Iris hypothesis

The **iris hypothesis** is a hypothesis proposed by Professor Richard Lindzen in 2001 that suggested increased sea surface temperature in the tropics would result in reduced cirrus clouds and thus more infrared radiation leakage from Earth's atmosphere. His study of observed changes in cloud coverage and modeled effects on infrared radiation released to space as a result supported the hypothesis. This suggested infrared radiation leakage was hypothesized to be a negative feedback in which an initial warming would result in an overall cooling of the surface. The consensus view is that increased sea surface temperature would result in increased cirrus clouds and reduced infrared radiation leakage and therefore a positive feedback.

Other scientists have since tested the hypothesis. Some concluded that there was no evidence supporting the hypothesis. Others found evidence suggesting that increased sea surface temperature in the tropics did indeed reduce cirrus clouds but found that the effect was nonetheless a positive feedback rather than the negative feedback that Lindzen had hypothesized. A later 2007 study conducted by Roy Spencer, et al. using updated satellite data supported the iris hypothesis. In 2011, Lindzen published a rebuttal to the main criticisms.[1] In 2012, Lindzen made the following (informal) statement.[2]

> ... the critics claim that I asserted that the water vapor feedback may be negative. This may well be the case, but that is not what I have been suggesting. Rather, we find that the total longwave feedback (to which the water vapor feedback is one contributor – thin upper level cirrus are another, and the two are so intrinsically dependent that ignorance of the latter leads to ignorance of the former) is negative, and unambiguously so (that is to say, it was identified clearly even at zero lag). This has actually been confirmed by Trenberth and Fasullo (2009) who find in their analysis that feedbacks are primarily shortwave feedbacks. Given the noise in the shortwave component, claims of positive feedbacks in the shortwave based on simple regression are highly suspect. I would suggest that the claimed 'body of observational and theoretical evidence' for a positive water vapor feedback is largely a product of wishful thinking. As to so-called modeling "evidence," it is the models that we are testing; the model results should not be confused with evidence. The critics allow for the possibility of negative shortwave feedbacks, but claim that most models do not have a strong shortwave feedback anyway. There are a number of important points buried in that innocent sounding claim. The amplification depends on one over the quantity (1- the sum of all feedback factors)=1/(1-f). The long term defense of the water vapor feedback stems from the fact that it provides, in current models, a value of about 0.5 to f. This already provides a gain of a factor of two. But, more importantly, if one then adds 0.3 to f from shortwave feedbacks, the amplification jumps to five. Add 0.5 and it jumps to infinity. It is this extreme sensitivity to small additions that allows models to suggest large amounts of warming rather than the relatively modest amounts associated with the assumed water vapor feedback. As recent studies have shown, the feedback is likely to be much smaller than appears in current models, and hence, the potential for large warming is also dramatically reduced.

In 2012 scientists from the University of Auckland analyzed satellite data and found that the average height of clouds declined between 2000 and 2010. The decline was a result of a reduction in high altitude cirrus clouds. The average global cloud height is linked to the average global temperature—generally, the higher the average cloud height, the higher the average surface temperature, and vice versa.[3][4]

References

[1] Lindzen R.S., Y.-S. Choi (2011). "On the observational determination of climate sensitivity and its implications", *Asia-Pacific J. Atmos. Sci.*, 47, 377-390. doi: 10.1007/s13143-011-0023-x

[2] Lindzen R.S. (12 April 2012). "Response to the critique of my lecture in the House of Commons on February 22, 2012" (http://thegwpf.org/the-climate-record/5437-richard-lindzen-response-to-the-critique-of-my-house-of-commons-lecture.html)

[3] http://www.redorbit.com/news/science/1112479879/falling-clouds-may-combat-global-warming/

[4] Davies R., Molloy M. (2012), "Global cloud height fluctuations measured by MISR on Terra from 2000 to 2010", *Geophysical Research Letters*, 39, L03701. doi:10.1029/2011GL050506

External links

- NASA summary of Global Warming and Iris Hypothesis (http://earthobservatory.nasa.gov/Study/Iris/) (June 2002)

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