One of the largest challenges in climate science is determining how the great ice sheets over Greenland and Antarctica will respond to the increase in temperatures expected from rising concentrations of heat-trapping emissions in the atmosphere.

On Wednesday, a research team led by a NASA scientist unveiled a new study that is sure to stir debate on the topic. The paper concludes that ice loss from both Greenland and Antarctica is accelerating, and that the ice sheets' impact on the rise in sea levels in the first half of the 21st century will be substantially higher than previous studies had projected.

The increasing ice loss means that, for the first time, Greenland and Antarctica appear to be adding more to sea-level rise than the world's other reserves of ice — primarily mountain glaciers, which are also melting because of rising temperatures. In 2006 alone, the study estimated that the two ice sheets lost roughly 475 billion metric tons of ice.

"The big deal is that we did not expect ice sheets to catch up with mountain glaciers so soon," said Eric Rignot, a climate researcher with NASA's Jet Propulsion Laboratory and the lead author of the study.

If the rates of melting observed in the study were to continue, the ice sheets could add nearly six inches to the rise in global sea levels in the next forty years — a far larger contribution than the United Nations Intergovernmental Panel on Climate Change, the international scientific body, has projected.

The study's findings that ice loss in Greenland has accelerated strikingly over the last two decades are largely in line with the conclusions of other researchers. But the estimate that Antarctica is also rapidly shedding ice was challenged by other scientists, who believe the continent's ice sheet remains largely in balance.

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