Hydrology and
Earth System
Sciences
Discussions

Interactive comment on "Co-evolution of volcanic catchments in Japan" *by* T. Yoshida and P. A. Troch

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Thank you for the comments to our paper. Below are our responses to each of your comment.

1. Currently, your only descriptor of climate is the aridity index. While this is a very useful and extensively used climate descriptor it ignores any intra-annual variability of the climate signal. This intra-annual variability of climate can have a strong influence on the flow regime (and this results of this study). It would be a valuable addition to the manuscript to make a description of the seasonal climatology of the catchments, and highlight if these seasonal patterns are the same for all catchments. If there are strong regional differences in climate seasonality (e.g. rainfall seasonality and timing,

snow vs. rain) between the catchments, I do not think that only looking at the long-term mean value (aridity) is a sufficient descriptor of the regional differences in climate.

To highlight the seasonality of the precipitation of each catchment, we calculated the seasonal index SI (Walsh and Lawler, 1981).

$$SI= 1/P \sum_{m=1}^{12}|X\_m - P/12|$$

where P is mean annual precipitation and Xm is the mean monthly precipitation. The maximum value of SI is 1.83 if all the precipitation fell in a single month, while the minimum is 0 where the precipitation is evenly distributed throughout years. Calculated SI ranged from 0.182 to 0.506, which are classified as 'Very equable', 'Equable but with a definite wetter season' or 'Rather seasonal with a short drier season' (Walsh and Lawler, 1981). We thus assume the precipitation seasonality of our catchments does not significantly influence the results.

The reviewer is right that snow catchments tend to have larger BFI because we used low-pass filter that filters out high frequency signals from daily hydrograph to separate baseflow from total runoff. Two out of our catchments (SIM and HAZ) are non-snow catchments, whereas others are snow-dominant as shown in Figures. 18 and 19, whose averaged water storage in January and February remained high but drops in March and April. This may explain the negative deviation of the plot for non-snow catchments from the regression line (Figure 5 in the manuscript; Fig 1 in this reply).

In the revised paper, we shall modify the figure and clarify that the effect of precipitation seasonality is negligible.

2. The catchments range in size from 30.9 to 635.0 km2. Is this a factor to consider in explaining differences (in flashiness) of hydrologic response? For example the base-flow index (since this is determined by a low pas filter) might be strongly affected by catchment size?

The catchment size does not explain the variability in neither BFI nor DD in our study

catchments. This was intended to describe in the manuscript; however it was not described because of the author's mistake in the section 4.2, 'Analysis by geological age: Controls of time on catchment co-evolution' (P9665, L23-25).

<Discussion Paper> No significant correlation was found between the hydrologic indices between catchment age; the baseflow index (R = −0.24, p = 0.42) and drainage density (R = 0.23, p = 0.43).

<Revised Paper> No significant correlation was found between the hydrologic indices between catchment areas; the baseflow index (R = −0.24, p = 0.42) and drainage density (R = 0.23, p = 0.43).

In the revised paper, we shall correct this sentence such that the catchment area has not significant influence on the results.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 9655, 2015.
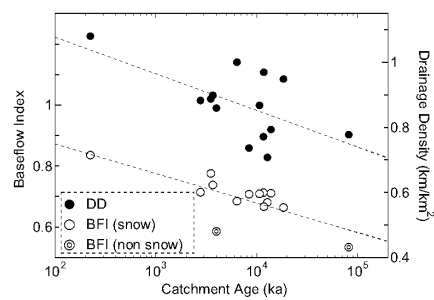
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Fig. 1.