Interactive comment on "Changing patterns of extreme water levels in urbanizing plain river network region of Taihu Basin, China: characteristics and causes" *by* Y. Wang et al.

Anonymous Referee #2

Received and published: 31 May 2016

This paper presents an analysis of daily rainfall and water level data for the period 1960 to 2012 for the Taihu basin, in the delta region of the Yangtze river in China. The aim is to detect changes in annual minimum and maximum water levels over the study period and to see whether changes can be attributed to changes in precipitation patterns and/or to anthropogenic impacts. While the dataset is rich in that it includes data for 24 rain gauges and 8 water level gauges, most of the analyses seem to be based on single water level and rainfall time series, representing either a single gauge or an average over all gauges (this is not clear from the text). Basic statistical tests are performed for trend analysis and detection of change points in the time series of annual maxima and minima. Then, an attempt is made to attribute detected changes

to precipitation and anthropogenic influence. The latter is based on small datasets (the original dataset is split into two) , which provides a weak and, in my view insufficient, basis to support conclusions drawn from this analysis.

The paper would greatly benefit from more extensive analysis of the available datasets, including an explicit analysis of data from the individual gauges and looking more deeply into relationships between rainfall and water levels across the basin. One of the key aspects of this study is analysis of anthropogenic impacts on the hydrological system, which are associated with rapid urbanisation over the past decades. This relationship is studied in a rather indirect way (based on the annual data series) and has a spatial aspect that is not touched upon in the paper. With the available data, there seems to be room for analysis of spatially varied urbanisation impacts across the basin (since it is likely that urbanisation is non-homogeneously distributed across the basin, one would expect different impacts on water levels at different gauges over time).

Comments per section: Introduction: - In their discussion of references, the authors refer to water level as one of the relevant hydrological parameters. The reason why they do so, is because they will be analysing water levels, not flows, in their study. This is however not explicitly mentioned, which makes the description in the first 2 paragraphs somewhat confusing. I would suggest to first present relevant literature, then explain specifics of water level instead of flow as a relevant parameter for delta regions, where storage (water level variation) dominates over flow. - P2, line 23: what do the authors mean by "criss-cross river network with a density of 3.2 km/km2", is this a river network density? In general, this paragraph (lines 23-35) needs to be restructured in a more logical way Study area and data source: - P3, lines 20-21: please report period for which the percentages are reported - P3, line 30: it is stated that Thiessen polygons were used to calculate regional extreme water level series. First, this does not seem to be an appropriate method for interpolation of water levels and second, it is not clear why this interpolation was done, since later analyses seem to be based on single data series? - P3, lines 27 and 32: please report type of gauges for rainfall and water levels,

data resolution and data gaps, if any. - P4, lin1: please specify "some other data" – what land use data, river network data and how these were used in the analysis Methodology: - In section 3.2, the dataset is split into 2 separate periods to study water level changes. The resulting sub-datasets are very small in size, thus insufficient to support statistical analysis. Also, the assumed relationships between precipitation and water level are far too simplistic to draw valid conclusions from the results. Results and discussion: - At several points in the discussion, authors draw conclusions on the impact of climate change and human activity on water levels which are not well justified by the results. A more critical analysis and discussion of results is required (for instance on page 6, lines 25-26; page 7, lines 10-11 and lines 26-27) - Section 4.2: as mentioned earlier, the number of data points seems to be too small to draw these conclusions - Section 4.3: lines 27: please check numbers for urbanisation, they do not match and seem to be rather low compared to the size of the basin (7929 km2)