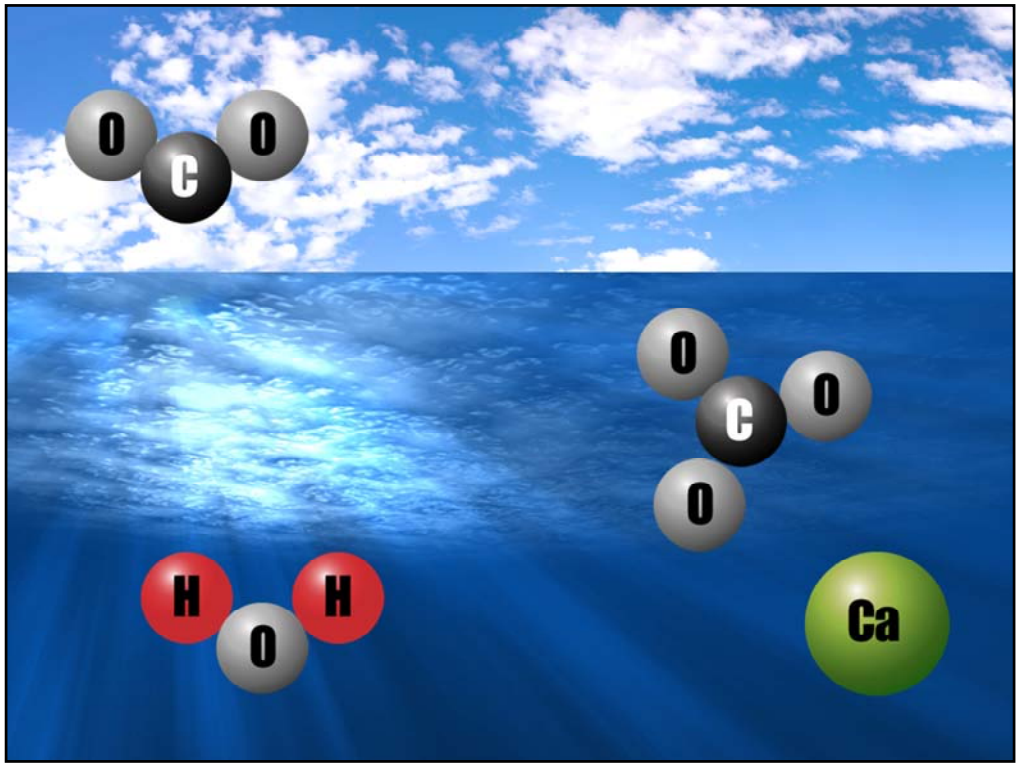
We need to know this if we are to answer the question “Are our Oceans Already Lost.” So we’ve taken a look at that question in the context of our oceans. I’ll cut to the chase – No, Our Oceans are not Already Lost, but we are on a fast track to that ending unless we change the story, fast.

Here's the scenario:

CO2 in the atmosphere is higher than it ever has been in the course of human civilization that's higher than it has been in about 800,000 -- as far back as the ice core studies have been able to go. This is about the time of the Neanderthals to give you a frame of reference.

In the meantime we've started burning fossil fuels and pulling carbon otherwise packed deep in the ground, out into the air. The oceans have been doing us the favor of absorbing about a third of the CO2 we've released, but in the process, it's making them very sick. Not only are they warming, and rising due to the heat, but they are also becoming acidic because of their CO2 uptake.

As a result, the oceans will soon be more acidic than they have been in nearly 20 million years! That takes us all the way back to the Meiocene Epoch, long before the stone age even began. This shows the unprecedented nature of the changes we're making to our atmospheric and marine chemistry in an extremely short time period by comparison.



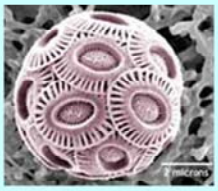
Here's the wonky science of what's happening when CO2 gets into the water and makes them acidic…

CO2 comes in, and reacts with water to create bicarbonate, which is a carbon form that is not available to marine life for building shells. This leaves a hydrogen ion – the thing that makes water more acidic… if there is any carbonate floating around, which is what needs to be available for animals like hard corals, clams and lobsters to make calcium carbonate structures, including skeletons, shells and other important parts. This extra hydrogen can bind to that to make more "unavailable" bicarbonate… taking the important carbonate out of the equation. It's no longer available to marine animals. And so on and so on it goes until there is simply not enough carbonate around for marine life.

