These Frequently Asked Questions (FAQs) have been written in support of "Ocean Salinities Reveal Strong Global Water Cycle Intensification during 1950-2000" By Paul J. Durack, Susan E. Wijffels and Richard J. Matear – published in Science Magazine 27th April 2012
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Graphics and materials for media are available from http://bit.ly/oceansalinity

Why is it important to understand ocean salinity?
As humans, we care about how much rain falls in our backyards, cities, farmlands and catchments. It is important that we understand how rainfall will change as the climate changes. Rainfall is difficult to measure, as it is occurs on very local- and short-timescales. As the oceans cover 71 percent of the global surface, and the ocean salinity field is shaped by both rainfall over the land and ocean and evaporation at the ocean surface, it provides us with gauge - a method of monitoring how large-scale patterns of rainfall and evaporation (the climate variables we care most about) are changing.

How do scientists measure ocean salinity?
Scientists who study the oceans (oceanographers) measure salinity and temperature using special sensors on ocean-borne or satellite instruments. These sensors measure electrical conductivity (which is converted to a salinity value), temperature and depth. Ocean profiles are collected by data centers and made available for examination by scientists. Development of the robotic drifting ocean profiling instrument called Argo has radically changed the amount of information available to scientists on ocean conditions. In a decade, this fleet has grown to more than 3,500 Argo floats. These Argo floats drift freely in the oceans providing oceanographers with measurements of salinity and temperature to 2,000 meter depths. Thanks to Argo, we now have a much better observational coverage of the global oceans, with the global fleet of floats providing considerably more information than our limited fleet of research vessels ever could.

How does ocean salinity tie into the global water cycle?
The ocean salinity field and its mapped change over time reflect changes to both rainfall and evaporation at the ocean surface. In response to these changes, the regional ocean's become either more salty (due to less rainfall and more evaporation) or less salty and fresher (due to more rainfall). This is really a simplified view, as the ocean's circulation acts to redistribute salinity additional to rainfall and evaporation changes which occur at the surface. However, it does provide a useful gauge to help understand how the water cycle is changing due to climate change.

What is the connection between a warming atmosphere, the ocean and changing salinity?
As the atmosphere warms, it is capable of holding and transporting more moisture as water vapor. This is expected to lead to an enhancement to the global patterns of rainfall and evaporation – with regions which habitually rain a lot, raining more, and regions which are habitually dry, becoming more so. As the ocean covers most of the globe (71 percent), changes to rainfall and evaporation will affect ocean surface salinity, with regions becoming wetter (more rainfall) leading to a freshening ocean beneath and those seeing less rainfall becoming saltier.

How will scientists continue to observe ocean salinity?
The oceans provide us with an inside view of how our climate is changing. They soak up most of the additional heat (90 percent) from the atmosphere while ocean salinity is an indicator of changes to the water cycle for 71 percent of the Earth's surface. Scientists have been measuring ocean salinity and temperatures for well over 100 years. Sensors deployed from research and commercial vessels, Argo floats and those on satellites dedicated to ocean observation have provided us with a record against which to monitor future change. Therefore, maintaining the observation network of Argo floats and research vessels is important. Without these observing programs, a large part of our global climate-observing network would be lost. Such observations allow us to better understand how the climate has changed and is changing into the future.

Is there a difference from region to region? For example: Tropical versus Temperate regions, Northern Hemisphere versus the Southern Hemisphere?
Ocean salinities are set by rainfall and evaporation at the ocean surface. So ocean regions dominated by rainfall (over evaporation throughout a year) are fresher on average compared to regions that at dominated by evaporation, which are saltier. Our observed estimates of salinity changes for 1950-2000 suggest that fresh ocean regions are getting fresher, and salty regions saltier. As salinity patterns are set by rainfall and evaporation, this suggests that the rainfall and evaporation patterns are changing, with wet regions becoming wetter (fresher) and dry regions becoming drier (saltier).
Dry regions, such as temperate Australia are likely to become drier in response to climate change, whereas the wet regions, such as the tropics are likely to become wetter. These spatial patterns are replicated for both the Northern and Southern Hemispheres. So dry regions such as the continental United States are likely to become drier, whereas high latitude regions near the North and South Poles are likely to become wetter.