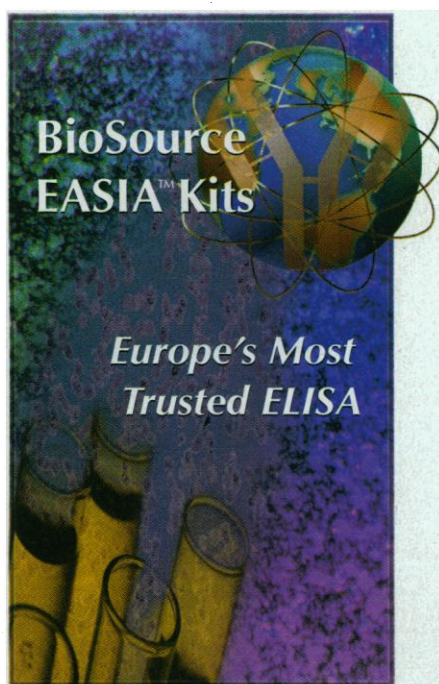
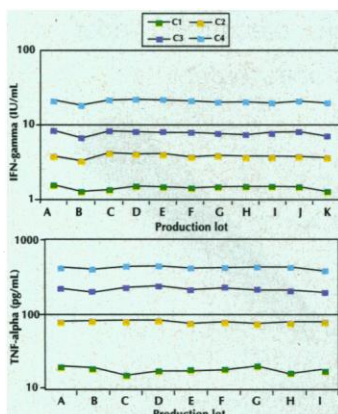




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cretion disk sufficiently massive to form an object as massive as another brown dwarf.

Ralph Neuhaeuser

Max Planck Institute for Extraterrestrial Physics, Garching, Germany. E-mail: me@mpe.mpg.de

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1. E. L. Martin *et al.*, *Astrophys. J.*, in press.

Scientific Responsibility in Global Climate Change Research

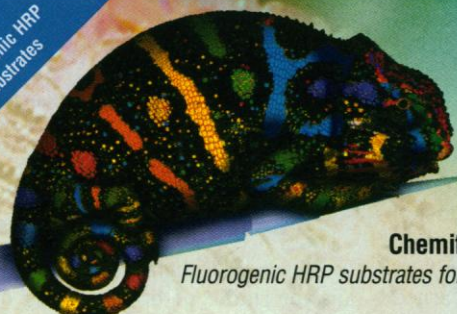
Over the last few years, several "major findings" in the area of global climate change research have been retracted or shown to be erroneous. The credibility of a few others is still being challenged in the literature. All of them were attempts to extract global climate change signals from satellites that are either so new that we are still learning how to use them or are so old that sensors are continuously degrading, orbits are declining, and the local observation time is drifting from one year to another. So, to try to extract a signal of global warming that, for example, is predicted to be of less than 1°C per decade, with a sea-level rise of 3 to 6 millimeters (mm) per year and an increase in the growing season

in the Northern Hemisphere of about 1 day a year is challenging, to say the least.

It's no wonder then that when papers come out saying, for example, that the sea level is rising at the rate of 5.8 mm per year (1), it is immediately taken by the media as "proof" of the onset of the much-awaited response of the ocean to greenhouse warming. This result was based on the analysis of data from one of the altimeters on board the U.S.-French satellite Topex-Poseidon. However, in less than a year an error was found in one of the algorithms. A joint paper, this time with the French team, revised the estimate of global sea-level rise over a 3-year period down to zero (2). Today, after a more careful analysis of both the altimeters on board the satellite over a longer period (1992-1997), one finds a positive trend of between 1 to 2 mm per year (3). The implications of these differences are huge when one is trying to predict when the Maldives or large parts of Bangladesh will go underwater: in 50 years or 200 years?

During most of the last decade, a battle has been raging between those who have said that the 1990s are the warmest years on record and those who have published satellite data showing that the middle at-

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mosphere temperature has not risen at all, but instead has cooled at a rate of 0.05°C per decade between 1979 and 1995 (4). Today we know that variations in the satellite orbital geometry were one of several reasons for these spurious results (5). The same data, reanalyzed, now show a positive trend of $+0.07^{\circ}\text{C}$ per decade (R. A. Kerr, News Focus, 25 Sept., p. 1948).

