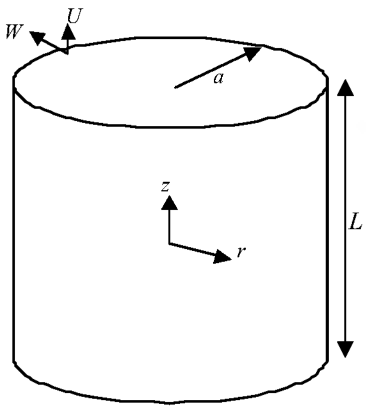
In this issue

Theoretical analysis of piezoelectric cylinders

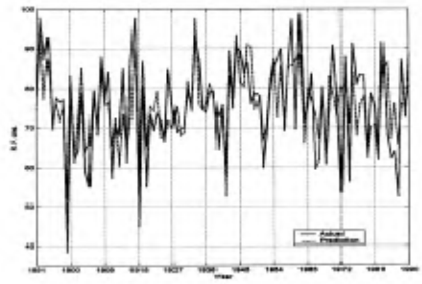
Piezoelectric ceramics find applications in electroacoustics and ultrasonics over a wide frequency range, for generation and transmission of acoustic signals, for ultrasonic applications, for sensors and actuators, for generation of high voltages, etc. The devices based on these materials are manufactured in a wide variety of sizes and shapes, including discs, rectangular plates, cylinders and in other complex geometries. They are used in several vibrational modes. Material parameters like dielectric, piezoelectric and elastic coefficients are measured on simple geometric test pieces like discs, cylinders, etc. under well-defined electrical boundary conditions. These basic material parameters can be used as a guide to the actual properties of manufactured commercial components.



Theoretical studies of piezoelectric materials are pursued by various approaches: analytical methods, finite element approach and numerical studies. Ebenezer and Ramesh (**page 1173**) have obtained exact solutions applicable to axially polarized piezoelectric cylinders. They have discussed four case studies applicable to different displacement and stress conditions. This is allowed by numerical studies and the results obtained are presented.

Forecasting Indian monsoon rainfall

The failure of the Indian monsoon in 2002, and the failure of all the current models of forecasting the Indian monsoon in predicting this failure, has been a cause of serious concern for the Indian meteorological community. A detailed reexamination of the existing models, improvement of model performance using finers grid and faster computers, search for other factors influencing the monsoon are some of the approaches being undertaken in this regard. In an important advance reported on **page 1189**, Iyengar and Raghu Kanth demonstrate how their empirical model based on a novel approach to time series analysis could have predicted the abnormally low Indian South West Monsoon rainfall of 2002.



Starting with the important observation on the non-guassian nature of the rainfall time series, and using an approach based on nonlinear maps and log-normal distribution, Iyengar and Raghu Kanth develop a set of three models of increasing sophistication. After incorporating lags of up to 19 years, and using a harmonic series with nine predominant frequencies for error terms, they are able to demonstrate a very substantial improvement in the predictive ability for the Indian Summer Monsoon, as judged by the available data from 1871 to 2000. The model performs very well even on smaller (regional) spatial scales, and most importantly, is able to capture the deficit monsoon of 2002 quite unambiguously. What is in store of 2003? See the article by Iyengar and Raghu Kanth on page 1189 of this issue.

Ozone's weird isotopic abundance in atmosphere

In the last two decades, there has been a mystery surrounding the isotopic distribution of atmospheric ozone. In the early eighties, Konard Mauersberger (Max Planck Institute, Germany) and Nark H. Thiemens (University of California, San Diego, USA) reported careful experimental observations that showed that the ozone in atmosphere had enriched ^{18}O (compared to natural abundance of ^{18}O, which is 0.2%). It was also noted that enrichment of ^{17}O and ^{18}O were similar unlike what would be predicted based on the difference in masses, i.e. mass independent isotope effect was observed. Marcus and coworkers published a series of papers recently explaining this anomalous isotope effect. The $O + O_2 \rightarrow O_3$ reaction has different rates depending on the isotopes involved. Various factors contribute to this anomalous isotopic distribution and they include: (1) mass effect, (2) symmetry, i.e. $^{18}O{-}^{16}O{-}^{16}O$ has more rovibrational states compared to $^{16}O_3$, and (3) difference in zero point vibrational energy levels for the various isotopomers. The isotopic fractionation of ozone shows such anomalous variations in stratosphere and troposphere. There is a regional variation observed as well. Our own scientists from Physical Research Laboratory, Ahmedabad have previously shown that the photodissociation of O_3 and the mass dependent $O(^1D) + O_3$ reaction both contribute to the observed isotopic fractionation. In this issue (**page 1210**), Chakraborty and Chakraborty have addressed the isotopic fractionation of the O_3 + NO reaction and show that it could possibly contribute to the regional variation found in western USA.