- a low-inclination satellite orbiting somewhat above the F-layer peak and carrying a suite of instruments for monitoring the electrodynamics and plasma structuring of the equatorial ionosphere, such as that proposed by the Air Force Research Laboratory to the Air Force Space Test Program (STP); and
- a UV instrument in geostationary orbit capable of imaging nighttime TEC with sufficient resolution to detect and track scintillation-prone regions, such as that proposed by the Navy to the Air Force STP.

Workshop participants also concluded that continued operation of the Advanced Composition Explorer satellite at the Earth-Sun libration point throughout its 5-year design lifetime (presently assured for only 2 years) would represent an extremely cost-effective means to provide data that are crucial for detecting space-weather events nearing Earth. Also, they said that the creation of a rapid prototyping center for space-weather products, such as that envisioned for the National Oceanic and Atmospheric Administration's (NOAA) Space Environment Center, is needed to foster development of a space-weather industry in the private sector.

An evocative workshop address by E.W. (Joe) Friday helped to set the context for development of effective space weather services. As assistant administrator for oceanic and atmospheric research at NOAA and former director of the National Weather Service (NWS), Friday provided a historical sketch of weather forecasting in the United States. That history includes the disquieting fact that public impetus for advancing the infrastructure needed for improved forecasting often arose only in response to weather-caused disasters.

As a precedent for space-weather forecasting, the NWS experience can provide important guidelines for transitioning space-weather research results into practical tools of economic and human value. Friday expressed hope that ongoing dialogue between developers and operators of space systems and the space-weather research and forecasting communities can preempt the disaster-based experience.

Michael Kelley of Cornell University presented an introduction to space weather in the ionosphere, sketching the tenuous-plasma nature of the ionosphere, its relation to neutral-atmospheric dynamics at middle and low latitudes, and the dominant influence of the solar wind and magnetosphere at high latitudes. He employed a variety of visual aids to impart an appreciation for structuring of the ionospheric plasma through several decades of scale size. Structured plasma is responsible for many of the radiowave-propagation effects addressed at the workshop and specific ionospheric effects were reviewed by several participants. Kelley's presentation on ionospheric physics was complemented by a description of communication satellite systems and the ionosphere by John Evans of COMSAT.

Concentrating on systems whose performance could be degraded by ionospheric effects, Evans described imminent and envisioned Little LEO systems intended to provide data-messaging services to small terminals at VHF/UHF and Big LEO systems for mobile telephony via handheld radios, most of which will operate at L Band. The effects of greatest concern are those produced by scintillation, Evans said.

Recommendations from the workshop will be referred to the Interagency Committee for Space Weather (ICSW) for consideration in advising the National Space Weather Program Council on priorities for the National Space Weather Program (NSWP). The NSWP has been formulated and is being implemented by the Office of the Federal Coordinator for Meteorological Services and Supporting Research, under guidance provided by the council. The council includes senior representatives from the National Science Foundation and the National Aeronautics and Space Administration and from the Departments of Commerce, Defense, Energy, and the Interior. It is assisted by the ICSW, which has members from the same federal agencies.—*Edward J. Fremouw, Northwest Research Associates, Bellevue, Wash., USA*

Acknowledgements

I thank Sunanda Basu of the National Science Foundation's Aeronomy Program for guidance in preparing the workshop. The workshop was sponsored by the National Science Foundation, the National Oceanic and Atmospheric Administration, the Air Force Research Laboratory, and the Office of Naval Research, and it was held at the facilities of COMSAT Corporation and organized by Northwest Research Associates. Workshop proceedings may be obtained (for $75) by contacting sandy@nwra.com.

The workshop on radiowave-propagation aspects of space weather was held in Bethesda, Md., USA, October 22-24, 1997.