Another recent paper (6) reports that the growing season in the Northern Hemisphere has lengthened by about 10 days in a decade, very close to the model predicted value. However, another paper (7), using data from the same satellite series, but correcting for sensor degradation and so forth differently, concludes that "[t]he artificial trends caused by the combination of calibration residuals and satellite orbit drift should be removed to alleviate their misidentification as real trends in the earth's climate system...."

It is clear that to build a 10- to 20-year history of planetary-scale changes with the needed accuracy to assess the predicted global climate change requires extreme caution. The reason is obvious. The "weather satellites" [NOAA (National Oceanic and Atmospheric Administration) series] that are being used to unravel these long-term and highly subtle changes were not designed for this job. They were made to observe the changes in weather patterns from one day to the next, not to monitor climate change from one year to another. The latter can only be achieved with great difficulty, if at all. In any case, in such published work, a statement about the confidence limit around any quantitative estimate of global climate change should be included.

Finally, just before the November 1998 global warming conference in Buenos Aires, S. Fan *et al.* (Reports, 16 Oct., p. 442) reported that the United States is a major sink of an amount of carbon close to what it emits. This is result of a model run, and there appears to be no credible way to test it. The carbon "sink" resulting in more storage in the soils or more rapid growth in the vegetation cover, or both, may remain undetectable for years, even beyond the next generation of satellites. Let us hope that these modelers are right; otherwise, the U.S. research community will begin to lose credibility in this critical field.

As the debate on global warming moves from the scientific to the policy world, we must be careful not to rush to publish. The price for a wrong decision based on spurious analyses may not be insignificant.

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References and Notes

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2. — *et al.*, *Geophys. Res. Lett.* **24**, 1331 (1997).
3. For example, A. Cazenave *et al.*, *AVISO Newslett.*, no. 6 (1998), p. 43.
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5. F. J. Wentz and M. Schabel, *Nature* **394**, 661 (1998).
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7. G. Gutman, *ibid.*, in press.

*Former Chief Scientist for Global Change, NASA (1987–1991).

CORRECTIONS AND CLARIFICATIONS

In the Table of Contents of the issue of 29 January (p. 596), the author of the Editorial (*Science's Compass*, p. 637) should have been given as "L. Zhu."

In the News Focus article "The mystery of the migrating galaxy clusters" by Alexander Hellmanns (29 Jan., p. 625), the list of members of the Streaming Motions of Abell Clusters (SMAC) Collaboration should also have included the following researchers: Russell Smith, John Lucey, David Schlegel, and Roger Davies, all at the University of Durham, United Kingdom.

In L. Gabriel Navar's letter of 29 January (*Science's Compass*, p. 639), the Web address given for the animal rights brochure

was incorrect. It should have read, "www.faseb.org/aps/pubaff/animals/index.html."

Reference 1 of the letter "Georgetown faculty grievance" by Robert I. Glazer and Donald Massaro (*Science's Compass*, 22 Jan., p. 487) contained an error. The Web address of the first item should have read, "C. Risen, *The Hoya*, 6 November 1998 (www.thehoya.com/news/110698/news4/htm)."

In the Perspective "Warm, warm on the range" by Jerry M. Melillo (*Science's Compass*, 8 Jan., p. 183), in the first paragraph of column 3, the common name of *Boutelous gracilis* should have been given as "blue grama," not "buffalo grass."

In table 1 (p. 88) in the report "Measuring the spin polarization of a metal with a superconducting point contact" by R. J. Soulin Jr. *et al.* (2 Oct., p. 85), the percentage of P_c for NiFe should have been given as 46 ± 2 . In the same report, in note 20, G. Deutscher should also have been thanked for the seminal role he played in initiating the Andreev Reflection program at the Naval Research Laboratory.



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