Assessment of Flood Disaster Risk in China: Integrated Analysis of Hydrological Information and Demographic Dynamics

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1. Research topic:

Extreme weather is one of the major challenges facing society today, especially with the impact of climate change. In the future, China will face more frequent and severe flood risks. Therefore, adapting to and mitigating flood disaster risks has become an urgent task for flood control and disaster reduction in China. Despite hydrological studies providing information on historical flood area scales, frequencies, and future predictions, there is a lack of in-depth research on how these flood disasters affect society and people's well-being.

2. Theoretical focus:

Flood risk is determined by the interaction of the disaster (flood scale and intensity), exposure (the number of people affected by the flood disaster), and vulnerability (the degree of societal vulnerability to flood disasters). Multiple factors, including population characteristics, social structure, and economic conditions, interact to shape the complexity of flood risk. Therefore, integrating hydrological information from flood-prone areas and demographic dynamics to assess flood disaster risk is of paramount importance.

3. Research aim:

This study uses high spatial resolution satellite images of flood disasters in China from 2000 to 2020, combined with socioeconomic and demographic data. It employs spatial statistical models to comprehensively assess flood risk based on exposure and vulnerability, identifying high-risk hotspots for flood disasters. Integrated analysis based on hydrological information and demographic dynamics is advantageous for government and social decision-makers to accurately analyze and identify various key areas and populations at risk of flood disasters. This facilitates the development of targeted risk avoidance, defense, and management policies and measures at both the national and regional levels.

4. Data:

Data availability: Flood events available in both exposure and impact are from 2003-2015
Exposure - Global flood database (2000-2018)
Impact(fatality, affected pop, economic loss) - China Meteorological Disaster Statistical Yearbook (2001-2021)

5. Method:

(1) Adapted bivariate choropleth map to evaluate the degree of relation between flood-induced fatality and potential flood exposure at the provincial level.
(2) Generalized linear model (GLM) to examine effects of flood exposure and socio-economic condition on flood-induced fatality.
(3) Piecewise regression modelto detect the breakpoint of the relationship between income (for

example) and flood-induced fatality.

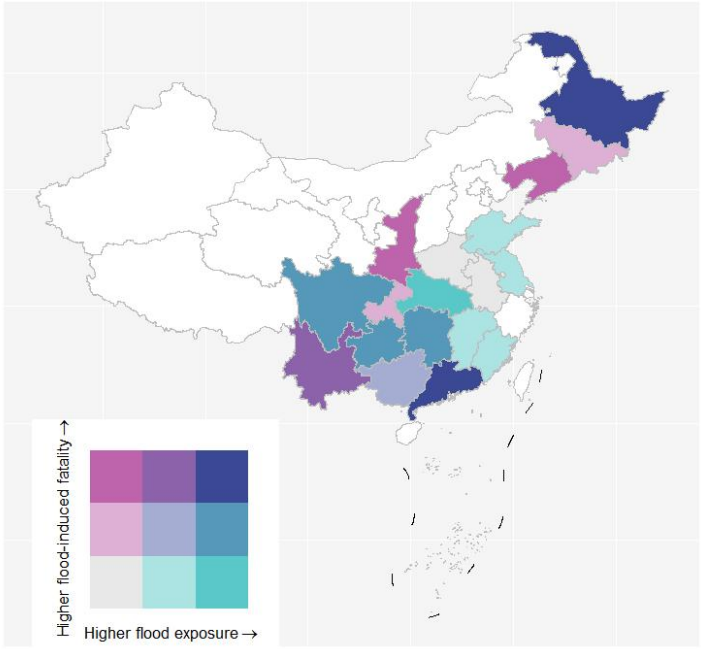
6. Preliminary results:

1. Identify regions with different characteristics

High flood exposure, High flood-induced fatality: Heilongjiang (may due to high elderly dependency ratio), Guangdong (may due to big population size)

Low flood exposure, High flood-induced fatality: Liaoning, Jilin, Shaanxi, Chongqing (may due to high vulnerability)

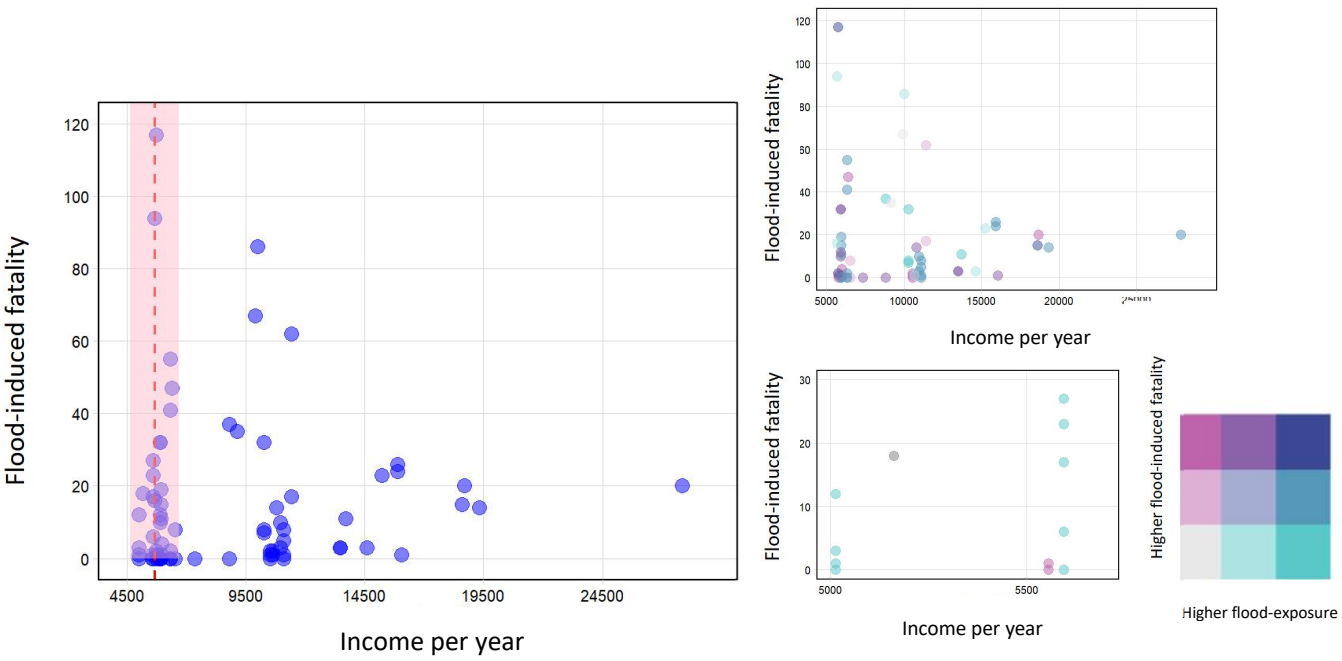
High flood exposure, Low flood-induced fatality: Anhui, Jiangxi, Fujian (may due to high economic development and flood experience), Zhejiang (may due to high economic development), Shandong



2. Income break point is about 5600

For regions which have income smaller than the break point, higher income per year, less fatality

For regions which have income higher than the break point, higher income per year is not necessary associated with less fatality.



3. Among regions have high flood exposure,Yunnan, Heilongjiang and Guangdong have high flood-induced fatality, while Jiangsu, Fujian, Jiangxi and Shandong have low flood-induced fatality, Guangdong, Fujian and Jiangsu have high income per year.