When exactly a given location will become carbonate deficient depends on a lot of factors including the depth and temperature of the water, and different animals have differing sensitivity to low carbonate availability. The corals, however, are very sensitive and they are already showing the effects of this ocean acidification process.

More than 30% of the world's tropical corals are already gone. (Since 1980) And at current rates the other 70% will be gone by middle to the end of this century. The cold water corals are in a similar boat.

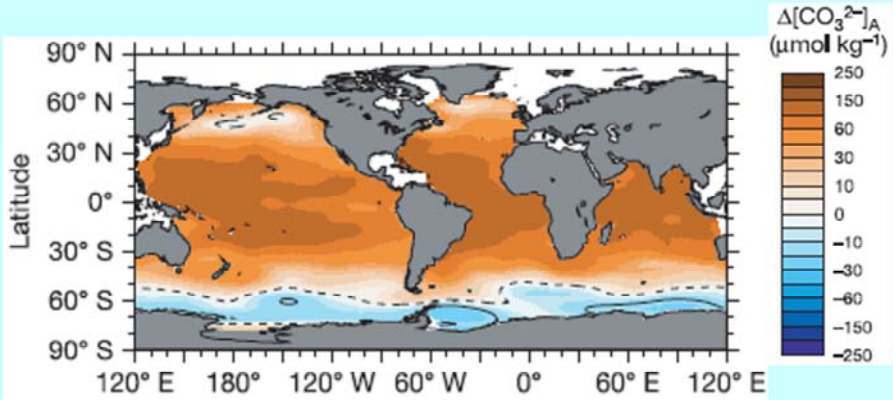
Maybe animate the slide on p. 24 or use NOAA animation? And explain what it's showing.



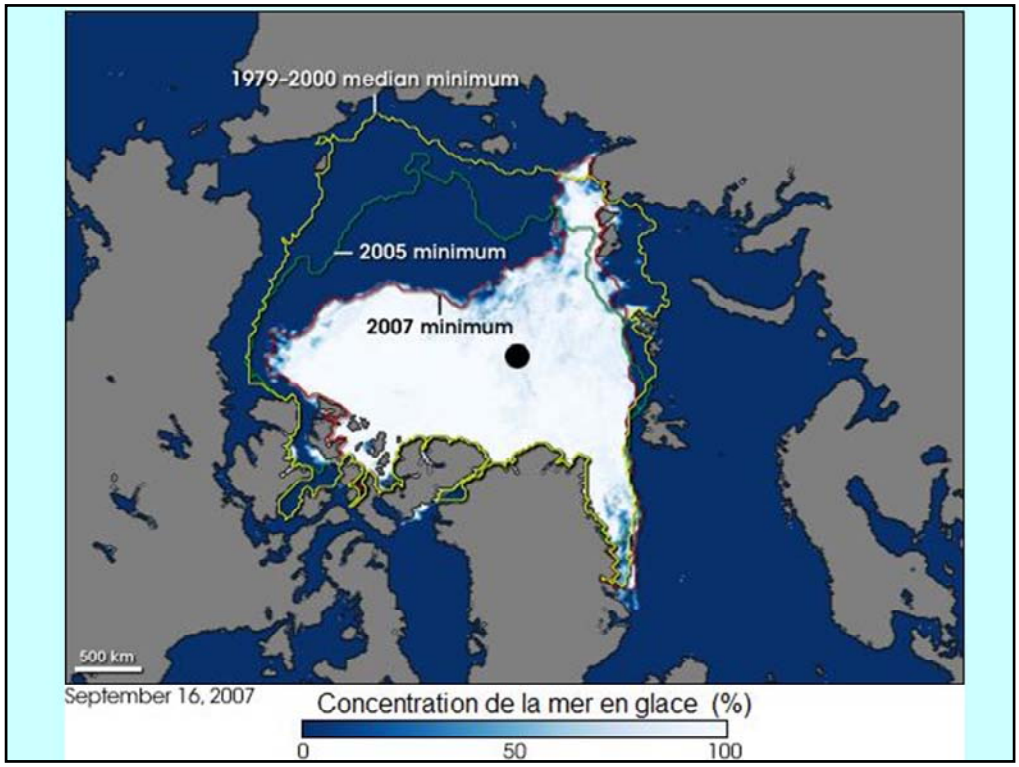
Calcifying organisms play multiple pivotal roles in marine ecosystems

