The appearances of meteorite streams

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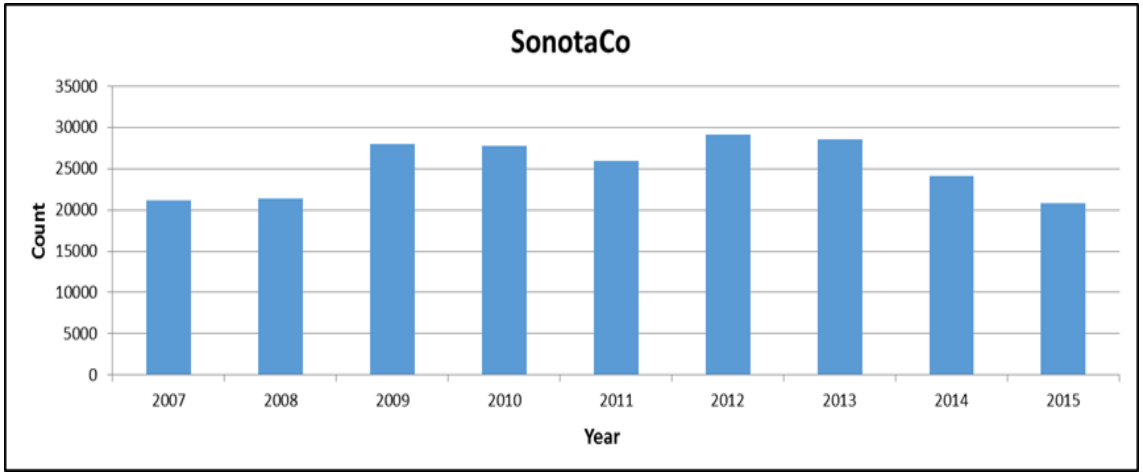
(also thanks Pei-Ying Wu)

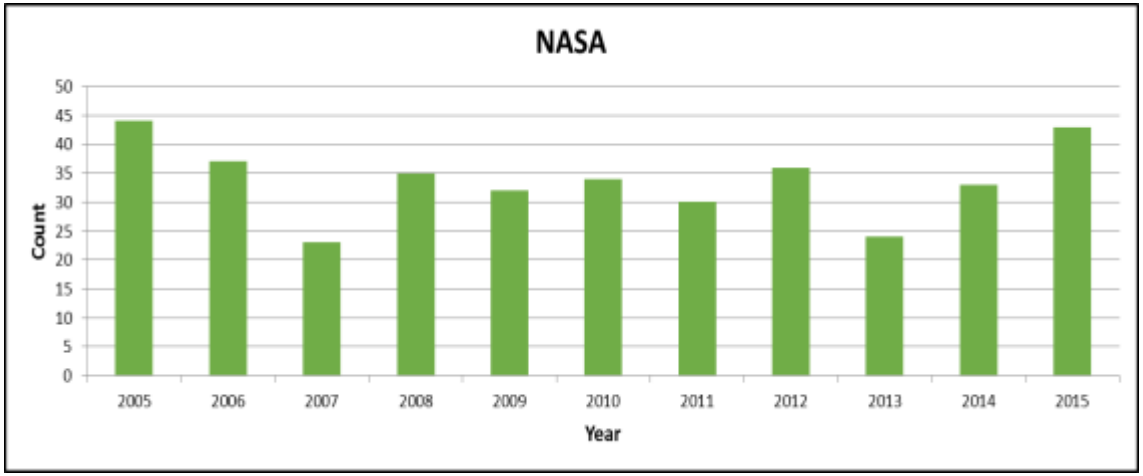
Motivation

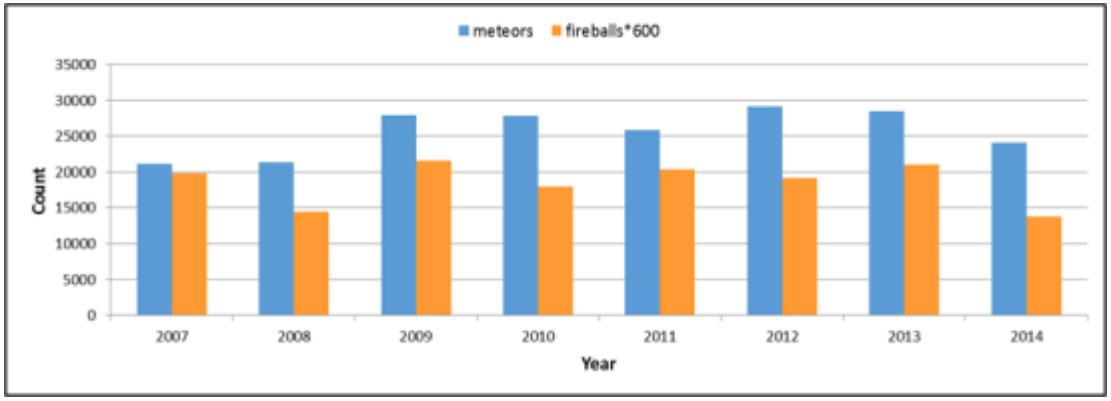
- Meteorites are interesting natural events all the time, which could have significant influence on human civilization as well.
- work on meteorite cataloguing, gathering reports based on “Song Shi” (960AD – 1279AD), “Yuan Shi” (1271AD - 1368AD) and “Ming Shi” (1368AD – 1644AD) in China

