Rely to Referee #2

Authors have presented the methods for applying the multivariate hydrologic design to the engineering practice under non-stationary conditions. Innovation of this paper is good but here there are main problems.

Response:

Great thanks for your positive evaluation as well as professional comments on our study. All your comments have been addressed in revising the manuscript.

(1) Materials and methods aren't described clearly. For accept of the manuscript, the test in mention section should be revised completely.

Response:

In the revision, we have added an Appendix to explain the methods used this study in more detail. The tests for the methods (including GoF tests for both marginal distributions and copula) have been revised completely and supplemented more explanations. The revised manuscript should be clear for readers.

The revised tests for the methods are given as follows:

The goodness of fit (GoF) of the probability distributions is examined by using the Kolmogorov-Smirnov (KS) test (Frank and Massey, 1951). The p-value of the KS test is simulated from Monte Carlo method, and the significance level of the test is 0.05.

The goodness of fit (GoF) tests for vine copulas are very limited, and the Probability Integral Transform (PIT) test (Rosenblatt, 1952) seems to be one of the few reliable methods (Aas et al., 2009). Under the null hypothesis that the multivariate flood variables (Q_1, V_3, V_7, V_{15}) follow a given C-vine copula, the PIT converts the dependent flood variables into a new set of variables that are independent and uniformly distributed on [0,1]4. Then the next step is to verify whether the resulting variables really are independent and uniform in [0,1]. This work can be finished by using chi-square test, and the significance level is set to be 0.05. For more details of the PIT test, readers are referred to Aas et al. (2009).

(2) The reason for selection of C-vine as chosen method isn't specified. First mention a scientific for using of C-vine, then continue the rest of the manuscript. Because error may occur due to an incorrect selection of Vine.

Response:

Thanks for this comment. In this study, the annual maximum daily discharge (Q_1), annual maximum 3-day flood volume (V_3), annual maximum 7-day flood volume (V_7) and annual maximum 15-day flood volume (V_{15}) are chosen to define the multivariate flood series. It is known that flood peak (e.g., Q_1) is the dominant feature quantifying flood event as well as the key factor in hydrologic design (Ministry of Water Resources of People's Republic of China, 1996). The C-vine is more suitable when there is a key variable governing multivariate dependence, therefore it is reasonable to employ C-vine copula to construct the joint distribution of (Q_1, V_3, V_7, V_{15}) with Q_1 elected as the key variable. In the revision, we have specified this explanation in the second paragraph of section 3.1.2.