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Interactive comment on "Climate-induced hydrologic change in the source region of the Yellow River: a new assessment including varying permafrost" *by* Pan Wu et al.

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(1) In Fig 5b it appears that the classic Budyko curve does not capture the local relationship type-curves well. This is because in our study we use a time varying average to calculate time-varying points. And therefore, each point has a different w value for each time period which is observed in Fig 5b as the distribution of points for each sub-basin. If we were to draw many more type-curves for different w values, all our points will be located on a classical Budyko type curve. Fig. 5b just show three curves with more than 120 time-varying points to help readers see the range of w values. Further, the classic Budyko method is obviously efficient for this study, because all the w values

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are calculated from Fu's equation which plotted in Fig. 5b as attached in following. As such we have further clarified the text. Specifically, in section 4.2 we added: Points in the Budyko space can be located respective to a given Budyko-type curve by changing the w value for Fu's equation. Example classical Budyko curves for w = 2.4,2.0 and 1.7 are shown in Fig. 5(b). The gray area of Fig. 5b indicates where the Budyko type-curve changes with different w values. (2) MFD variations have been discussed in Sect. 2.2 The mean frozen depth exhibits a decreasing trend at most of the observation sites, especially in the period after 1980. And 11-year moving average value of the selected for the further analysis. We did not describe these variations clearly, however, all the analyses are based on realistic data. It won't impact the analysis results. (3) The reliability of this research has been discussed in Sect. 5.2: Considering permafrost degradation in a whole catchment hydrological system is more complexed, but it is necessary for better understanding and predicting earth system and hydrological change in cold regions. At present, there is few physical models can accurately handle these situations. But it can be preliminarily considered by using a conceptual model and statistic methods. And interesting results obtained by considering permafrost at a catchment hydrological scale, degrading permafrost that can role as a positive factor for discharge change. And the potential physical explanations are further discussed in Sect. 5.2: It has been found that the permafrost degradation could enlarge baseflow in cold regions (Walvoord and Striegl, 2007; Jacques and Sauchyn, 2009; Bense et al., 2012; Evans et al., 2015; Duan et al.,2017). Decrease in MFD because of global warming was considered as a major factor for the increase in baseflow in the Qilian mountain, China (Qin et al. 2016). Additionally, the melt ice within permafrost and increasing hydrologic connectivity fallowing permafrost thaw-induced land-cover change will increase the runoff discharge (Connon et al. 2014; Duan et al. 2017).

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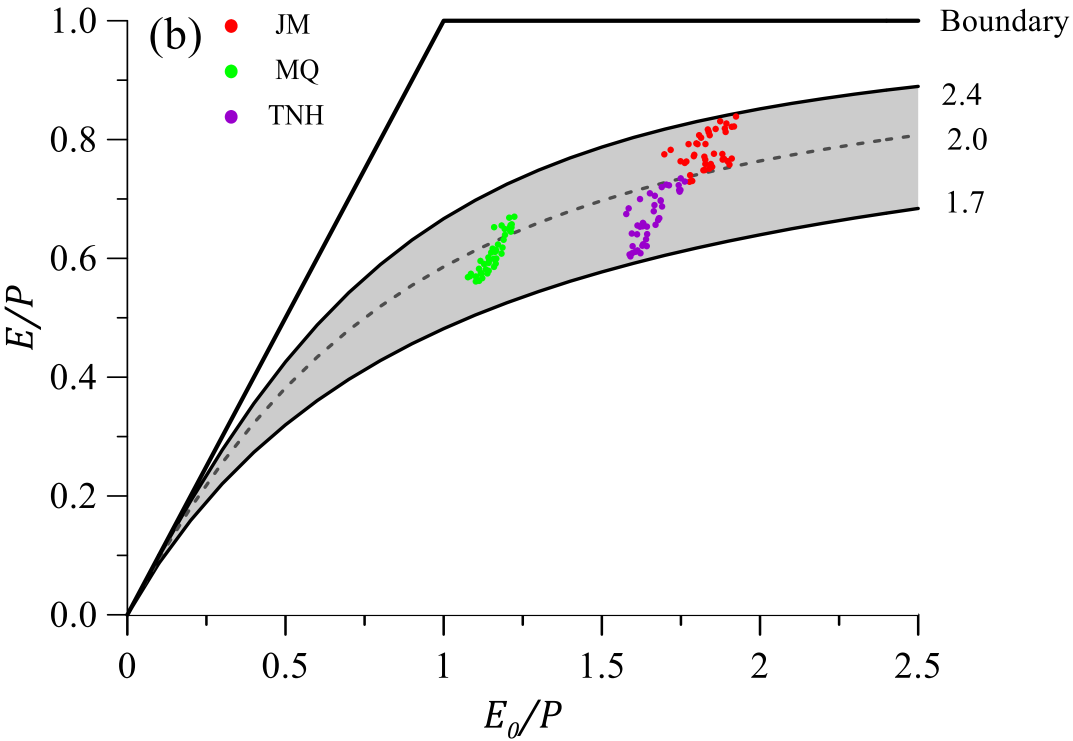

Fig. 1. Figure5b

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