Space Weather prediction would be simpler if hazardous events arrivals were statistically independent. However studies of Coronal Mass Ejections (CMEs) and Solar Energetic Particles (SEPs) indicate that individual strong enhancements are not independent but tend to group. Empirical space environment methods were developed to group SEPs into independent “SEP events”. Here we introduce an advanced statistical method that allows us to define the distribution and clustering properties of extreme Space Weather events. The method is based on scaling properties of averages of event maxima in selected time intervals of fixed sizes. Using this method we obtain a systematic statistical description and clustering of the extreme speed (fast) CMEs. We identify a self-similar high-speed portion of spectrum of speed maxima (700-2,000 km/s) that provides a meaningful definition of “the fast” CMEs and indicates that these CMEs are produced by a process that is the same across the range of scales. We characterize the clustering by the extremal index, which is the inverse of the averaged number of CMEs per cluster. To illustrate the method’s predictive capabilities we identify clusters of CMEs with speeds greater than 1,000 km/s and calculate their statistical characteristics such as the size and duration of the clusters. The method can be applied to other extreme geophysical events.