Global Warming Linked to Increasingly Warmer and Wetter Winters in Europe and Western North America

June 4, 1999 New York City -This week in the journal *Nature* (June 3, 1999), the first well-documented link between global warming and much warmer and wetter winters in western North America and Europe has been published. Atmospheric physicist, Drew Shindell, at NASA's Goddard Institute for Space Studies, Columbia University in New York City confirms that over the past thirty years winter temperatures in the Northern Hemisphere have warmed up a full *ten time more* than the global average increase of .9 degree Fahrenheit. That means that the west coast of the U. S., Canada and Europe now have winters a full ten degrees Fahrenheit warmer than they were in the 1960's. For the first time, Dr. Shindell has been able to show with confidence that this chronic warming is a result of greenhouse gas emissions.

Interview:

Drew Shindell, Ph.D., Atmospheric Physicist, NASA's Goddard Institute for Space Studies, Columbia University, New York City: "Now, we find that those (warmer winters) also seem to be a result of greenhouse gasses and the reason that we have some confidence in the result is that we have a physical reason why this should take place in the atmosphere. And what we find is that the greenhouse gasses as they float up into the atmosphere and collect there, they cause different areas to heat at different rates, to heat or cool. And at high latitudes and high altitudes as well, they cause the atmosphere to cool. And at lower latitudes, the atmosphere warms where the atmosphere is denser at lower latitudes. And both of these things have been observed.

AND HOW DOES THAT APPLY TO THE STATEMENT THAT WARMER AND WETTER WINTERS IN EUROPE AND WESTERN NORTH AMERICA SPECIFICALLY ARE LINKED TO INCREASING GREENHOUSE GASSES?

The reason that our weather in the Northern Hemisphere comes from the west - if you ever look at a weather map, you see storm systems moving from west to east is because on the spinning earth we have colder temp. in the north polar regions and warmer temps in the south and this causes the air to flow north and to the west. So these predominant westerly winds that carry our weather systems around - if the temperature difference between the high and low latitudes

increases, those wind speeds also increase. And that's what we have been seeing over the past few decades and those winds carry warm, wet air from over the oceans onto the western part of continents.

SO, NOW WHAT IS HAPPENING IS BECAUSE THE WIND SYSTEMS THEMSELVES ARE BEING AFFECTED, THEY ARE CARRYING MORE WARM AIR ESSENTIALLY INTO EUROPE AND WESTERN NORTH AMERICA.

That's exactly right. So, this is somewhat different than the greenhouse effect that we have been talking about for years now whereby greenhouse gasses cause more energy to be trapped down near the surface of the earth. This is not saying there is more energy. It's saying that the greenhouse gasses by affecting the windspeeds affect where the energy goes. So that the oceans which are warm during the winter because they are able to retain the warm summer temperatures with their greater mass and heat capacity than the land, their warm air gets brought on to the continents.

WHAT KIND OF COMPUTER MODEL PROJECTIONS INTO THE FUTURE HAVE YOU DONE TAKING THIS NEW DATA AND LOOKING AT WHERE THE WEATHER SYSTEMS AND CLIMATE WILL CONTINUE TO CHANGE - LET'S SAY OVER THE NEXT FIFTY TO A HUNDRED YEARS?

Well, we first ran our computer simulation to see if we could reproduce the past few decades and we did find they matched the observed trend toward increasing winds and warmer continental temperatures. So, we let them continue and those trends continue as well for about another three or four decades - we see the westerly winds in the Northern Hemisphere during winter time continue to increase, continue to bring warm, wet air over western No. America and Europe and Asia. And after about 30 or 40 years, the affect kind of levels off. So, we expect that we are roughly half way through and that the storm systems that move off the Atlantic tend to move up to northern Europe and become more and more intense. The affect is especially strong over Europe and Asia where air coming off the ocean flows quite easily across the continents. Over No. America, the Rocky Mtns. Deflect the air quite a bit. So there is a lot warmer and wetter temperatures in the Pacific Northwest and Western Canada and as they hit the mtns and flows down and is mitigated somewhat.

WELL, IF YOU HAVE HAD A TEN DEGREE FAHRENHEIT INCREASE IN TEMPERATURE IN THESE AREAS OF EUROPE AND WESTERN NORTH AMERICA OVER THE LAST 30 YEARS AND WE HAVE ANOTHER 30 YEARS TO GO, DOES THAT MEAN WE ARE GOING TO SEE YET ANOTHER 10 DEG. F. OR 20 DEG. F WARMING OVER 60 YEARS?

That's really about the maximum level. The temp. changes over large areas have been roughly 6 to 10 degrees, so up to 10 degrees over the past 30 years. As you point out, if the trend continues for another 30 to 40 years, we should see roughly a doubling of that.

AND IF SO, WHAT DO YOU FORESEE FOR WEATHER IN EUROPE AND WESTERN COAST OF CANADA AND THE UNITED STATES?

Well, if you live kind of lower down in altitude or somewhere where it hasn't historically been incredibly cold, we would expect a lot more rain and generally fairly mild winters. If you live up in the mtns., with the warmer temps you might see more often rain and sleet and less snow as the temps rise by something pretty dramatically 10 to 20 degrees. Not good news for ski resort operators.

