The What, When, Where, and How Many of Aftershocks

What

Mainshock:

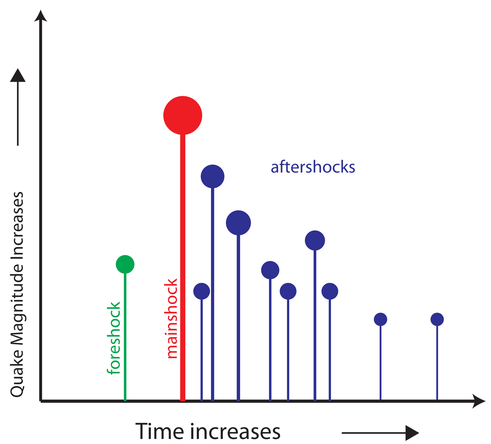
An earthquake that happens
without obvious ancestors

Aftershock:

The smaller earthquakes
after the mainshock

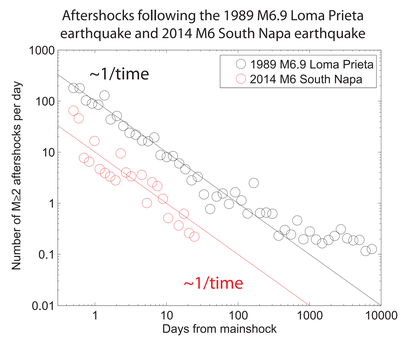
Foreshock:

If an aftershock occurs that's bigger
than the mainshock,
then there is a renaming.
The earlier quakes become
foreshocks and the biggest aftershock
becomes the mainshock.



When

The rate of aftershocks
decreases as approximately
1 / time.



Aftershocks Following the 1989 M6.9 Loma Prieta Earthquake
Compared with Number Expected Given Generic CA
Earthquake Statistics

When	Observed Number M2 or larger	Expected Number M2 or larger
First Day (½ – 1½)	124	466
Tenth Day	7	36
100th Day	0	3.2
1000th Day	0	0.3
10000th Day	?	0.03

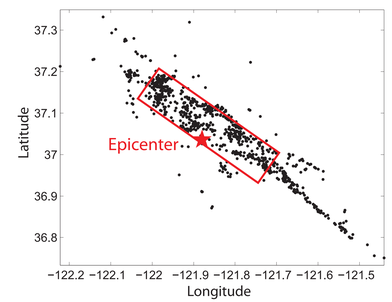
Aftershocks Following the 2014 M6 South Napa Earthquake
Compared with Number Expected Given Generic CA
Earthquake Statistics

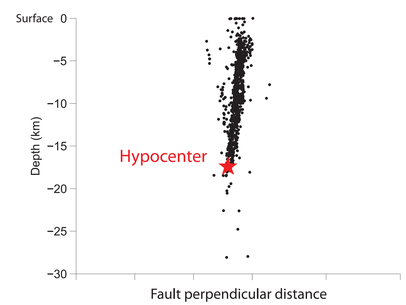
When	Observed Number M2 or larger	Expected Number M2 or larger
First Day (½ – 1½)	17	59
Tenth Day	1	5
100th Day	?	0.4
1000th Day	?	0.04
10000th Day	?	0.004

Where

In the general region of the
mainshock,
up to 1-2 fault lengths away
from the mainshock

M2 and Larger Aftershocks in the 100 Days
Following the 1989 M6.9 Loma Prieta Earthquake





How Many

Bigger mainshocks produce more aftershocks

Number of Aftershocks for a Given Mainshock Size

Magnitude of Mainshock	Expected number of aftershocks Magnitude 3 or larger In the first week
5	6.7
6 (Napa)	67
7	670
8	6700

A Forecast of Number of Aftershocks for the
First Week After a Magnitude 6 Mainshock
Based on Typical Earthquake Statistics

Minimum Magnitude	Expected Number	Probability of 1 or more events
3	67	>99%
4	6.7	99%
5	0.67	50%
6	0.067	6.5%
7	0.0067	0.66%
8	0.00067	0.067%