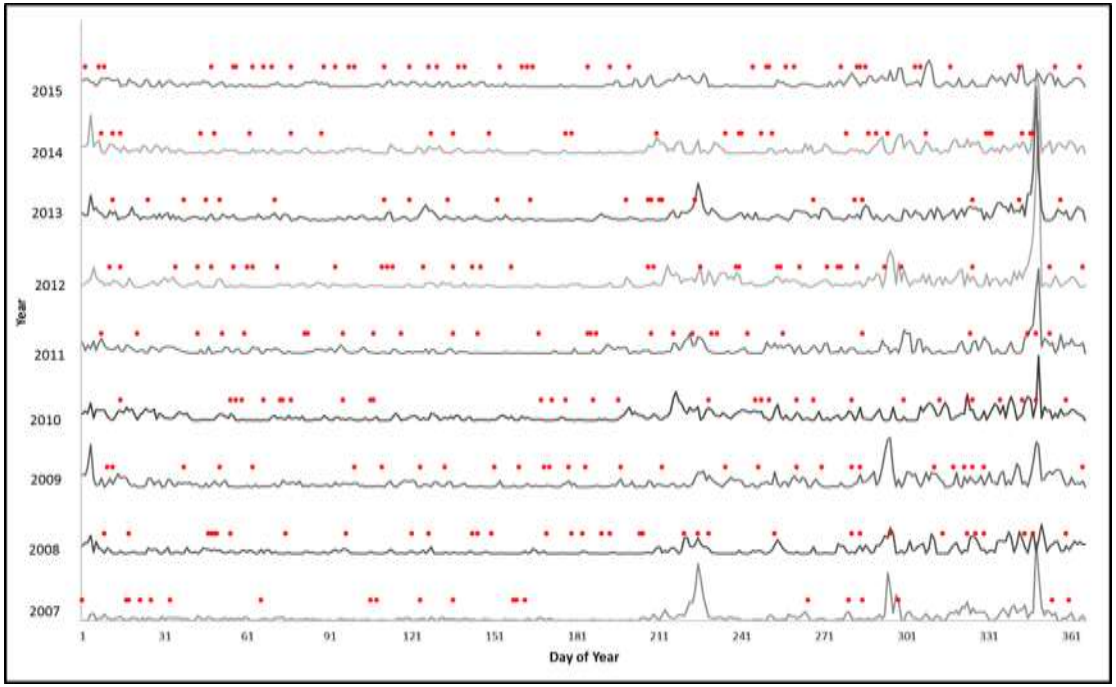
The histogram of the 1-year event rate distribution

meteors data is from SonotaCo; fireball data is from NASA.



