Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2018-213-AC2, 2018

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Seismic Indirect Economic Loss Assessment and Recovery Evaluation Using Night-time Light Images – Application for Wenchuan Earthquake" *by* Jianfei Wang et al.

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Received and published: 21 October 2018

Thanks for your contribution to this paper. I have read your comments very seriously and responded as follows:

Reply to the Comment 1: I have added the important impact of this earthquake and why was it worth studying, in expert's reply. These will be reflected in the next revision.

Reply to the Comment 2: According to your suggestion, we will add some research, focusing on the relationship between night-time light and economic activity, in the method

part. As follows:

The seismic direct economic loss refers to the damage of existing production materials and environment by earthquake, which mainly reflects the impact of earthquake disasters on economic stock. However, the seismic indirect economic loss is a systematic manifestation of losses in the chain of economic activities, which focuses on the far-reaching impact of disasters on economic flows. Studies show that night-time light can be used as a proxy of economic activity. Chen et al.(2011) had proven nighttime luminosity could be used to improve estimates of output at the regional level, Bruederle et al.(2018) conclude that nighttime lights are a good proxy for human development at the local level, Ma et al.(2014) had proved that nightlight data could be indicative of demographic and socioeconomic dynamics in China's cities. Therefore, this paper holds that the changes in night-time light after the earthquake can reflect changes in the regional economic system. The technical route is shown in Figure 3:

Reply to the Comment 3: According to your suggestion, we have added experiment module of the relationship between night-time light and economic activity. There are some interesting results will be updated to the discussion part. As follows:

The path of economic change in the disaster area after the earthquake gradually spread from the northeast to the southeast (Figure 15). The economy level for 5 years after the earthquake in disaster area (2008-2012) were compared to the level of 2007, we found that in the first year (Fig. 15-a), the economic decline is mainly concentrated in the disaster area, and the city's economic decline is most significant. In the second year (Figure 15-b), the economic slowdown area began to spread to some major cities in the southeast of the disaster area. It was not until the third year (Fig. 15-c) that the disaster area began to recover, and the first one was not the area where the economy was reduced seriously after the disaster, but some cities located near these areas in the northeast. The force gradually spread from north to south during 2010-2012 (Fig. 15-c, Fig. 15-d, Fig. 15-e). Eventually, some cities were developed farther outside the disaster area (Figure 15-f). This explains the path of the Chinese government's

aid funds from the north to the southwest and its radiation effects on the surrounding areas.

The areas where the economy first turned around were along the road or around the city in the disaster area (Figure 16). Previous analysis have proved that the economic recovery in disaster area began around 2010. Therefore, the process of economic recovery can be studied by comparing the economic level of the disaster area from 2009 to 2012 with the level of 2008. In 2009 (Figure 16-a), excepted few areas along several roads close to the disaster area, there were few economic growth in the areas. However, in 2010 (Fig. 16-b), the economy where along most roads showed significant growth, and the surrounding areas of cities, which were seriously affected by earthquake, showed an increasing trend. By 2011 (Fig. 16-c), the trend of economic growth in the disaster areas has spread to neighboring cities and provinces, and the urban economy has also begun to recover from the periphery to center. As of 2012(Fig. 16-d), the economy of disaster area showed an interesting development pattern. On the one hand, there were few recovery in the urban economy with severe recession; on the other, a series of significant growth were shown in the surrounding areas. This may help us to distinguish the industrial layout of the disaster-stricken areas after the disaster. The economically active areas after earthquake are mainly the secondary industries such as construction and manufacturing, while those areas with slow recovery are mainly the tertiary industry such as service and entertainment industry.

References:

Chen X. ,Nordhaus W.D. :Using luminosity data as a proxy for economic statistics. Proceedings of the National Academy of Sciences, 108(21),8589–8594,2011.

Bruederle A, Hodler R. :Nighttime lights as a proxy for human development at the local level. Public Library of Science (one),13(9),e0202231,2018.

