



This is the print version of the [Skeptical Science](http://sks.to/slr2010) article '[Sea level fell in 2010](http://sks.to/slr2010)', which can be found at <http://sks.to/slr2010>.

Why did sea level fall in 2010?

What The Science Says:

Sea level fluctuations during El Niño (rising) and La Niña (falling) are the result of large exchanges of water between land and ocean in the form of rain and snow. This averages out to zero over time. It does not affect long-term sea level rise, which comes from melting icesheets, glaciers, and thermal expansion.

Climate Myth: Sea level fell in 2010

Large sea level fall in 2010 means IPCC sea level projections are wrong.

A number of climate not-so-skeptics have been exploiting global sea level data in their latest attempt to hide the incline. Skeptical Science readers will be very familiar with the tactics the "skeptics" use to make this argument:

1. Cherrypick a very small amount of data during which the short-term noise has dampened the long-term incline.
2. Ignore the long-term trend.
3. Refuse to examine the reasons behind the short-term change.

Climate "skeptics" have used this exact same strategy to hide the incline in global surface temperatures ([here](#) and [here](#) and [here](#)), lower troposphere temperatures ([here](#)), and ocean heat content ([here](#) and [here](#)). We've found that an effective way to reveal the deception of these arguments is with an animated GIF, comparing the long-term data with the short-term "skeptical" cherrypick. Figure 1 makes this comparison for the global mean sea level data during the satellite radar altimeter record (since 1993) [from the University of Colorado](#). The first frame shows the entire record, the second shows four periods of flat or declining mean sea level, and the third shows the most recent short-term decline.

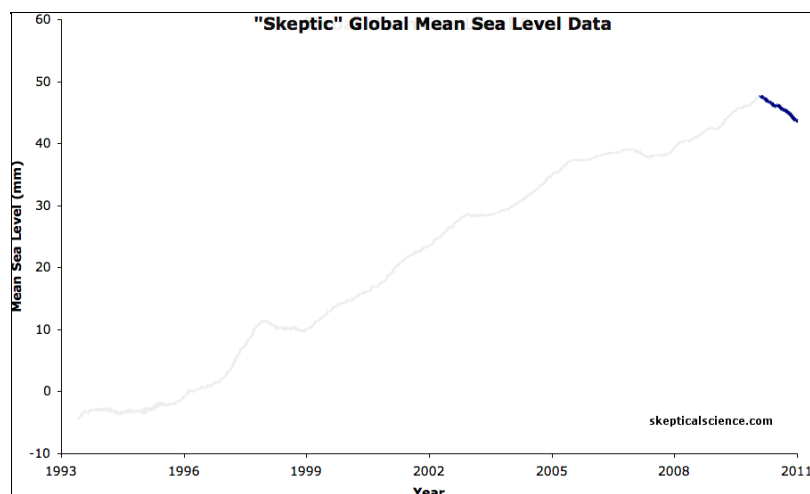


Figure 1: University of Colorado global mean sea level data with a 12-month running average, and short-term declines.

Cause of Short-Term Decline

Figure 1 confirms that yes, global mean sea level has declined slightly over the past year or so, and even slightly more than previous recent short-term declines. But a true skeptic should ask what has caused this

short-term decline, especially since it appears counter-intuitive. After all, [land-based ice continues to melt rapidly](#), and the [oceans continue to warm rapidly](#) (thermal expansion of ocean water contributes to sea level rise). So what has dampened the long-term sea level rise illustrated in Figure 1?

[As Skeptical Science has previously reported](#), climate scientists attribute the short-term decline to extreme flooding in 2010. This period also saw a strong La Niña cycle, which typically results in an increase of rain and snow falling over land, which corresponds with a fall in global sea level. 2009 to 2011 saw some epic deluges throughout the world; countries such as [Pakistan](#), [Sri Lanka](#), [Australia](#), the [Philippines](#), [Brazil](#), [Colombia](#) and the [United States](#) have been hammered with extreme flooding. Figure 2 illustrates where the water has gone.

