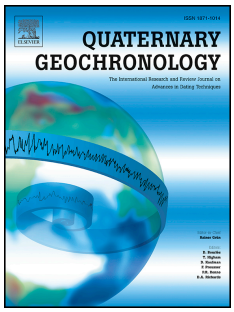
Accepted Manuscript



Bayesian analysis of individual and systematic multiplicative errors for estimating ages with stratigraphic constraints in optically stimulated luminescence dating

Benoit Combès, Anne Philippe

PII: S1871-1014(16)30083-8

DOI: 10.1016/j.quageo.2017.02.003

Reference: QUAGEO 824

To appear in: *Quaternary Geochronology*

Received Date: 15 July 2016

Revised Date: 1 February 2017

Accepted Date: 6 February 2017

Please cite this article as: Combès, B., Philippe, A., Bayesian analysis of individual and systematic multiplicative errors for estimating ages with stratigraphic constraints in optically stimulated luminescence dating, *Quaternary Geochronology* (2017), doi: 10.1016/j.quageo.2017.02.003.

Bayesian analysis of individual and systematic multiplicative errors for estimating ages with stratigraphic constraints in optically stimulated luminescence dating

Benoit Combès[a], Anne Philippe[b,*]

[a] *IRAMAT-CRP2A, Maison de l'archéologie, Université de Bordeaux Montaigne, France.*
[b] *Laboratoire de Mathématiques Jean Leray et ANJA INRIA - Rennes, Université de Nantes, France.*

Abstract

Many dating techniques include significant error terms which are not independent between samples to date. This is typically the case in Optically Stimulated Luminescence (OSL) dating where the conversion from characteristic equivalent doses to the corresponding ages using the annual dosimetry data includes error terms that are common to all produced datings. Dealing with these errors is essential to estimate ages from a set of datings whose chronological ordering is known. In this work, we propose and we study a Bayesian model to address this problem. For this purpose, we first consider a multivariate model with multiplicative Gaussian errors in a Bayesian framework. This model relates a set of characteristic equivalent doses to the corresponding ages while taking into account for the systematic and non-systematic errors associated to the dosimetry. It thus offers the opportunity to deal properly with stratigraphic constraints within OSL datings, but also with other datings possessing errors which are independent from systematic errors of OSL (*e.g.* radiocarbon). Then, we use this model to extend an existing Bayesian model for the assessment of characteristic equivalent doses from Single Aliquot and Regenerative (SAR) dose measurements. The overall Bayesian model leads to the joint estimation of all the variables (which include all the dose-response functions and characteristic equivalent doses) of a sequence of, possibly heterogeneous, datings. We also consider a more generic solution consisting in using directly the age model from a set of characteristic equivalent dose

*Corresponding author. Anne.Philippe@univ-nantes.fr