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Interactive comment on "Lightning risk assessment at a high spatial resolution using the resident sub-district scale: A case study in Beijing metropolitan areas" *by* Hai Bo Hu and Jing Xiao Li

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The authors present a lightning risk assessment of different structures but do not make it clear what the improvement/difference to the lightning risk assessment in the standard IEC 62305-2 is. Response: We admitted the fundamentals of our risk assessment still follow the standard IEC 62305-2t. However, some work had been done on the improvement of lightning risk assessment. The primary improvement is that the resolution is downscaled from 1 km spacing grids to that of 5m spacing grids. Thus, the risk recognition in this high resolution sufficiently detailed in reflecting lightning risk characteristics and allowing risk discrepancies recognizable in a real-world view. Technically, the newly methods of CG lightning stroke estimates, downscaling, and correction for

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detection efficiency, as well as NDLE estimates in 5m spacing grids are different from that in 1km spacing grids. However, we revised our manuscript slightly on emphasizing on the improvement/difference. Please see p4. line23-26.

Further they use really strange assumptions, e.g. - They use the stroke densities for risk calculation. To really estimate the lightning risk, the ground strike point density should be used (see IEC 62858). Response: The stroke density is derived from the observed data and the ground strike point density is determined based on a multiplication factor of 2 on flash density (IEC 62858). So it is puzzling to tell which is better than other. Thus, we accepted the suggestion of referee #2, and added the distribution of strike point density (NSG=2*Ng) and calculated the NDLE using strike point density suggested by IEC 62858. Please see Fig. 4d, Fig.6c, p.4 line 5-6, and p. 10 line 7-9.

- The grid size of the stroke densities is not clear and it is further not clear if the amount of data is enough to calculate a meaningful lightning density with an accuracy of +/- 20%. For such an accuracy about 80 strikes should be within a grid cell (Diendorfer, 2008, and also IEC 62858). It is also not clear why the authors use 5m resolution for risk calculation. In my opinion this does not make sense for lightning risk calculation.

Response: Our purpose is to assess the lightning risk in an extremely high resolution, which enables visualization of the relative low and high risk areas in real world view, critical for disaster preparedness and practical lightning risk management. Technically, based on an interpolation method, the CG stroke densities of 1*1 km grids were downscaled to these of 5*5 m. However, this procedure kept the original uncertainty of derived CG stroke densities in 1*1 km grids, which in some degree (not fully) are in accordance with the grid size requirement of IEC62858 for obtaining an uncertainty of less than 20% and 90% confidence level. Moreover, to meet the requirement of IEC62858, we appended 2012-2014 ADTD data, meaning recently 8 years of LLS data (2007-2014), were used to derive the CG flash density, stroke density and strike-point density, which is critical to NDLE estimates. So we replaced figure 4 and 6, and edited the corresponding paragraphs. Please see Fig. 4, Fig. 6, p. 2 line 24, and p.8

line 23.

The lightning location system (LLS) accuracy is not even close to that value (for really high performing LLS in the low frequency range the median accuracy is in the range of 100m). Response: We had corrected the paragraph about the lightning location system accuracy. However, the ADTD parameter of median location accuracy within 1 km is provided by the manufacturer. Please see p.3 line 7.

The authors mention that LLS data was corrected for detection efficiency but do not tell how it was corrected or with which method. Response: We estimated the detection efficiency using the method in reference to that of Schütte et al. (1988), and Naccarato and Pinto (2009). We added some description of our DE estimate method for a clear introduction of its fundamentals. Please see p.8 line 6-9 and line 20. .

The paper is compiled very superficial with a lot of small mistakes. E.g. chapter 3.2.2 exists three times with the same chapter heading and slightly different content. Response: We had corrected it. Please see P.6 line 1 and P.6 line 6.

Reference

Tyahla, L. J., and R. E. Lo′pez, 1994: Effect of surface conductivity on the peak magnetic field radiated by first return strokes in cloud-to-ground lightning. J. Geophys. Res., 99 (D5), 10 517–10 525. IEC62858. Lightning density based on lightning location systems (LLS)-General principles. IEC, Geneva, Switzerland, 2015.

Please also note the supplement to this comment:
http://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2016-231/nhess-2016-231-AC1-supplement.pdf

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