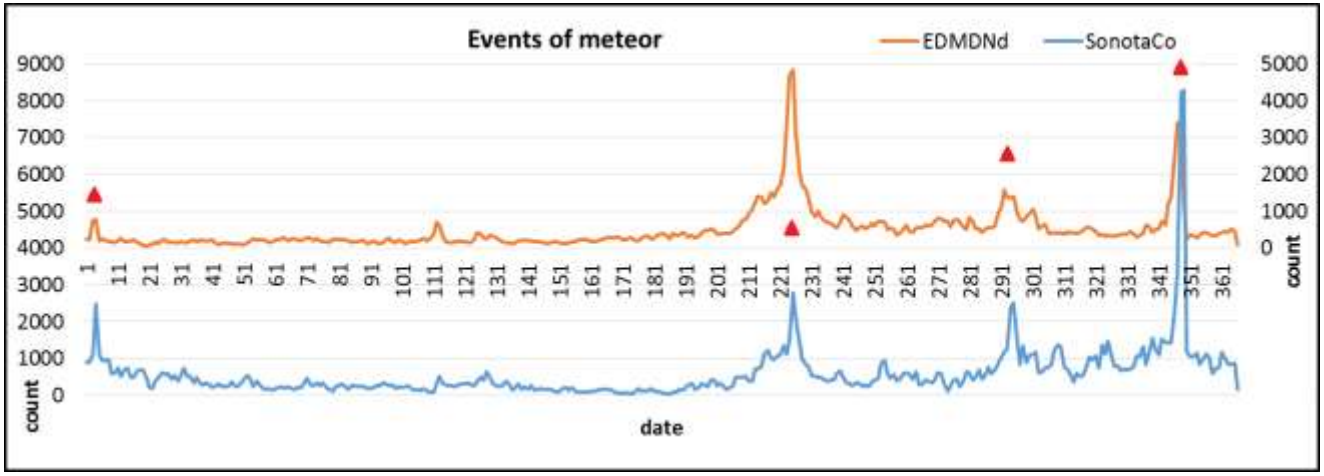


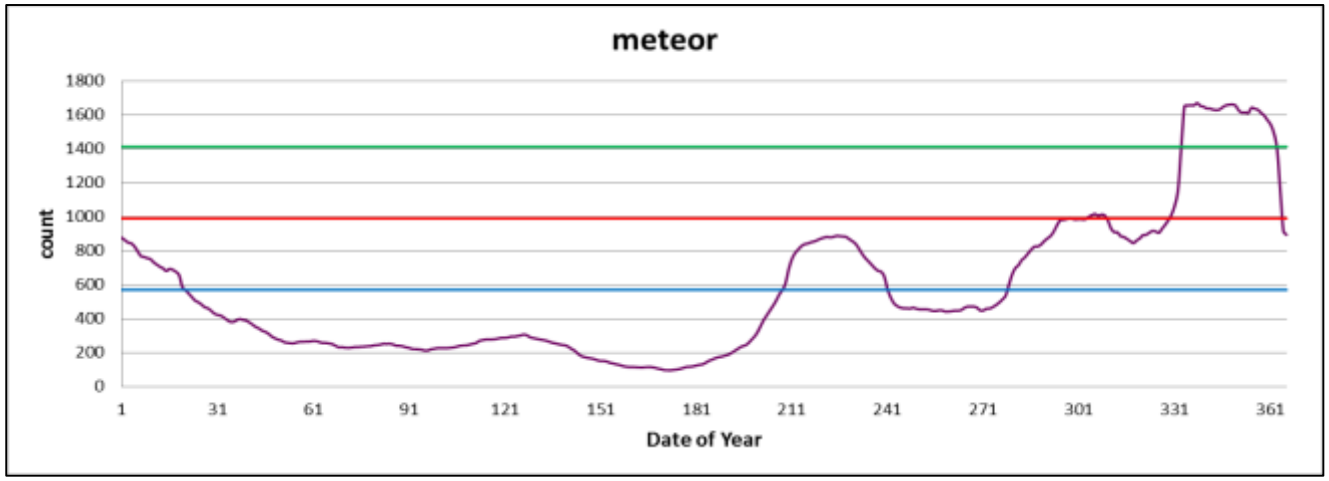

meteors
fireballs*600
35000
30000
25000
20000
15000
10000
5000
0
Count
2007
2008
2009
2010
2011
2012
2013
2014
Year


2015
2014
2013
2012
2011
2010
2009
2008
2007
Year
1
31
61
91
121
151
181
211
241
271
301
331
361
Day of Year

Meteor stream

- one meteor shower is one meteor stream
  - Quadrantids (Williams et al., 1979; Mcintosh, 1990)
  - Perseid (Lindblad & Porubčan, 1994; Brown & Jones, 1998)
  - Leonid (Yeomans, 1981; Asher, 1999)
  - Geminids (Plavec, 1950; Williams & Wu, 1993)