Many are harvested commercially

Projected Aragonite Surface Saturation, 2100 (IS92a)



Orr et al. Science 2005


1979-2000 median minimum
2005 minimum
2007 minimum
500 km
September 16, 2007
Concentration de la mer en glace (%)
0
50
100

We've looked at various predictions from scientists showing:

We need to level off at 350 ppm or less to save the corals

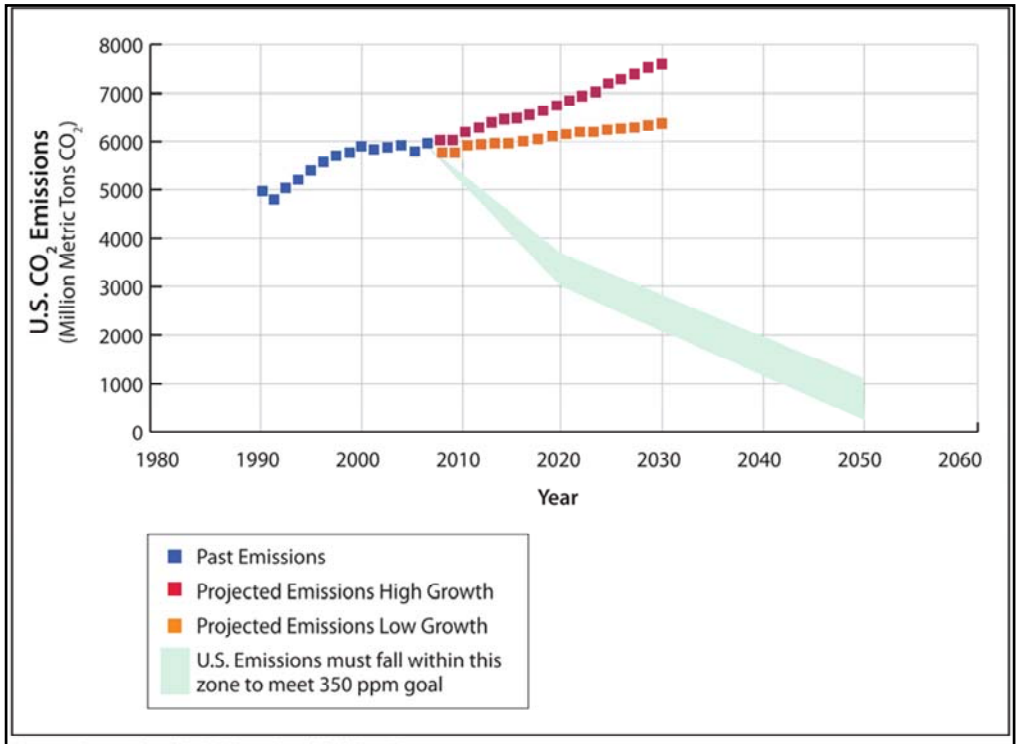
This needs to happen before we spend too much time (decades) in the "danger zone"

To do this we need to reduce US CO2 levels quickly. but right now those levels are increasing… (Show animated graph of trajectory – line number one.)

Some scenarios that have been discussed by IPCC will stop the growth of CO2 emissions, but that won't be enough.

We will need to reduce C02 by 25-40% (below 1990 levels) by 2020… and then by a total of 80-95% by 2050.

What if we don't?



Source: Oceana, based on EIA (2008) and IPCC (2007)

We may be looking at a PETM type of scenario… I need to add more here but basically an extinction theme for corals etc… maybe a good reef photo where various species slowly disappear…

If we can find the political will to save the corals we will really be saving the oceans and the planet itself from climate change.

What we can't do – set our sights on 2050.
Expand our use of fossil fuels
Wait for other countries to take action

There is a diverse array of solutions that need to be put in place immediately. List them out in a scrolling slide maybe.

Adopt a Policy of Stabilizing Atmospheric Carbon Dioxide at 350 ppm
Governments must commit to stabilizing the levels of carbon dioxide in the atmosphere at 350 ppm or below. In order to achieve this, serious strides need to be taken within the next 5 years to set society on a path to achieve zero or close to zero net carbon emissions within the coming decades.