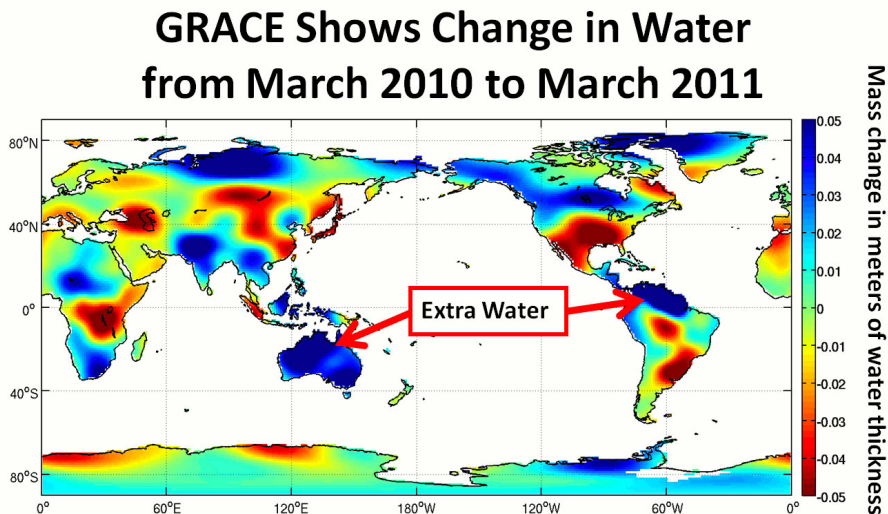


Figure 2: change in land-based global water storage in the period March 2010 to March 2011, as observed by [GRACE gravity satellites](#). Image from NASA JPL.

Cherry-Flavored Water

In short, arguments that sea level rise has stopped are based on the same tired old "skeptic" tricks of cherry-picking short-term data and ignoring the long-term trend. We know that ocean warming and melting ice will cause sea level to rise over the long-term, and the only reason the sea level rise has temporarily slowed is that there was so much flooding in 2010 - hardly a result worth celebrating. As long as humans continue to warm the planet by increasing the amount of greenhouse gases in the atmosphere, we can expect the long-term sea level rise to continue.

Basic rebuttal written by dana1981

Update July 2015:

Here is the relevant lecture-video from [Denial101x - Making Sense of Climate Science Denial](#)

[see video at [this link](#).]



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ne and United States corn. The potential exists for increased biofuels production to compromise agricultural production, unless the biofuels are created from a non-food crop or other source such as [algae oil](#).

- **Forest management:** At least one wedge would be available from reduced tropical deforestation and the management of temperate and tropical forests. At least one half-wedge would be created if the current rate of clear-cutting of primary tropical forest were reduced to zero over 50 years instead of being halved. A second half-wedge would be created by reforestation or afforestation approximately 250 million hectares in the tropics or 400 million hectares in the temperate zone (current areas of tropical and temperate forests are

1500 and 700 million hectares, respectively). A third half-wedge would be created by establishing approximately 300 million hectares of plantations on non-forested land.

• **Agricultural soils management:** When forest or natural grassland is converted to cropland, up to one-half of the soil carbon is lost, primarily because annual tilling increases the rate of decomposition by aerating undecomposed organic matter. One-half to one wedge could be stored by extending conservation tillage to all cropland, accompanied by a verification program that enforces the adoption of soil conservation practices that work as advertised.

PS04 concludes "None of the options is a pipe dream or an unproven idea....Every one of these options is already implemented at an industrial scale and could be scaled up further over 50 years to provide at least one wedge." While the study has identified 15 possible wedges, PS04 argues that only seven would be necessary to stabilize atmospheric CO₂ at 500 ppm by mid-century. The list in the study is also not exhaustive, for example omitting [concentrated solar thermal power](#) and other renewable energy technologies besides wind and solar PV.