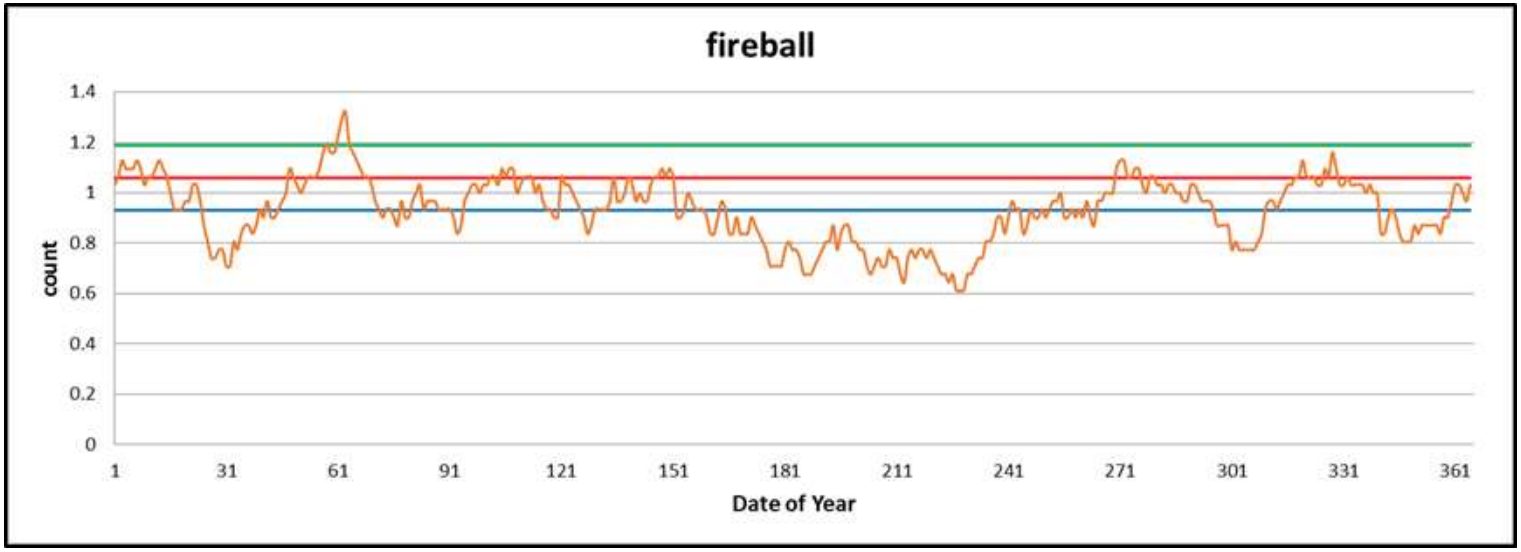


Moving Average

$$f(x)=\frac{1}{2n+1}\sum_{k=x-n}^{x+n} p_k$$

Fireball streams

- 57% of the fireball streams are associated with meteor showers (Terentjeva, 1989).
- a substantial fraction of the fireballs (Porubčan & Gavajdová, 1994)
  - special fireball streams;
  - members of the known meteoroid streams.
- Associations between fireball streams and asteriods (Gavajdová, 1995)

