

# Isochrons and beyond: maximising the use of tephrochronology in geomorphology

Andrew J. Dugmore<sup>1,2</sup> and Anthony J. Newton<sup>1</sup>

<sup>1</sup>*Institute of Geography and the Lived Environment, School of GeoSciences,  
University of Edinburgh, Drummond Street, Edinburgh EH8 9XP, Scotland, UK*

<sup>2</sup>*Human Ecodynamics Research Centre and Doctoral Program in Anthropology,  
The Graduate Center, City University of New York, 365 Fifth Avenue, NY 10016-4309, USA*

*Corresponding author: andrew.dugmore@ed.ac.uk*

**Abstract** – *This paper reflects on the application of tephrochronology in geomorphology. A common use of tephra layers is to define isochrons and use them to date environmental records. Applications of tephrochronology with the greatest practical utility, however, involve both classic isochrons (layers with an extensive distribution, distinctive well-characterised properties and good independent dating) and all other tephra present, including poorly-identified, unprovenanced and re-mobilised units that define time transgressive horizons. The effective use of this 'total tephrochronology' requires replication across multiple sites, the clear identification of primary tephra deposits and re-mobilised deposits, combined with a good understanding of when tephra deposits truly define isochrons. Large scale replication of tephra stratigraphy is possible (and desirable) with terrestrial sequences, and can offer a detailed understanding of both geomorphological processes and human interactions with the environment. It is possible to use sequences of unprovenanced tephra as a 'barcode' to undertake local correlations and refine the application of well-known marker horizons to environmental records. High frequency and high resolution measurement of both the units between tephra layers and the tephra layers themselves can identify subtle shifts in landscape stability and land use.*