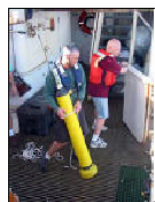


BREAKING NEWS One U.S. pilot killed in crash of F/A-18 jets in Iraq; second plane still missing



Environment



'Smoking gun' on humans and global warming claimed

NASA-led scientists say ocean data ties manmade emissions to warmer Earth

Researchers with the National Oceanic and Atmospheric Administration prepare to launch a "probing float" in the tropical Pacific. The float is one of hundreds used around the world to monitor climate change and which was instrumental for a new report on warming and human greenhouse gas emissions.

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Updated: 3:04 p.m. ET April 26, 2005

Using ocean data collected by diving floats, U.S. climate scientists released a study Thursday that they said provides the "smoking gun" that ties manmade greenhouse gas emissions to global warming.

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The researchers, some of them working for NASA and the Energy Department, went a step further, implicitly criticizing President Bush for not taking stronger action to curb emissions of carbon dioxide and other heat-trapping gases.

They said the findings confirm that computer models of climate change are on target and that global temperatures will rise 1 degree Fahrenheit this century, even if greenhouse gases are capped tomorrow.

If emissions instead continue to grow, as expected, things could spin "out of our control," especially as ocean levels rise from melting Greenland and Antarctic ice sheets, the NASA-led scientists said. "The climate system could reach a point where large sea level change is practically impossible to avoid."

The study, published Thursday in the Journal Science, is the latest to report growing certainty about global warming projections.

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Floata and satellites used
More than 1,800 technology-packed floats, deployed in oceans worldwide beginning in 2000, are regularly diving as much as a mile undersea to take temperature and other readings. Their precise measurements are supplemented by better satellite gauging of ocean levels, which rise both from meltwater and as the sea warms and expands.

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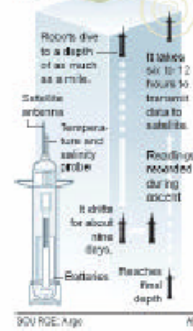
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Robots measure warming seas

Improved measurement of the Earth's warming seas using technology-packed floating robots confirms that global temperatures will rise at least 1 F. Eighteen countries deploy the floats in the program called Argo.

Collecting the sea's temperature and salinity. Total cycle time is 10 days.



Researchers led by NASA's James Hansen used the improved data to calculate the oceans' heat content and the global "energy imbalance." They found that for every square meter of surface area, the planet is absorbing almost one watt more of the sun's energy than it is radiating back to space as heat — a historically large imbalance. Such absorbed energy will steadily warm the atmosphere.

The 0.85-watt figure corresponds well with the energy imbalance predicted by the researchers' modeling of climate change through a supercomputer, the report said.

Computer models, which are numerical simulations of climate change, factor in many influences on climate, including greenhouse emissions. Such gases, produced naturally but also by humans burning fossil fuels, trap heat as they accumulate in the atmosphere.

'Can no longer be genuine doubt'
Significantly, those emissions have increased at a rate consistent with the detected energy imbalance, the researchers said.

"There can no longer be genuine doubt that humanmade gases are the dominant cause of observed warming," said Hansen, director of NASA's Goddard Institute for Space Studies. "This energy imbalance is the 'smoking gun' that we have been looking for."

Fourteen other specialists from NASA, Columbia University and the Department of Energy co-authored the study.

Scientists have found other possible "smoking guns" on global warming in recent years, but Klaus Hasselmann, a leading German climatologist, praised the new report for its innovative work on energy imbalance. "This is valuable additional supporting evidence" of manmade climate change, he told The Associated Press.

