Journal of Sedimentary Research

An International Journal of SEPM

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Review Accepted 22 December 2003

***Pyroclastic density currents and the sedimentation of Ignimbrites*, by M.J. Branney and P. Kokelaar, 2002. Geological Society of London, Memoir 27, Unit 7 Brassmill Enterprise Centre, Brassmill Lane, Bath (Somerset, United Kingdom BA1 3JN; 130 pages, paperback; USD 108.00, GBP 65.00 (for GSL members USD 54.00, GBP 32.50; for AAPG members USD 65.00, GBP 39.00. ISBN 1-86239-124-6.**

Ignimbrites are the products of the most devastating type of explosive eruption. Small-volume, historic events have killed thousands of people, whereas large-volume, caldera-forming prehistoric events introduced ash and gases into the atmosphere interfering with solar radiation and leading to global cooling. These major ignimbrite episodes are so poorly understood that the Commission on Explosive Volcanism (IAVCEI) has recently promoted a global database to collect all the available data. The topic is unquestionably interesting and intriguing, particularly if we consider that the term "ignimbrite" itself has been variably defined in the past (e.g. welded tuff, pumice-flow deposit, ash-flow tuff). Even the genesis of this deposit is not universally accepted and contrasting emplacement models were proposed in the recent literature.

The spiritual father of this book is Prof. R.V. Fisher to whose memory this volume is dedicated. The authors generously recognise that, in the '60s, Fisher was an early exponent of the turbulent transport and progressive aggradation of ignimbrites. Undoubtedly, this view was abandoned in favour of the universally accepted model in which a partially fluidized, laminar flow was deposited almost instantaneously by freezing *en masse*. The product of this high-concentrated flow was the so called "standard ignimbrite flow unit" formed by a sequence of three layers with well defined characteristics (e.g. normal grading of lithics and reverse grading of pumice clasts) that only locally show specific varieties.

In 1992, Branney and Kokelaar published a paper concerning ignimbrite welding. Starting from this peculiar approach they used grain-fabric evidences to state that ignimbrites record progressive aggradation from a sustained current. In their model, bedding and sorting of an ignimbrite reflect mainly depositional processes in a dense basal part (depositional boundary layer) of the parental flow. In the last few years, this model was adopted by numerous volcanologists who further developed it. In this book, the authors extend their original model including the recent research documenting ignimbrite lithofacies and the results of modelling and experimental studies.

The main concept developed into the text is that ignimbrites are emplaced by pyroclastic density currents that are inhomogeneous in time and space. They consist of an underflow - denser than the atmosphere - that flows underneath, and of a phoenix plume - less dense than the atmosphere - that lofts convectively. Conditions in these stratified currents change both vertically and longitudinally, so that diverse clasts are supported in various ways. Depositional mechanisms are influenced by conditions near the lower flow boundary. The authors classify the various types of pyroclastic density currents on the basis of two physical parameters: steadiness and uniformity. The variation of both parameters has consequences for the grading in the resulting deposits. In particular, the "standard ignimbrite unit" is assumed to be deposited from one of the thirteen different types of currents here defined.

The book is arranged in six chapters with the first presenting key concepts concerning pyroclastic density currents. Chapter 2 provides a background by defining origin, nature and behaviour of these currents. These hyperconcentrated currents, in which both clast interactions and interstitial fluid are important, are classified as a spectrum of types ranging from "fully dilute" to "granular fluid-based".

Chapter 3 is devoted to the mechanisms of particle support and segregation. The bulk of the research is presented in Chapter 4, where the deposition of the ignimbrite is conceptualised through a flow-boundary approach. Following this approach, all clasts during sedimentation must cross a lower flow boundary characterised by a defined combination of support and segregation effects. The authors consider four types of flow-boundary zones, dominated by, respectively, traction, granular flow, direct fallout and fluid escape. Chapter 5 is arranged with descriptions of lithofacies features, followed by their interpretation. The lithofacies are described using a combination of features such as stratification type, sorting, composition and fabric that can be adopted also for lithified deposits.

The authors adopt a non-genetic scheme (e.g. massive lapilli tuff, stratified tuff, lens of lithic-rich breccia, etc.) to avoid specific emplacement models. They present a list of lithofacies (17) that is intended to be open to future modification rather than being prescriptive. I join the authors wish that the examples illustrated in this chapter will not define a new paradigm. In the final chapter the overall structure or architecture of an ignimbrite is illustrated. The analyses of vertical and horizontal lithofacies changes across ignimbrite sheets makes it possible to reconstruct the behaviour of the entire current.

The book reminds us that there is no substitute for detailed fieldwork and that theoretical models for deposition of ignimbrites are possible only with such constraints. To better describe how a pyroclastic current evolves with time, two new time-lines are introduced: the depochron (which represents instantaneous aggradation surfaces) and the entrachron (that joins the pyroclasts that entered together at the same time and place).

Nearly half of the almost 400 papers and books cited in the reference list refer to sedimentological studies, testifying the strong influence of sedimentological experiments and theories on the pyroclastic current emplacement model. A broader consideration (regarding this field of study) is that due to the scarcity of experiments on pneumatic systems, models of ignimbrite emplacement still refer extensively to aqueous system, notwithstanding the different behaviour shown by liquid/solid and gas/solid dispersions.

To conclude, this book has fully achieved its aim of presenting a conceptual framework for investigating the deposition of the various ignimbrite lithofacies. I am convinced that Branney and Kokelaar have presented an excellent example of scientific research, because their model is *exact* (ex-actus) i.e. “obtained from the preliminary remarks”.

The typography and latout make the book easy to read. The figures are well chosen and of high quality, even though I would have appreciated more colour for the lithofacies illustrations.

I disagree with the price politic of most of the publishers who prefer to sell relatively few, expensive copies rather than many cheaper copies. The high price of this paperback book will put this book unfortunately out of reach for research students. Yet, I warmly recommend this book to researchers and students in this field of study; it will be a must to anyone approaching ignimbrites study.

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