Earth Science

Relieving stress at nuclear-waste site

Contrary to earlier reports, a new land survey near Yucca Mountain, Nev., shows no appreciable ground warping at the proposed site for an underground nuclear-waste dump. If confirmed, the analysis would deflate concerns over geological hazards at Yucca Mountain.

The issue emerged last year, when Brian Wernicke of the California Institute of Technology in Pasadena and his colleagues reported significant ground movement—known as strain—around Yucca Mountain (SN: 4/18/98, p. 251). Measurements made by Global Positioning System (GPS) receivers at five sites showed that between 1991 and 1997, the region stretched at a rate much faster than expected.

James C. Savage and his colleagues at the U.S. Geological Survey in Menlo Park, Calif., performed a separate study by surveying 14 sites surrounding Yucca Mountain, using data from 1983 through 1998. The analysis combined conventional techniques with GPS data.

In the Aug. 10 JOURNAL OF GEOPHYSICAL RESEARCH, they report a rate of strain less than 20 percent of what Wernicke's group found. "There is essentially no strain accumulating at the proposed site for the high-level waste repository," says Savage.

One area of disagreement is how to treat a magnitude 5.4 earthquake that struck near Yucca Mountain in 1992. According to Savage, most of the motion detected in Wernicke's study represents a normal and temporary readjustment of the crust to the quake.

Wernicke doesn't discount this explanation, but he says that such an amount of postquake shifting would be unusually large. Another possibility is that some other source of stress near Yucca Mountain is causing the warping that his team measured.

An answer may emerge within 2 years. Wernicke and his colleagues have set up a network of GPS receivers that continuously collects data. The system should be able to detect ground movements as small as 0.1 millimeter per year, he says. —*R.M.*

Will it rain Tuesday? Ask a supermodel

Meteorologists have discovered a way to improve weather forecasts significantly by combining the strengths of many computer models. This approach, called a superensemble, "always performs better than the best model," says study leader T.N. Krishnamurti of Florida State University in Tallahassee.

The National Weather Service and other forecasting agencies around the world routinely run complex computer models to predict how the atmosphere will evolve. The models break the global sky into a three-dimensional grid and solve equations to compute the temperature, humidity, wind speed, and other factors for each grid point. Meteorologists then use the outputs of these models to make forecasts ranging from a few hours ahead to several seasons in the future.

The superensemble works by analyzing the strengths and weaknesses of individual forecasting models. Krishnamurti and his team train their *übermodel* by feeding in actual weather measurements and past forecasts made by many separate models.

In the case of weather prediction for a few days ahead, the superensemble reduces the error in forecasts by 20 to 80 percent, compared with individual models. For seasonal climate outlooks, Krishnamurti's model lowered the size of the error by 50 to 70 percent, the researchers report in the Sept. 3 SCIENCE. It even outperforms the best hurricane models, the team says.

The superensemble study, however, will not bowl over practicing forecasters. "There's nothing new about this work," says Robert E. Livezey of the National Weather Service in Silver Spring, Md. Forecasters have known about this approach for a long time but have had difficulty using it because of limitations in computer power. Also, continuous improvements in models complicate the process of training a superensemble. —*R.M.*

United States Postal Service

Statement of Ownership, Management, and Circulation

1. Publication Title: SCIENCE NEWS
2. Publication Number: 0 0 3 6 - 8 4 2 3
3. Filing Date: 9/29/99
4. Issue Frequency: Weekly
5. Number of Issues Published Annually: 51/year
6. Annual Subscription Price: $ 49.50
7. Complete Mailing Address of Known Office of Publication *(Not printer) (Street, city, county, state, and ZIP+4)*: Science Service, Inc., 1719 N Street, N.W. Washington, D.C. 20036-2888
   Contact Person: Christina Smith
   Telephone: (202) 785-2255
8. Complete Mailing Address of Headquarters or General Business Office of Publisher *(Not printer)*: Science Service, Inc., 1719 N Street N.W. Washington, D.C. 20036-2888
9. Full Names and Complete Mailing Addresses of Publisher, Editor, and Managing Editor *(Do not leave blank)*
   Publisher *(Name and complete mailing address)*: Donald Harless SCIENCE NEWS, 1719 N Street N.W. Washington, D.C. 20036-2888
   Editor *(Name and complete mailing address)*: Julie Ann Miller SCIENCE NEWS, 1719 N Street, N.W. Washington, D.C. 20036-2888
   Managing Editor *(Name and complete mailing address)*: Keith Haglund SCIENCE NEWS, 1719 N Street N.W. Washington, D.C. 20036-2888
10. Owner *(Do not leave blank. If the publication is owned by a corporation, give the name and address of the corporation immediately followed by the names and addresses of all stockholders owning or holding 1 percent or more of the total amount of stock. If not owned by a corporation, give the names and addresses of the individual owners. If owned by a partnership or other unincorporated firm, give its name and address as well as those of each individual owner. If the publication is published by a nonprofit organization, give its name and address.)*

Full Name	Complete Mailing Address
Science Service, Inc.	1719 N Street, N.W.
a non-profit corporation	Washington, D.C. 20036-2888

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12. Tax Status *(For completion by nonprofit organizations authorized to mail at nonprofit rates) (Check one)*
   The purpose, function, and nonprofit status of this organization and the exempt status for federal income tax purposes:
   [X] Has Not Changed During Preceding 12 Months
   ☐ Has Changed During Preceding 12 Months *(Publisher must submit explanation of change with this statement)*

PS Form 3526, September 1998 *(See Instructions on Reverse)*

13. Publication Title: SCIENCE NEWS
14. Issue Date for Circulation Data Below: September 25, 1999

15. Extent and Nature of Circulation	Average No. Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
a. Total Number of Copies *(Net press run)*	196,863	177,540
b. Paid and/or Requested Circulation (1) Paid/Requested Outside-County Mail Subscriptions Stated on Form 3541. *(Include advertiser's proof and exchange copies)*	192,397	173,544
(2) Paid In-County Subscriptions *(Include advertiser's proof and exchange copies)*	0	0
(3) Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Non-USPS Paid Distribution	0	0
(4) Other Classes Mailed Through the USPS	783	1,250
c. Total Paid and/or Requested Circulation *[Sum of 15b. (1), (2),(3),and (4)]*	193,180	174,794
d. Free Distribution by Mail *(Samples, compliment ary, and other free)* (1) Outside-County as Stated on Form 3541		
(2) In-County as Stated on Form 3541		
(3) Other Classes Mailed Through the USPS	1,494	896
e. Free Distribution Outside the Mail *(Carriers or other means)*	0	0
f. Total Free Distribution *(Sum of 15d. and 15e.)*	1,494	896
g. Total Distribution *(Sum of 15c. and 15f)*	194,674	175,690
h. Copies not Distributed	2,189	1,850
i. Total *(Sum of 15g. and h.)*	196,863	177,540
j. Percent Paid and/or Requested Circulation *(15c. divided by 15g. times 100)*	99.2%	99.5%

16. Publication of Statement of Ownership
   [X] Publication required. Will be printed in the October 9, 1999 issue of this publication. ☐ Publication not required.
17. Signature and Title of Editor, Publisher, Business Manager, or Owner: Donald R Harless Publisher — Date: 9/30/99

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