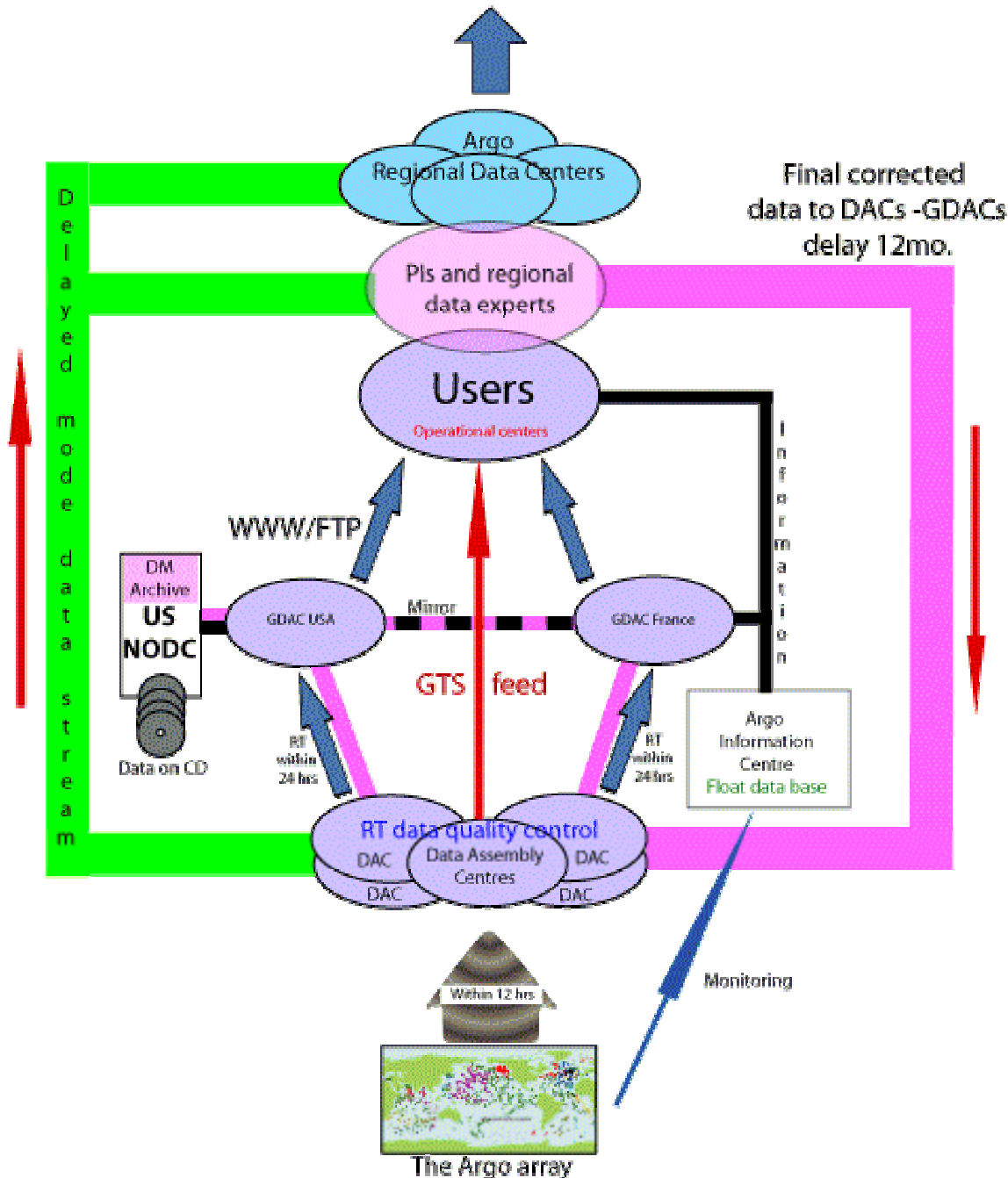
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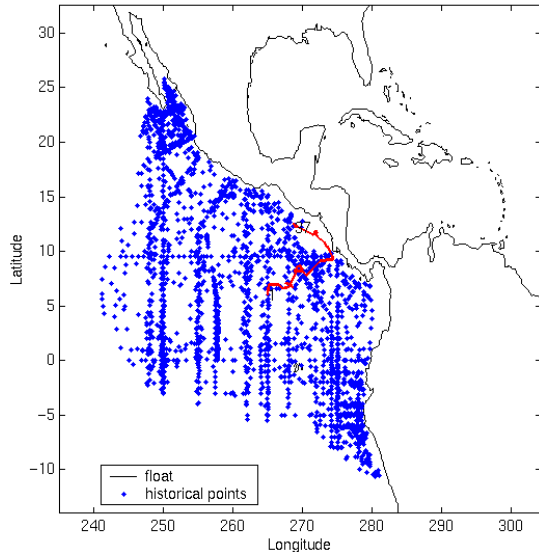
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U.S. Argo

Delayed Mode Salinity QC

3900059 profile locations with historical data



Example of a float with salinity drift:

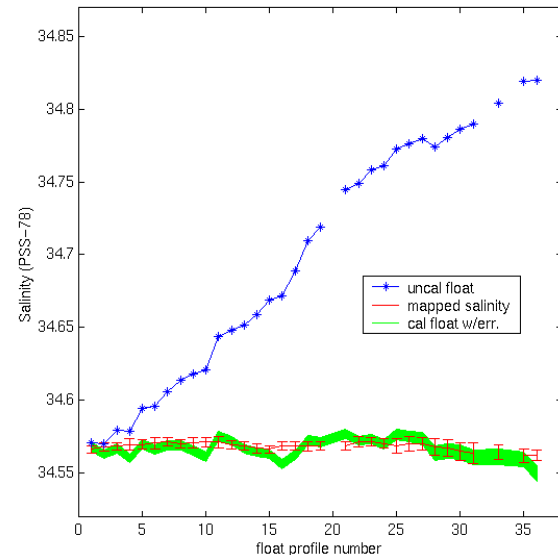
Float trajectory (red) & historical data locations (blue dots)

Original float T-S diagram (lines) with historical map (o's with error bars). Both progress blue to red over float life.

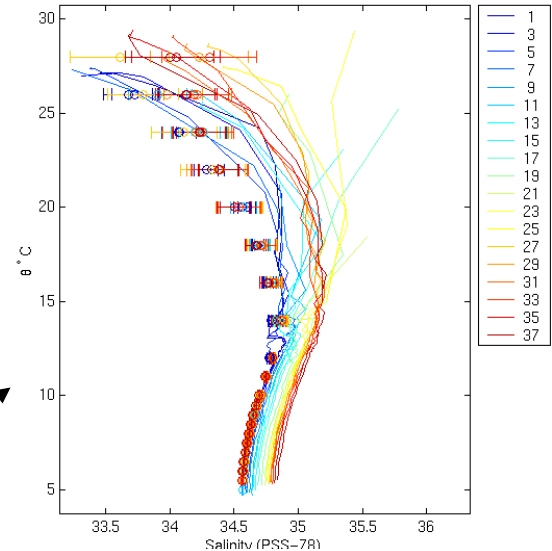
Float Salinity (blue) drifts w.r.t. historical map (red with error bars) and adjusted values (green shading shows error estimate) on deep isotherm

Adjusted T-S diagram after QC

Salinities with errors on $\theta = 5.5^\circ\text{C}$



Uncalibrated float data (-) and mapped salinity (o) with errors



Calibrated float data (-) and mapped salinity (o) with errors