Ma T.,Zhou C.H.,Pei T., Haynie S., Fan J.F.: Responses of Suomi-NPP VIIRS-derived nighttime lights to socioeconomic activity in China's cities, Remote Sensing

Letters,5(2),165-174,2014.

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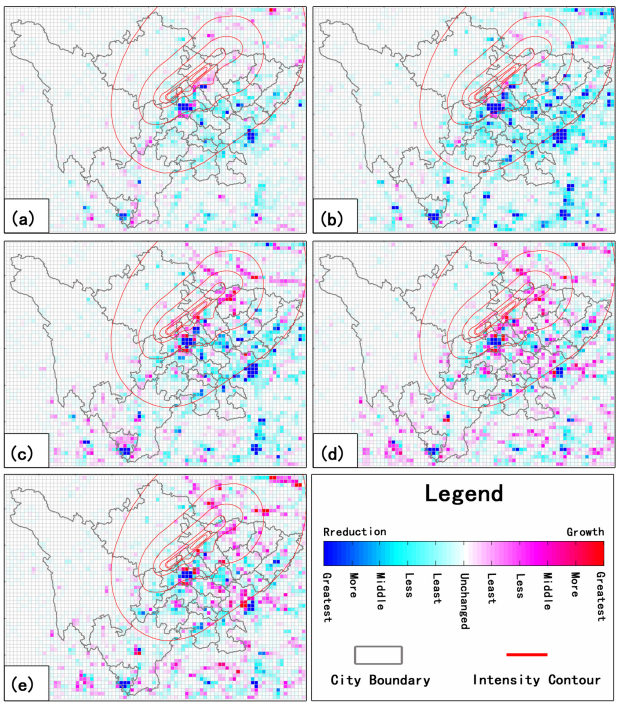

Figure 15:The economic change path in disaster area
(a.The path of 2008; b.The path of 2009; c.The path of 2010;
d.The path of 2011; e.The path of 2012)

Fig. 1.

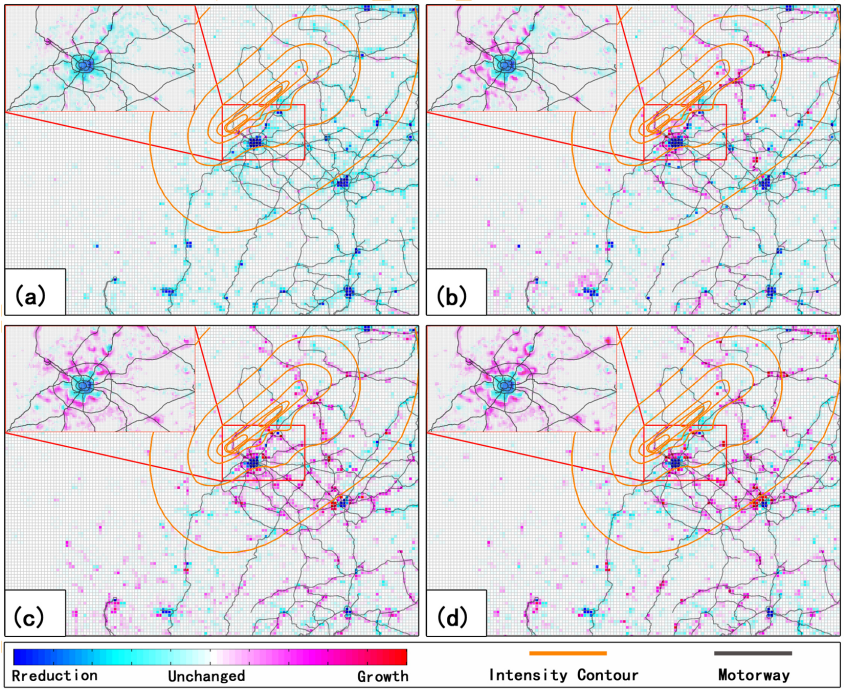

Figure 16: Economic recovery process in the disaster area
(a.Economic recovery area in 2009; b,Economic recovery area in 2010;
c.Economic recovery area in 2011; d.Economic recovery area in 2012)

Fig. 2.