Hydrol. Earth Syst. Sci. Discuss., 9, C2456–C2459, 2012
www.hydrol-earth-syst-sci-discuss.net/9/C2456/2012/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Joint impact of rainfall and tidal level on flood risk in a coastal city with a complex river network: a case study for Fuzhou city, China" *by* J. J. Lian et al.

Anonymous Referee #1

Received and published: 22 June 2012

Review of

Joint impact of rainfall and tidal level on flood risk in a coastal city with a complex river network: a case study for Fuzhou city, China

by J.J. Lian, K. Xu, and C. Ma

Recommendation

accept with major revisions

Synopsis

Most coastal cities are situated along a river or in a delta. They are therefore not only threatened by high sea level (e.g., storm surge), but also by high river discharges caused by high rain fall. The threat is especially large when both events occur at the same time. The paper investigates the joint effect of rainfall and sea level on the water level in the rivers and canals of Fuzhou.

Rainfall data are used as input for a hydrodynamic model of the main waterways in Fuzhou to determine water levels in the rivers and canals, assuming different heights of sea level and different pumping conditions. At high rainfall rates pumping becomes ineffective already at a relatively low sea level, while at low rain rates it can cope with a much higher sea level. The greatest threat in Fuzhou thus comes from the rain, not from the sea level.

In a second part the authors try to assess the probability of heavy rain and high sea level occurring simultaneously. To do so, they analyze observed rain and sea level data and try to fit their empirical distributions using Extreme Value theory (EVT).

General

The paper addresses an important question and attacks it from two different view points (hydrological modeling and EVT). The results are interesting, and the paper deserves publication. However, I think that the presentation can be much improved.

Major points

English proofreading required.

All Figure captions need to contain more information about what is displayed in the figure.

sec. 3.3 More explanation is needed. Not many people are familiar with copulas. Explain what they are, and especially explain the specific copulas that you mention (Gaussian, t, Clayton, etc.)

p 7485, l 19-25 A better explanation is needed. What precisely is depicted in the figure? Does the figure mean that for precipitation return times of more than 20 years pumping is useless? Would stronger pumps help?

p 7486, l 17 What is the meaning of the fact that the Gumbel copula works best?

p 7486, l 20-23 I cannot see why (6) follows from (3). Where are f_h and f_z?

p 7487, l 1-7 Please explain the columns in Table 2.

p 7487, l 18/19 So this means that a high tidal level is usually accompanied by heavy rain and *vice versa*? Seems obvious: It rains heavily during a storm (or typhoon) that transports moist air from the ocean to the land, and the same wind creates a surge, increasing the tidal level. Why do you need a complicated mathematical method (EVT) to conclude this?

p 7488, l 12-14 This seems rather obvious. But what is the consequence? You have shown that sea level poses an extra risk. So how to cope with sea level? Higher dykes?

Minor points

p 7476, l 11 diverse → different

p 7479, l 2-4 refer here to Fig. 1

p 7480, l 3 explain DEM

p 7481, l 7 rest → remaining

p 7481, l 16 reference needed for Reasoning Formula Method

p 7483 Make equations part of the sentence instead of listing them at the end of the sentence.

p 7486, l 21 Make equation part of the sentence.

p 7487, l 10+20 slight → low

Figs. 5+6 The information content of these figures is rather low. It is hard to find any differences. Perhaps it would be better to show a difference plot only.

Fig. 7 At which location?

Fig. 8 What does the value 25% mean? 25% of what?