_{c\text{lim}/LU}}{Q_{\text{int}}} \times 100$$

RC3: L25 P2220: "... the analysis is Sect. 3.3.1 ..." –> "... the analysis in Sect. 3.3.1…"

AR: Thanks for bringing this into the notice of the authors. Requisite change will be made during the manuscript revision.

Table A1. Contribution of climate and LU to the streamflow for different time periods during monsoon months

Region	Streamflow	P1 (1971-1980)				P2 (1981-1990)				P3 (1991-2000)				P4 (2001-2005)			
		Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep
Upstream	Q_{int} (m^3s^{-1})	782	1656	1920	1224	568	1572	1952	1141	762	1579	2339	1576	681	1921	2204	1523
	Q_{clim} (m^3s^{-1})	768	1610	1869	1196	548	1487	1840	1082	741	1505	2220	1499	649	1777	2044	1401
	Q_{clim} (%)	98	97	97	98	96	95	94	95	97	95	95	95	95	92	93	92
	Q_{LU} (m^3s^{-1})	15	46	51	28	20	85	112	59	21	74	119	78	31	144	160	122
	Q_{LU} (%)	2	3	3	2	4	5	6	5	3	5	5	5	5	8	7	8
Midstream	Q_{int} (m^3s^{-1})	1007	2766	3425	2492	719	2814	3839	2755	921	2584	4130	3403	981	2811	3016	3907
	Q_{clim} (m^3s^{-1})	991	2679	3367	2458	681	2606	3526	2592	852	2323	3745	3144	909	2520	2724	3597
	Q_{clim} (%)	98	97	98	99	95	93	92	94	92	90	91	92	93	90	90	92
	Q_{LU} (m^3s^{-1})	16	87	58	34	38	208	313	164	69	261	385	259	73	292	292	310
	Q_{LU} (%)	2	3	2	1	5	7	8	6	8	10	9	8	7	10	10	8
Downstream	Q_{int} (m^3s^{-1})	63	263	382	242	43	226	282	286	13	13	301	288	69	193	205	293
	Q_{clim} (m^3s^{-1})	63	260	379	240	43	224	281	284	13	13	299	286	69	192	204	293
	Q_{clim} (%)	100	99	99	99	100	99	100	100	100	100	99	99	99	99	100	100
	Q_{LU} (m^3s^{-1})	0	3	3	2	0	2	1	1	0	0	3	3	1	1	0	0
	Q_{LU} (%)	0	1	1	1	0	1	0	0	0	0	1	1	1	1	0	0