However, Dr. Joseph Romm (Acting Assistant Secretary of Energy for Energy Efficiency and Renewable Energy during the Clinton Administration) argues that [at least 14 wedges](#) would be necessary to stabilize atmospheric CO₂ at 450 ppm. Romm proposes what he believes to be the [most plausible way to achieve 16 wedges](#):

- 1 wedge of vehicle efficiency — all cars 60 mpg, with no increase in miles traveled per vehicle.
- 1 of wind for power — one million large (2 MWp) wind turbines
- 1 of wind for vehicles — another 2000 GW wind. Most cars must be plug-in hybrids or pure electric vehicles.
- 3 of concentrated solar thermal power — ~5000 GW peak.
- 3 of efficiency — one each for buildings, industry, and cogeneration/heat-recovery for a total of 15 to 20 million GW-hrs.
- 1 of coal with carbon capture and storage — 800 GW of coal with CCS
- 1 of nuclear power — 700 GW plus 10 Yucca mountains for storage
- 1 of solar PV — 2000 GW peak [or less PV and some geothermal, tidal, and ocean thermal]
- 1 of cellulosic biofuels — using one-sixth of the world's cropland [or less land if yields significantly increase or algae-to-biofuels proves commercial at large scale].
- 2 of forestry — End all tropical deforestation. Plant new trees over an area the size of the continental U.S.
- 1 of soils — Apply no-till farming to all existing croplands.

The bottom line is that while achieving the necessary GHG emissions reductions and stabilization wedges will be difficult, it is possible. And there are many solutions and combinations of wedges to choose from.

Economics

[Working Group III](#) of the IPCC Fourth Assessment Report focused on climate change mitigation, and a substantial portion of the report focused on the economic impacts of mitigation efforts. The key finding of the report is as follows.

"Both bottom-up and top-down studies indicate that there is substantial economic potential for the mitigation of global GHG emissions over the coming decades, that could offset the projected growth of global emissions or reduce emissions below current levels (high agreement, much evidence)."

The report found that stabilizing between 445 and 535 ppm CO₂-equivalent (350–440 ppm CO₂) will slow the average annual global GDP growth rate by less than 0.12%. Additionally, this slowed GDP growth rate is in comparison to the [unrealistic business-as-usual \(BAU\) scenario where climate change has no impact on the economy](#). By 2030, the IPCC found that global GDP would decrease by a total of no more than 3% compared to the unrealistic BAU scenario, depending on the magnitude of the emissions reductions.

The report also found that health benefits from reduced air pollution as a result of actions to reduce GHG emissions can be substantial and may offset a substantial fraction of mitigation costs. Some other key findings:

"Energy efficiency options for new and existing buildings could considerably reduce CO₂ emissions with net economic benefit."

"Forest-related mitigation activities can considerably reduce emissions from sources and increase CO₂ removals by sinks at low costs"

"Policies that provide a real or implicit price of carbon could create incentives for producers and consumers to significantly invest in low-GHG products, technologies and processes. Such policies could include economic instruments, government funding and regulation"

In short, there are numerous opportunities to reduce GHG emissions at low cost, some of which result in a net economic gain. Overall, emissions can be reduced at a cost which will not cripple the global economy. Moreover, these emissions reductions would have a significant positive economic impact by slowing global warming.

We have the necessary technology. The net costs to implement them will not be crippling. The question remains - do we have the will to put forth the effort and initial investment to solve the problem?



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Skeptical Science explains the science of global warming and examines climate misinformation through the lens of peer-reviewed research. The website won the Australian Museum 2011 Eureka Prize for the Advancement of Climate Change Knowledge. Members of the Skeptical Science team have authored peer-reviewed papers, a [college textbook on climate change](#) and the book [Climate Change Denial: Heads in the Sand](#). Skeptical Science content has been used in university courses, textbooks, government reports on climate change, television documentaries and numerous books.



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