Climate predictions and observations

To the Editor — Forecast verification can provide a valuable test of knowledge and predictive capabilities. Rahmsdorf *et al.*[1] compare observations of global temperature and sea level rise with predictions (conditional on appropriate emissions scenarios) made by the Intergovernmental Panel on Climate Change (IPCC) in 2001. Additional context on the evolving understanding of climate change can be found by looking at the IPCC conditional predictions made in 1990, 1995 and 2007.

Figure 1a compares the IPCC 1990, 1995, 2001 and 2007 temperature predictions (its "best estimate" for the realized emissions scenario) with observational surface (NASA, UKMET) and satellite (UAH, RSS) data. The observations fall between the best estimates presented by the IPCC in 1990 and 2001, which is consistent with the conclusions of Rahmsdorf *et al.*

Similarly, Fig. 1b shows a comparison of the IPCC 1990, 1995, and 2001 sea level rise predictions (its "best estimate" for the realized emissions scenario) with observational data from satellite altimeter measurements (from 1993 onwards, as used by Rahmsdorf *et al.*). The 2007 IPCC report did not present comparable sea level rise projections for the near term. Again, the observations fall below the 1990 estimate, and are above those of 1995 and 2001.

A comprehensive and longer-term perspective on IPCC predictions, such as this, suggests that more recent predictions are not obviously superior in capturing climate evolution. Temperature observations fall at the low end of the 1990 IPCC forecast range and the high end of the 2001 range. Similarly, the 1990 best estimate sea level rise projection overstated the resulting increase, whereas the 2001 projection understated that rise. In 1995 the IPCC explained the substantial reduction in projected temperature and sea level rise as being due to inclusion of aerosols and improved treatment of the carbon cycle.

Exercises such as these highlight the usefulness of projections of relevant climate variables that can be verified on timescales of a few decades or less. Such projections, no matter how accurate, can help to accelerate understanding about the human effects on the climate system as well as the limits to our ability to predict future consequences of those effects with accuracy and precision.

To facilitate such comparisons the IPCC should (1) clearly define the exact variables in its projections and the appropriate corresponding verification (observational) datasets, and (2) clearly explain in a quantitative fashion the exact reasons for changes to its projections from assessment to assessment, in even greater detail than found in the statement in 1995 regarding aerosols and the carbon cycle. Once published, projections should not be forgotten but should be rigorously compared with evolving observations.

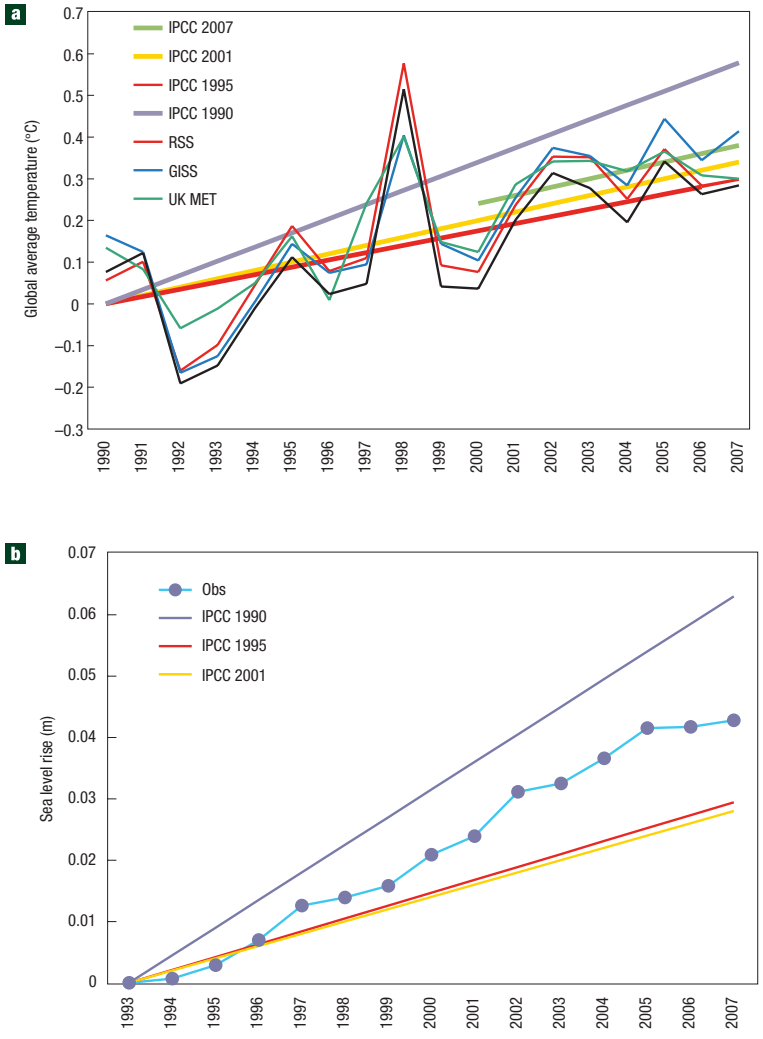

Figure 1 Temperature and sea level predictions and observations. **a**, IPCC global average temperature predictions from 1990 (page 190 of ref. 2), 1995 (pages 322–323 of ref. 3), 2001 (Fig. 9.14 of ref. 4) and 2007 (Fig. 10.26 of ref. 5), compared with observational data[6–9]. **b**, IPCC sea level rise projections from 1990 (page 277 of ref. 2), 1995 (Fig. 7.6a of ref. 3), and 2001 (Fig. 11.12 of ref. 4), compared with satellite altimetry data[10].

References

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