Claire Parkinson, senior scientist and climatologist, NASA Goddard Space Flight Center

For more than 40 years Claire has studied changes in arctic sea ice and its connection to the climate system and climate change. She is one of seven 2020 finalists for the Paul A. Volcker Career Achievement Medal, recognizing excellence in federal government service in a career lasting 20 years or more.

Conversation with Carolyn Clarke Peterson. Claire asked that her responses be presented in full and unedited.

What has been the focus of your research at NASA?

My research focuses on using satellite data to determine sea ice coverage and how it has changed over the course of the satellite record.

And how has it changed?

In both the Arctic and Antarctic, sea ice coverage changes a lot within each year, with way more ice in winter than in summer, and there is also quite a bit of variability from year to year. However, by the late 1980s, the satellite data showed hints that Arctic sea ice coverage had decreased slightly from the late 1970s; and by the late 1990s, this decrease was much more apparent. Because the decrease fit well with growing concerns about global warming, interest in sea ice increased greatly at that point. Since then, the decreases in Arctic sea ice have not only continued but gotten faster, resulting in a highly convincing downward trend in what is by now a record of over 40 years.

The Antarctic case has been very different and much less in line with expectations, as, overall, Antarctic sea ice coverage was increasing rather than decreasing for most of the period since the late 1970s, which is when the consistent long-term satellite record began. The Antarctic sea ice increases peaked in 2014, followed by very rapid decreases over the next three years and a slight rebound since then.

I realize there is considerable controversy surrounding various aspects of climate change. How confident are you in the sea ice results?

No data set is perfect, and I certainly wouldn't be surprised to get refinements in the numerical values; but I'm very confident in the qualitative basics that I just mentioned, namely, the overall decreases in Arctic sea ice coverage since the late 1970s and the increases in Antarctic sea ice coverage from the late 1970s until 2014, followed by rapid decreases. The satellite data are really quite convincing on each of those points.

Satellites are fantastic for monitoring sea ice coverage. Sea ice looks quite different than liquid water, which helps a lot in terms of getting confident measurements; and we use instruments that allow us to get sea ice data under cloudy as well as cloud-free conditions and irrespective of whether it's day or night (key here is measuring microwave radiation rather than visible radiation). Furthermore, we can generally get these data for every day or at least every other day. The result is a very convincing record.

Why has there been so much controversy regarding climate change?

Several factors have been involved, including science issues, data issues, financial interests, concerns about the economy, and, frankly, flaws in how scientists have presented the issues. Climate change is not just a theoretical matter; it has real consequences, explaining in part why people have such adamant positions. Many climate models predict that if we continue "business as usual", the climate will change in ways that will cause major disruptions, for instance with sea level rise causing flooding of low-lying coastal cities. So it is quite reasonable that people believing in the predictions are firm in not wanting us to continue "business as usual", instead wanting major reductions in human-induced changes, especially reductions in our emissions of greenhouse gases. However, implementing these changes is expensive, and hence it is understandable that other people rebel against making these changes, knowing that they are based on predictions from models that are not perfect or complete (as no model can be).

You mentioned flaws in how scientists have presented the issues. Could you elaborate on that?

Sometimes exaggerated statements are made, like statements that every glacier in the world is retreating, or implications that the world is hotter than it's ever been or sea level is rising faster than it's ever risen. Such statements can readily be shown to be inaccurate, and it can leave the listener mistrusting scientists. In my mind, it is overwhelmingly better to present the facts as we know them, without exaggeration. The Earth has experienced periods when it was much hotter than now and periods when sea level was rising much faster than now; but that doesn't alter the fact that major sea level rise now could cause huge disruptions to low-lying coastal cities all around the world. Sea level rise is just one of the predicted changes that could cause major disruptions, but it's a good example because of how readily understood it is.

I also feel that there has been too much criticism of the so-called "sceptics". This has led to a back-and-forth that is way too nasty and unnecessary, and it has blurred the key issues. We should be clear that we can't know for sure what will happen in the future and that the climate models are indeed incomplete and could be wrong. Still, despite their flaws, the top climate models are the best means we have at this time for predicting future climate. They shouldn't be taken as "gospel truth", but they shouldn't be ignored either.

Do you see a link between the major problems humanity faces?

Yes, major problems are intertwined. There is a sizeable literature on environmental justice, where racism, poverty, and environmental issues are all tied together, and I hugely recommend looking into that

What might we of the Class of 1970 do to be part of the solution?

Travel less, consume less, recycle and reuse more, and encourage others to do the same. For many people, traveling is the largest contributor to their carbon footprint. Perhaps the current horrifying COVID 19 pandemic can help here, as the shutdown of so many activities might lead to adjustments that result in less traveling in the future as well as right now.

Tying this back to two of your earlier questions, I think the failure of many scientists to cut back on travel is a serious mismatch between message and actions. Too many people who speak out forcefully about the dangers of human-caused climate change have extremely high individual carbon footprints, in

many cases due in substantial part to extensive traveling. I think back to the Civil Rights Movement in the 1960s, in which many of us in the Class of 1970 were involved. During the 1960s, people were willing to risk losing their jobs and even their lives for the cause of civil rights. What a contrast versus declaring that climate change is among the most important issues facing humanity and then not even being willing to cut back on travel. This mismatch between message and actions is discouraging.

Is there any reason to be hopeful about Earth's changing climate? Are there technologies on the horizon for carbon sequestration that seem promising? Are there technologies that you think should be avoided?

Yes, there is reason for hope. The mere fact that climate change has been recognized as a problem has many people – including many bright young people – thinking about it, and this leads to a good chance that ways will be developed to allow us to continue to enjoy the benefits of civilization without continuing to severely damage the environment and climate.

In addition to reducing emissions, carbon sequestration and quite a few other methods of so-called "geoengineering" have been proposed to counter current climate change. Some of these seem reasonable to pursue, while others don't seem reasonable at all. I particularly don't like the ones that propose inserting even more material into the atmosphere or oceans, like the one suggesting adding matter to the upper atmosphere to reflect away sunlight. But I do feel hopeful that good solutions will be found.

How did your experiences at Wellesley lead to your career?

I majored in math at Wellesley and loved it, just as I had from early childhood. However, from an early age I was also deeply concerned about events in the wider community, especially injustices. At Wellesley I found many others with the same concerns and, frankly, far more articulate and knowledgeable than I was. This was in huge contrast to my middle school and high school experiences in central Vermont, when I was often the only student speaking out in support of the civil rights movement and in opposition to the Vietnam War. Wellesley taught me how much deeper the arguments should be. By the time we graduated, it was clear to me that I couldn't go into theoretical math as a career, as I feared that it would divorce me too much from the realities of the world. But I had no alternative career choice at that point. In the year after Wellesley I decided I wanted to work in Antarctica, being drawn to it by the Antarctic Treaty, which wonderfully preserves an entire continent "for peaceful purposes only." The liberal arts education I received at Wellesley helped prepare me both for changing my career course and for the multi-faceted nature of science and citizenship.