Of Dipoles and Spherical Cows

How empirical analyses provide but a limited perspective

—S. George Philander
Department of Geosciences, Guyot Hall,
Princeton University, Princeton, New Jersey

A physicist was asked to advise a dairy farmer on ways to improve the productivity of cows. At their first meeting the physicist drew a large circle on his notepad and said to the farmer, "Let us consider a spherical cow." The farmer regarded this as a joke. The physicist, however, was serious; his tools—his methods of empirical analysis—when applied to a cow revealed that a sphere is an accurate representation of a cow. The puzzled farmer asked about the head, surely an important feature. The physicist thought about the matter, and after further empirical analyses, attached a small circle to the large one. To his surprise, the farmer was unimpressed with a cow composed of two spheres, one large, one tiny. The farmer explained that what interests him most are the teats on the udder, that being where he gets the milk.

Interannual fluctuations in the Indian Ocean have a complex structure. Certain types of analyses indicate that much of that variability is associated with the presence of El Niño in the Pacific and amounts to consistent changes in the rainfall patterns, surface winds, etc. Some colleagues are adamant that these analyses tell us everything we need to know (Hastenrath 2002; Allan et al. 2001). Others demur and claim that, on certain occasions—in 1961, 1967, and 1994, for example—it is possible to discern something very different in the Indian Ocean: a dipole that is not necessarily related to El Niño (Saji et al. 1999; Rao et al. 2002). Although the evidence is persuasive, this possibility seems to outrage those who are determined to see the world through the filters of their analysis methods.

Do they really believe that cows are spherical?

REFERENCES

Allan, R. J., and Coauthors, 2001: Is there an Indian Dipole, and is it independent of the El Niño–Southern Oscillation? *CLIVAR Exch.,* **6,** 18–22.

Hastenrath, S., 2002: Dipoles, temperature gradients, and tropical climate anomalies. *Bull. Amer. Meteor. Soc.,* **83,** 735–738.

Rao, S. A., S. K. Behera, Y. Masumoto, and T. Yamagata, 2002: Interannual subsurface variability in the tropical Indian Ocean with special emphasis on the Indian Ocean Dipole. *Deep-Sea Res.,* **49,** 1549–1572.

Saji, N. H., B. N. Goswami, P. N. Vinayachandran, and T. Yamagata, 1999: A dipole mode in the tropical Indian Ocean. *Nature,* **401,** 360–363.