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Non-Poissonian Nature of Strombolian Surface Activity at Yasur Volcano, Vanuatu

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In 2008 we operated a Doppler radar and one infrared camera for two weeks at the crater rim of Yasur volcano, Vanuatu. Our observations reveal different activity regimes characterized by Strombolian explosions showing either a clear bursting of lava bubbles, or an ash-rich jet-like explosion pattern. To better understand the surface activity dynamics we studied the recorded radar data in terms of event rate and inter event times. For this purpose an event catalogue was created adopting a simple threshold search, and parts of the time-series exceeding velocity values of 15 m/s were classified as eruptive events. The analysis of the event database indicates a prominent change in event rate between the two regimes. First results show that inter event times in the bubble bursting phase follow an exponential distribution implying that the related surface activity can be described by a homogeneous Poisson process. However, the examination of the complete event catalogue demonstrates that overall surface activity is distributed according to a non-homogeneous Poission process in time. In particular in the ash-rich regime a Weibull distribution seems to be appropriate to describe inter event intervals. The recorded event rates during this phase likely represent event clusters which can be related to intermittent degassing behaviour occurring in a pulsed manner. Clustering increases until a certain threshold is reached, and than decreases again. Our findings suggest that general surface activity cannot fully be generated by a random point process, and that the bubble bursting regime only forms a stationary sub-phase of volcanic surface activity.