Promote Energy Efficiency and Low Carbon Fuels

Energy should be conserved at every opportunity. This includes reducing the use and improving the fuel efficiency of cars, trucks, airplanes and ships. It also includes provision of cleaner fuels and investment in efficient mass transit, as well as individual, institutional and corporate actions to reduce use of all energy-demanding items.

Shift to Alternative Energy Sources

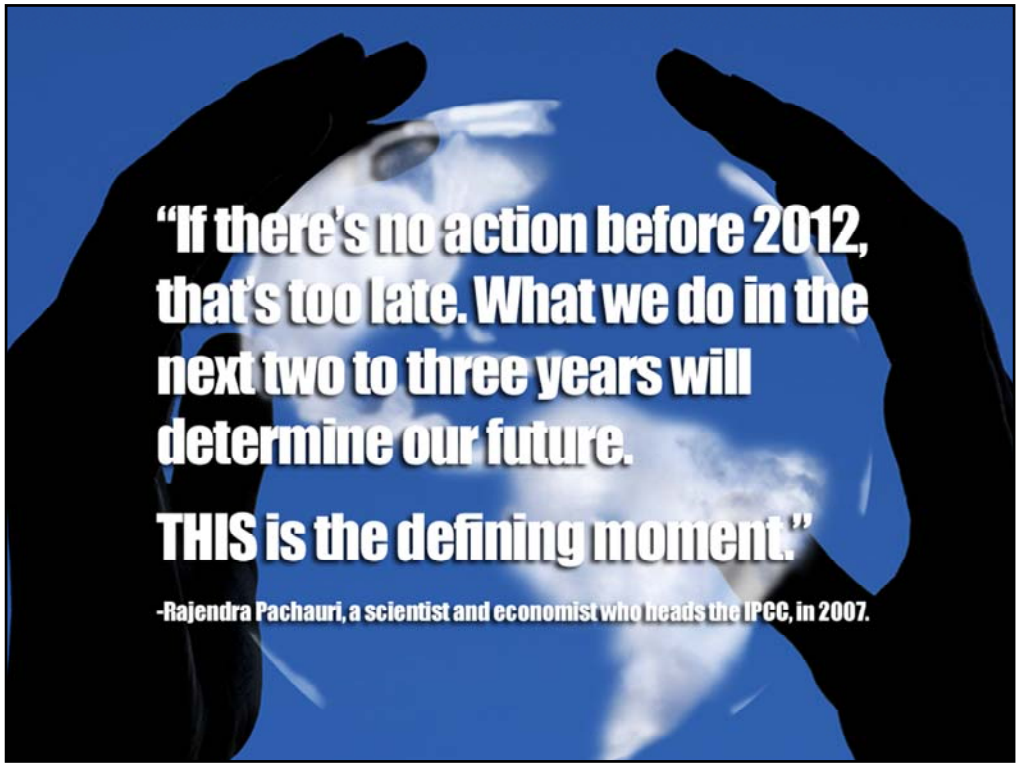
We should not be building or expanding coal-fired power plants unless global warming pollution is going to be trapped and safely stored or disposed of prior to emission. In its place governments and the private sector should implement programs to stimulate the development and use of renewable energy options such as wind and solar and invest in upgrading the national power transmission grid so that energy produced from alternative sources can be cost-effectively moved to markets. Governments should immediately eliminate any and all subsidies that encourage the use of fossil fuels. Fossil fuels currently in the ground in sensitive ecosystems such as the arctic and offshore should stay in the ground.

Regulate Carbon Releases

Governments should immediately begin regulating carbon releases using a system that internalizes emissions costs and prevents continued releases that harm the oceans. EPA should regulate releases from shipping, aircraft, and other under-regulated sources as soon as possible.

Preserve Natural Resilience

We need to boost the natural resilience of ocean ecosystems by removing other human stresses like over-fishing and pollution. Ocean acidification and climate change work in synergy with other impacts on ecosystems and species, making it more difficult for species to survive. Ecosystems will have the best possible chance of surviving the pressures of ocean acidification if they are not simultaneously struggling to survive in the face of other anthropogenic threats.


"If there's no action before 2012, that's too late. What we do in the next two to three years will determine our future.
THIS is the defining moment."
-Rajendra Pachauri, a scientist and economist who heads the IPCC, in 2007.