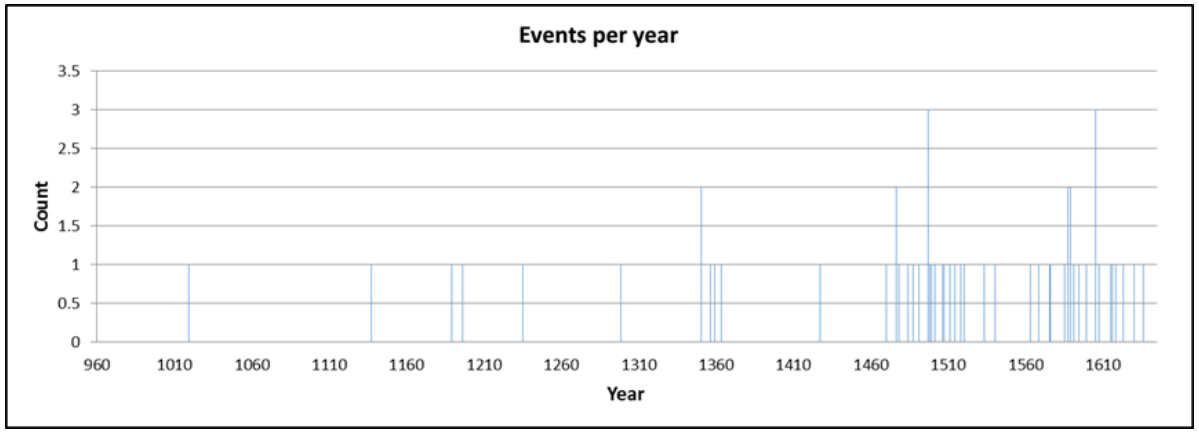


– the blue line is average daily occurrence frequency

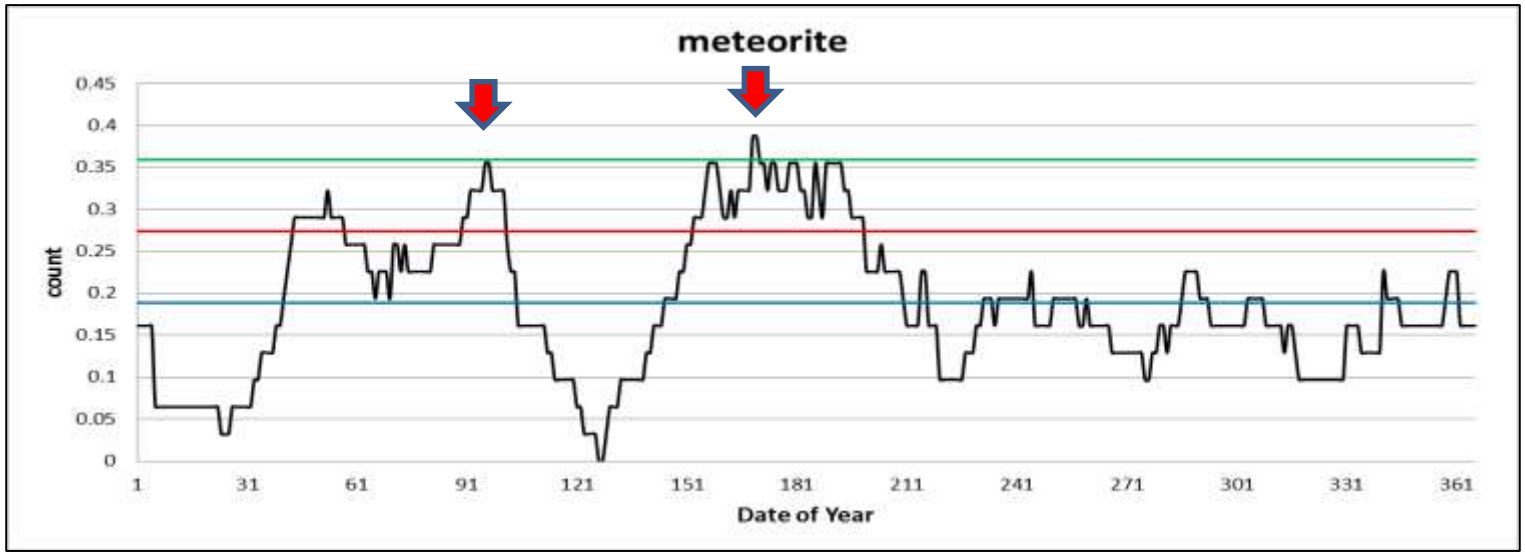
– he red and green lines are 1σ and 2σ level

Official history books

- “Song Shi” (宋史)：The history of Song dynasty during 960AC to 1276AC.
- “Yuan Shi” (元史) ：The history of Yuan dynasty during 1271AC to 1368AC.
- “Ming Shi” (明史) ：The history of Ming dynasty during 1368AC to 1644AC.



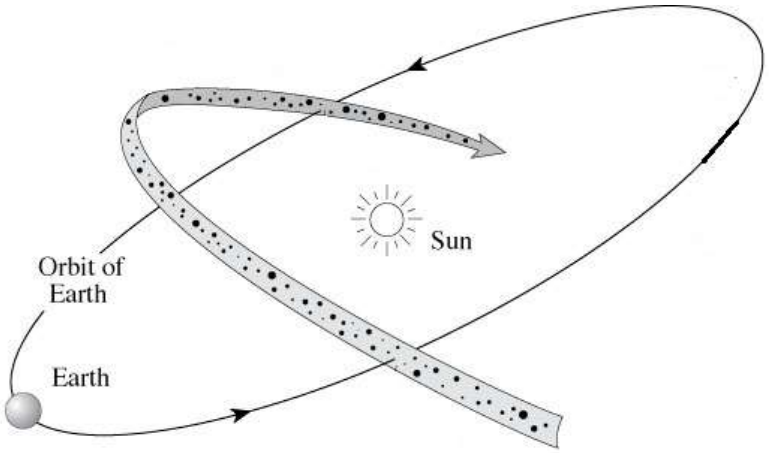
Meteorite stream

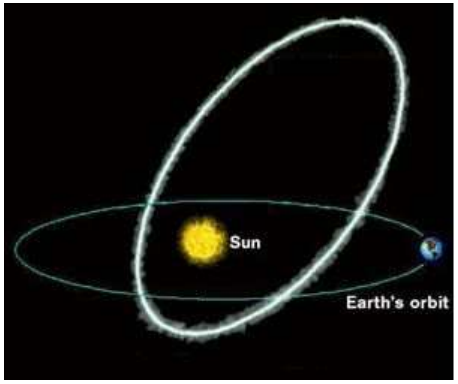


- green line is 2σ level

Conculsion

- An asteroid make meteorite stream
  - two main peaks in Fig(3b)
  - a wide window in Fig(1b); meteors is cleaned by meteorite stream



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