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Book review

Paleolimnology of European Maar Lakes. By J. F. W. Negendank & B. Zolitschka (eds). (1993). Lecture Notes in Earth Sciences No. 49. Springer-Verlag, Berlin, Berlin, 513 pp. ISBN-540-56570-1. Price (soft cover) 158.00 DM

This book represents a collection of papers presented at a symposium in May, 1991 on the formation and paleolimnology of European maar lakes. Paleolimnological discussions embrace maar lake deposits of late Quaternary to early Tertiary age in Germany, France and Italy. The goal of the symposium and its outgrowth, this book, is to develop a funding initiative to study, core and analyze the deposits of these remarkable depositional systems.

Maars are explosive volcanic craters usually formed monogenetically by phreato-magmatic interaction. A shallow-dipping ring of bedded ejecta, penetrated and distorted by blocks and bombs from the eruption, surrounds the crater, and steep, ring-faulted walls that reflect collapse of underground volcanic conduits and chambers characterize these topographic features.

Maar lakes are typically deep relative to their area and in temperate climates their permeable bedrock roots (ash, broken rock, and ejecta) extend to the water table which guarantees a lacustrine continuity that is seldom available in shallower lakes fed mostly by surface water. In addition to lacustrine continuity, the lakes, protected by steep walls, are usually sheltered enough so that complete circulation is restricted. Their lower hypolimnia are often anoxic and as a consequence seasonal sedimentation (diatom blooms, influxes of clastic sediments, carbonate whittings etc.) are preserved as varves. The deposits of such lakes, therefore, offer invaluable and sometimes long archives with tight chronological control and excellent preservation of both terrestrial and lacustrine proxies of environmental change.

The papers in the book are organized into nine thematic groups: 1. maar formation, 2. regional overviews of maar districts in Germany, France and Italy, 3. seismic studies aimed at characterizing facies relations and geometries of maar lake deposits, 4. sedimentological studies of cores, 5. sediment geochemistry, 6. paleo-

magnetism (= environmental magnetism in US usage), 7. paleobiological studies, 8. Tertiary maar deposits, and 9. a concluding paper on future plans for the study of maar lake sediments.

I found the geology-oriented chapters the most interesting. The careful descriptions of maar deposits and eruptive sequences in the Alaskan Peninsula (Büchel & Lorenz), although outside the geographic and disciplinary focus of the book, merit study by anyone interested in volcanoes and craters irrespective of the paleolimnological potential of their lakes. The first chapter, which sets out the basic characteristics of maar craters and their lakes (Negendank & Zolitschka), is also of prime importance for those interested in a holistic approach to a paleolimnological study of maar lake deposits.

The regional summaries of maar districts in Germany (Negendank & Zolitschka), France (Juvigné et al.) and Italy (Follieri et al.) present a synopsis of limnological and geological information for these crater complexes. Understandably, the data are brief, somewhat unfocused and variable between the regions. Abundant referencing of relevant studies in each area is valuable.

The chapters on seismic and other geophysical methods employed to describe maar lake deposits illustrate the singular importance of understanding basin stratigraphy in advance of coring. The steep sides and basin slopes of maar lakes are prone to failure triggered by tectonism or abrupt climate variability. Indeed, facies changes and complicated stratigraphic associations (turbidites, landslides etc.) pose the main drawbacks to paleolimnological interpretations of maar records.

The papers dealing with maar lake sedimentology have more stand-alone value. Together, they document the wide variety of sediment types accumulating in maars and provide instructive examples of developing varve chronologies and approaches to paleolimnologic and paleoclimatic interpretation based on microstratigraphic analysis of varve couplets. Papers on the maars at Lac du Bouchet (Truze & Kelts), Lago Grande di Monticchio (Zolitschka & Negendank), and Vico

(Francus et al.) illustrate their potential for long, multi-proxy paleoclimatic records extending beyond the past glacial period.

The geochemical papers concentrate on the paleolimnological significance of trace element distributions in Holzmaar (Lottermoser et al.) and Lago Grande di Monticchio (Robinson et al.) and on the application of geochemical analyses of tephra to identify and date lacustrine sediment sequences (Newton & Dugmore).

Magnetic studies of maar lake sediments have concentrated on environmentally sensitive parameters related to the kinds, amounts, and sizes of magnetic minerals although their paleoclimatic interpretations are still preliminary. In a long core from Lago Gande di Monticchio, variation in these parameters is ascribed to orbital mechanics, and comparison to SPECMAP, suggests that this long magnetic record may provide a useful environmental chronology for the past 250 ky (Turton). In the West Eifel maar region, paleomagnetic secular variation is consistent with other European records. Coupled with varve and tephra chronologies, secular variation records from maar lakes promise useful chronologies that extend this record beyond 30 ka (Williams et al.).

Biological studies of Eifel maar lake sediments are restricted to one paper each on cladocerans (Hofmann), chironomids (Hofmann), and ostracodes (Scharf) although discussions of other biological proxies (diatoms and pollen) appear in the sedimentology contributions to the volume. These papers illustrate the importance of variable limnology among different maar lakes in controlling the kinds and distribution of aquatic animals in the sediments and consequent-

ly the need of limnological information to properly interpret the paleoclimatic significance of their stratigraphic distribution. Marine Oligocene dinoflagellates in the young sediments of Meerfelder and other maars (Weiler) apparently document redeposition during a late Quaternary marine transgression.

The papers on Tertiary maar lake deposits provide an interesting perspective to the Quaternary focus of volume and the well preserved fossils in such sediments have considerable application to biogeographic and evolutionary studies of terrestrial biota.

Overall, the volume contributions are more similar to extended abstracts rather than finished products. Jointly they present a great deal of information about maar lake deposits and thereby serve to guide researchers to the potential of such records for a number of paleoclimatic and paleolimnologic studies. The many references enhance the value of the book. Unfortunately, no papers about the hydrology and limnology of maar lakes were included to provide linkages between the autochthonous sediments and the processes responsible for their formation. Although multi-proxy data will go far to make accurate paleolimnological and paleoclimatic interpretations, holistic investigations that incorporate neolimnological and hydrological interactions are required to fully understand stratigraphic variations of paleolimnological records.

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