SECTION NEWS

GEOMAGNETISM & PALEOMAGNETISM

Editor: Lisa Tauxe, Scripps Institution of Oceanography, La Jolla, CA 92093-0220 USA; Tel: +1-619-534-6084; Fax: +1-619-534-7084

Worldwide Database for Magnetostratigraphy Available

PAGE 167

The International Association of Geomagnetism and Aeronomy (IAGA) has sponsored the development of databases in paleomagnetism and rock magnetism. The databases operate under Microsoft Access V2.0 (for Windows 3.1) or Access 97 (for Windows 95) [*McElhinny and Lock*, 1996]. Following the publication of the first major book in English on magnetostratigraphy by *Opdyke and Channell* [1996], we have set up a worldwide database for magnetostratigraphy. The new database is based on the summaries of western data given by *Opdyke and Channell* [1996] but also includes all data available from the former Soviet Union.

The magnetostratigraphy database incorporates the format and designs of the previous databases [*McElhinny and Lock*, 1996]. In the future, this database will be included in the package of updated databases that are released periodically and available from World Data Center A in Boulder, Colorado, USA. The structure of the database is illustrated in Figure 1. For ease of use, it is based to some extent on the structure developed for the Global Paleomagnetic Database (GPMDB).

There are six basic tables with a number of subsidiary ("look-up") tables. Each set of data is derived from some published "reference" that links to a "rockunit" table that gives general details of the sections studied. If the same study also gives a paleomagnetic pole position, then the table "crossref" gives the corresponding reference and rockunit number in the GPMDB. The Rockunit table, in turn, links to two tables, "sections" and "magtests." The sections table gives details of each section studied and the magtests table gives details of the sampling and laboratory procedures with a quality index factor for each study as defined by *Opdyke and Channell* [1996]. The sections table is linked to the magstrat table that gives the magnetostratigraphic column for each section (or a composite section) as a polarity-versus-depth profile showing the thickness for each polarity zone, or gap, in the section.

Each section is given in stratigraphic sequence with the youngest zone at the start of the sequence. These successive zone thicknesses are not yet compiled in a pictorial representation that enables time comparisons to

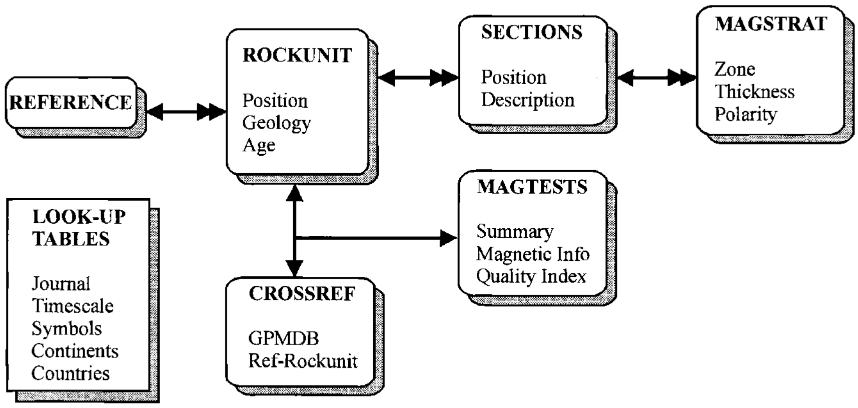

Fig. 1. Structure of the Magnetostratigraphy Database (MAGST). The tables are linked as one-to-one (single-headed arrows) or one-to-many (single- to double-headed arrows) associations.

be made. However, users will be able to write ASCII files of these section zone thicknesses for manipulation with other software. The attributes for each of the tables are given below.

Main Tables: (Primary keys are underlined)

REFERENCE (Refno, Authors, Year, Journal, Volume, VPages, Title)

ROCKUNIT (Refno, Rockno, Rockname, Rlat, Rlong, Nsect, Region, Country, Continent, Rocktype, Strata, Stratage, Latspread, Youngage, Oldage Method, Isotopedata, Comments)

MAGTESTS (Rockno, DMC, Analysis, Revtest, Fieldtest, Treatment, Rockmag, Quality)

SECTIONS (Rockno, Section, Thickness, Slat, Slong, Syoungage, Soldage, Lithology, Intervals, NSI, NSA, Nchrons, Nmagzones, %R)

MAGSTRAT (Rockno, Section, ZoneNo, Zonename, Thickness, Pol, Dating, Comments)

