Compact Discs Shrinking Data Storage Costs

The CDs that offer 75 minutes of unsurpassed Bach are now providing 600 megabytes of geophysical data at bargain prices

THEY look the same as the compact discs (CDs) that are displacing vinyl records as the medium of choice of music lovers, but the CDs coming out of geophysical data banks across the country have an entirely different appeal. One of these 12-centimeter discs of polycarbonate plastic may contain anything from a record of the Northern Hemisphere's weather for the past few decades to seismic records of the world's moderate or larger earthquakes of the past 6 months. The CD revolution in data storage and distribution that is getting under way will not only ease the burden of mushrooming data banks but also open big-time research to a new group of researchers.

One of the first geophysical CDs to be issued routinely offers recent data from the U.S. Geological Survey's Global Digital Seismograph Network. "There's no problem in generating the data of interest to people," says Raymond Buland of the USGS in Golden, Colorado. "The problem has been, where's the data storage device?" The USGS's National Earthquake Information Center had been mailing out a 25-centimeter reel of 1.25-centimeter-wide magnetic tape to 20 recipients every other week. That was necessary to distribute the 30 megabytes of data generated by the network in that time. Now the center has doubled the amount of data distributed by including smaller earthquakes, but only one 600-megabyte CD is sent out every 6 months to 100 recipients.

Aside from a drop in costs by a factor of 20, there are numerous other benefits for seismologists. Instead of needing a tape machine that costs anywhere from $5,000 to $50,000 to read the data, a researcher uses a $1,000 CD reader and the ever-present personal computer. Unlike magnetic tape, whose data can begin to deteriorate as soon as a machine handles it or even while stored on the shelf, a CD and its data will last indefinitely, barring a meltdown on the lab hot plate or other such malicious mischief. Because the CD reader's laser focuses beneath a clear coating on microscopic pits representing the digital data, dust and minor smudges are no problem. There is even internal compensation for a certain amount of disc warping.

Prototype CDs are now available containing a wide variety of geophysical data. Carl Abston of the National Geophysical Data Center in Boulder reports that 170 copies of the center's prototype CD of solar-terrestrial data have been distributed since early June. It contains 530 megabytes of data on everything you wanted to know about the sun's influence on the earth—records of solar flare and sunspot activity, varying space plasma and magnetic fields from all the national satellites, and geomagnetism at 197 stations. In the case of the geomagnetic data, the time periods covered vary from the year 1984 for minute-by-minute data to the entire lifetime of the network for annual site values. The discs cost $15.70 each to produce, but as prototypes they are free to researchers.

Clifford Mass of the University of Washington has put the National Meteorological Center's Northern Hemisphere grid-point data set on a single CD. It includes the pressure, temperature, winds, and other properties determined twice daily at eight different altitudes at points 400 kilometers apart over periods that extend as far back as 1946. This first meteorological CD has been a big hit. "This thing turns out to be bigger than I ever imagined," says Mass. "I'm getting calls from people I never imagined would want it." His next step will be to ensure that the CDs can be read by micro- and minicomputers as well as personal computers.

Otis Brown of the University of Miami creates his own discs rather than sending data to a commercial firm that creates a master disc and any copies. A researcher cannot write his own data on the CDs being distributed by data centers, as is done with magnetic tape; he can only read them. (The technology is sometimes called CD-ROM, for read-only memory.) Brown is writing his own optical digital discs with meteorological data from the Nimbus satellites. That fills up one and a half larger, 3200-megabyte discs a day. "We just ran out of room" to store tapes, says Brown. "We figured that even if it cost $100,000 to set up a disc production facility, we would be ahead of the game."

Jerry McFaul of the USGS in Reston, Virginia, has overseen the production of three different CDs during the past 2 years, each containing a variety of earth science data. He says that although the USGS is a storehouse of geophysical, chemical, geographic, and hydrologic data, those data receive limited distribution because of their availability on tape or in print. The prototype discs include, among other data sets, Landsat imagery and full-text bibliographies. As a sign of the times, McFaul notes that the Special Interest Group on CD-ROM Applications and Technology that operates out of the USGS in Reston has 1000 members from federal and private organizations.

The coming revolution in data distribution could be a far-reaching one. Every researcher with just a few thousand dollars to spend will have complete, low-cost data sets at his fingertips that were previously only available piecemeal after weeks or months of delay while on order. That should be music to any earth scientist's ears. ■

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A CD system

The 600-megabytes of data on a compact disc can be read using the reader and computer shown. This CD would replace at least five reels of magnetic tape.

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