LETTER TO THE EDITOR:
A RESPONSE TO BRADWELL’S COMMENTARY ON RECENT STATISTICAL STUDIES IN LICHENOMETRY

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In his commentary ‘Lichenometric Dating: A Commentary, in the Light of some Recent Statistical Studies’, Bradwell (2009) attacks the Generalized Extreme Value (GEV) approach (Cooley et al. 2006; Jomelli et al. 2007; Naveau et al. 2007) recently employed in several lichenometric studies (Jomelli et al. 2008; Rabatel et al. 2008; Chenet et al. 2009). Bradwell judged the GEV approach as too unconventional for geomorphologists, overly complex, and incapable of bringing any added value to the field of lichenometry. Furthermore, the article raises a more general philosophical question: ‘Can statistical complexity and high precision in a “geobotanical” dating technique, fraught with high degrees of environmental variability and inbuilt uncertainty, ever be scientifically valid?’ We disagree with Bradwell’s assessment. Furthermore, we think that Bradwell does not fully recognize the assumptions made in the traditional lichenometric analyses that he recommends.

Lichenometry and statistics
Bradwell (2009) claims that it is not necessary to consider the type of the distribution of the lichen measurements because we do not need such information to develop a growth curve. The author continued his argument by saying that the GEV ‘group fail to recognize that uncertainties have been expressed quite succinctly and precisely in many traditional lichenometric studies. For dating curves constructed using two standard deviations are preferred (95% confidence limits).’

Confidence intervals are the product of precise probabilistic computations whose assumptions are clearly identified. Knowing and understanding these assumptions are paramount to any statistical analysis. Appropriate assumptions differ according to the object of study. For example, the sample mean is classically assumed to follow a Gaussian distribution because of the Central Limit Theorem. Similarly, the sample maximum is assumed to follow a GEV distribution because of the Fisher-Tippet Theorem, which provides the foundation of extreme value theory (EVT) (Coles, 2001). Bradwell stated that the point of his article is to ‘dispel some of the current myths surrounding the statistical treatment of lichenometric data.’ The EVT results are not ‘mythical’ but mathematical and stand alone. In practice, they provide justification to compute meaningful confidence intervals.

At its most fundamental level, a lichenometric dating analysis consists of two steps. In the first step, a dating curve is established which relates lichen measurements to the age of the objects on which the lichens grow. In the second step, the curve is then used to estimate the age of an undated object from which lichen measurements have been taken. In statistical terms, the first step is a regression analysis, and the second step is an inverse problem.

In a regression analysis, assumptions must be made. In addition to the assumed form of the