CROSSREF (Refno, Rockno, GDBRefno, GDBRockunitno)

Look-up Tables:

CONTINENTS (Continent)

COUNTRIES (Continent, Country)

JOURNAL (Abbreviation, Fullname)

SYMBOLS (Symbol, Explanation)

TIMESCALE (No, Period, Subdiv, Epoch, Symbol, Begin, End)

Assistance for setting up this database was provided by grant EAR9627808 from the National Science Foundation.—*Michael W. McElhinny, Department of Geological Sciences, University of Michigan, Ann Arbor, USA; Neil D. Opdyke, Department of Geology, University of Florida, Gainesville, USA; Sergei A. Pisarevsky, Russia Oil and Geological Research Institute, St. Petersburg, Russia*

References

McElhinny, M. W., and J. Lock, IAGA paleomagnetic databases with Access, Surv. Geophys., 17, 575–591, 1996.

Opdyke, N. D., and J. E. T. Channell, *Magnetic Stratigraphy*, Academic Press, San Diego, 346 pp., 1996.

BOOK REVIEW

Antarctic Meteorology and Climatology

PAGE 166

J. C. King and J. Turner, Cambridge University Press, Cambridge, UK, xi + 409 pp., 1997, ISBN 0-521-46560-5, $90.

Antarctica is the coldest of the continents and the most remote. Both of these facts pose problems for meteorologists. The lack of easy access to most of the continent presents significant obstacles to effective data collection, and the often hostile conditions make accurate, believable measurements difficult to obtain. Nonetheless, as the authors point out in the preface of *Antarctic Meteorology and Climatology*, the last decade has seen a great increase in both the quantity and quality of data available in the Antarctic region, making this book a timely review of the state of knowledge of the Antarctic climate system. The reader will not find extensive discussion of the "ozone hole" or of paleoclimate records here. Rather, what the reader does find is a comprehensive and smoothly written account of the present and recent past climate of the Antarctic troposphere in its many aspects.

The book contains a truly gripping account of the history and current state of the Antarctic observing network, including a detailed discussion of the uses and limitations of the various types of currently available data. The advances in remote sensing technology made in the past decade or so have been particularly important over the data-sparse regions of the Antarctic, and the authors describe in some detail the use of imagery and satellite radiance data. Not only is the quality of the data evaluated, but the reader is told how to obtain it. This may tend to date the book somewhat in coming years, but for now it is an invaluable aid for the active researcher.

There is an extensive discussion of the physical climatology of Antarctica. As elsewhere in the book, the authors have made a concerted effort to go beyond pure description and have included lengthy explanations of the physical mechanisms behind the current state of the climate. This is particularly true of the section explaining the persistent katabatic wind circulation of the continent, in which a number of theoretical and observational concepts are brought together in a clear and concise fashion. The large-scale general circulation and synoptic meteorology of Antarctica are treated in considerable depth, including a detailed discussion of the quality of the various operational analyses and their use in the challenge of producing accurate forecasts in this region of the globe. A further entire chapter is devoted to mesoscale systems. These include confluent katabatic winds, katabatic "jumps," barrier winds, and the recently discovered mesoscale cyclones, which form off the coast of the continent and mostly last for less than a day. There is also a concluding section on the current knowledge of the interaction on longer timescales of the Antarctic climate system with the rest of the globe, including the more recent recognition of the influence of El Niño on the continent.

All of this makes this book a solid reference work and really the definitive work on the subject. If I were to quibble, though, I would say that, for a volume published in 1997, this book occasionally lacks truly up-to-date references. For example, in the discussion of observed cyclogenesis in the Antarctic region, a passing reference is made to a paper published by M. R. Sinclair in *Monthly Weather Review* in 1995, but this is included almost as an afterthought, despite the fact that Sinclair's paper reveals important new insights into this subject. Furthermore, the authors include a small section on the influence of climate change, but do not refer to any work on this topic published after 1992. This may be caused partly by the difficulty of finding enough time over several years to compile such a substantial text, which often means that incorporating substantial ac-