MEANING LESS SNOW?

If the temp. gets very warm, the snow would fall as rain instead. That's all I mean. There would be more precipitation in general. But whether it will come down as rain or snow - if it gets warm past the freezing point, it will fall as rain instead of snow.

AND I HAVE THE IMPRESSION THAT IN EUROPE OVER THE DECADE OF THE NINETIES, THERE HAS BEEN A LARGE NUMBER OF FLOODS AND HEAVY RAINS, HEAVIER THAN IN THE PAST. IS THAT TRUE? AND WILL THAT CONTINUE?

It does seem that both over Europe and the U. S., there has been a lot of extreme weather recently. What we expect is - especially over Europe - the storms that hit Europe form in the western Atlantic and come across the ocean picking up moisture and intensity and those we would expect to become more intense and especially we would notice that effect in Europe more even than in North America, and as the winds pick up, those storms will intensify.

AND WOULD THIS INCREASE THE VIOLENCE OF TORNADOES IN THE MIDWESTERN PART OF THE UNITED STATES BECAUSE OF COLLIDING WARM AIR AND COLD AIR?

That's certainly a possibility. That's something that's very difficult to pick out in a computer model because these are very small scale phenomenon in the real atmosphere. And where it's very difficult for us to resolve anything that is really that small. But in general, the atmosphere will be picking up more and more energy, both from the greenhouse effect leading to global warming and from the increase in wind speeds. And the more energy that's there, the more is possible and the more that's been available to creating severe weather and storms.

SO THE LIKELIHOOD IS THAT THE VIOLENCE OF TORNADOES COULD INCREASE OVER THESE NEXT TWO OR THREE DECADES?

That's certainly a possibility, yes.

HAS ANY BODY IN FEMA OR THE GOVERNMENT TALKED TO YOU IN A CONSULTING BASIS ABOUT WHAT YOUR PROJECTIONS ARE FOR INCREASED WEATHER VIOLENCE THAT WILL AFFECT EMERGENCY MANAGEMENT?

Nobody has talked to me directly about this, but it's something that the (atmospheric physics) community and the government have been both interested in quite a lot. But as I said, it's one of the most difficult aspects of climate modeling is really getting these small scale very unusual extreme events - each

one is different from the others. It's much easier for us to predict broad scale continental wide features than a very small storm system.

BUT THE CLINTON ADMINISTRATION AT SOME LEVEL HAS MET WITH ATMOSPHERIC PHYSICISTS OUT OF THEIR CONCERN FOR WHAT THE FUTURE IS GOING TO BRING?

Yes, and the government has certainly been funding quite a lot of research in this area. People would like very much to understand what will happen to severe storms. There have been suggestions from numerous groups that severe weather will become worse - more frequent and more severe storms. But that's still something that we don't have as much confidence in those predictions as we do in something like global warming.

AND THAT WOULD AFFECT EVERYTHING INCLUDING BUILDING CODES.

That's true. Yes, it would have enormous repercussions. And of course, the insurance industry as well as the govt would be quite interested in something like this.

FROM YOUR COMPUTER MODELS, HAVE YOU SEEN THAT WIND SPEEDS THEMSELVES WILL CONTINUE TO INCREASE AND THAT WE MIGHT SEE MORE ABOVE 300 MPH WINDS AS GUSTED IN ONE OF THE TORNADOES THIS YEAR?

Well, we see an overall increase in the dominant wind patterns, the westerlies that bring all of our weather around the Northern Hemisphere. But these extreme excursions will in all likelihood there will be some increase, but that's something that's very tricky for us to pull out of the model and we see small signals, but against such a large variability of winds going up to 300 mph it's very hard to see any real substantial difference.

BUT IF WE DID START HAVING MORE 300 MPH WINDS, VERY LITTLE IS BUILT ON THE SURFACE OF THE PLANET TO SUSTAIN 300 MPH GUSTS.

That's certainly true. Any real change in the weather patterns is going to be difficult to adapt to and that's one of the main motivations for understanding these sort of affects. The increase in greenhouse gasses has been going on for decades and the earth climate system takes decades to respond. So, even if we stopped immediately, the earth's climate in the atmosphere and the oceans would continue to respond for decades. And we can't shut this off. But if we can understand it better, we can try to mitigate some of the negative impacts and if we find there will be more severe storms, that rains will fall in different areas, and some areas that were formerly lush crop land will become more drought-prone and vice versa, we can try to mitigate the affects. But anything will be difficult because the current economic system and distribution of food and building codes, as you mentioned, - all of these things are set with the CURRENT climate system in mind.

More Information:

Dr. Shindell's current computer model projections show that the greatest climate changes over the next thirty years in the United States and Canada will continue to be west of the Rocky Mountains. Increasing warmer temperatures and rainfall during the winters are expected. The southern United States will also have significantly warmer winters, but in the northeast U. S. and eastern Canada, winter temperature changes will be fairly small in comparison.

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