Response to Reviewer 3 Comments

**Point 1:** It is well known that China in the past 20 years has grown rapidly, that the definition of urban has changed and that Chinese planning authorities have changed policy goals at intervals. This study tries to use satellite imagery, AuAi algorithms and fractal systems to produce an accurate assessment of the results. The basic picture produced is fascinating and exciting as Shenzhen, for instance, replaces Xian in rank order. But the introduction of Zipf’s law, an American statistical anomaly of its century of growth, seems arbitrary and extraneous to the research and conclusions found here. The hierarchy and distribution of cities in China might once have followed this law, but with centuries of planning and the current planning institutes and design offices it is hardly surprising that The Chinese pattern is so different. It would help a great deal if the structure and hierarchy of Chinese cities was discussed further. Also the definition of urbanization boundary and actual urban build out is unclear and important, making the definition of urbanization rate and extent in some vast city territories in western China unclear. This paper contained important insights but needs further clarification.

**Response 1:** We are very grateful for your questions and suggestions.

(1) Zipf's law is proposed by George Kingsley Zip in word frequency statistics, 1949 and then applied in assessment of American and other country's cities' distribution. It is not just a law to obey but a statistical technique to analyse the structure and hierarchy of cities. The rank-size rule has been a quantitative theory and method in the study of urban geography.

Cities' distribution analysis is important for giving a brief outlook to understand the structure and hierarchy for a country's cities. The rank-size rule and Zipf's law are not only for natural cities but also a useful tool for analysing the influence of government policies. So, we think it is necessary and important to the research and conclusions. And we accept your suggestion and discuss the structure and hierarchy of Chinese cities further.

And many researchers have used rank-size law to analyse the city distribution. Jeff Luckstead\(^1\) on China's and India's urban rank-size analysis when the population is more than 750000 city as the research samples, Fang C\(^2\) and Cheng K M\(^3\) selected capital city and cities at or above the prefecture level as the research samples to analyse Zipf index. Chen Z\(^4\) first verifies the scale-order distribution of Chinese cities, and then divides them into tourism cities, provincial capital cities, coastal cities, Yangtze river delta cities, pearl river delta cities, southwest cities and northeast cities, and conducts parallel growth analysis.

All in all, we think the analysis of rank-size rule is important and we have done more research.

(2) We have given more details of the definition of urbanization boundary and actual urban build out in Section 3.2.

\[1\] Luckstead J, Devadoss S. A comparison of city size distributions for China and India from 1950 to

