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Inside The Clouds

Meteorologists Gather Important Information With 5-satellite

April 1, 2008 — Meteorologists analyzing data from a closely-packed group of five satellites have identified a decrease in cloud cover over the Arctic. They find this alarming because cloud cover absorbs some of the heat in sunlight, stopping it from warming the surface of the earth. It is possible that this loss of cloud cover is contributing to global warming.

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NASA satellites are lifting the cloud of uncertainty surrounding climate change. Five satellites, flying in formation above the Earth, are revealing several times more information about global warming than traditional research methods.

We are really just sort of beginning to discover how to combine the data -- how to unlock certain secrets that sort of exist," Graeme Stephens, Ph.D., an investigator at Colorado State University in Fort Collins, Colo., told Ivanhoe.

At Colorado State University, meteorologists working with NASA are discovering how what happens up in the sky affects what happens down here. "What we are able to observe with this new observing system," Dr. Stephens explains. "With the radar and the laser system, in particular, we are able to unequivocally tell you how much the cloud changed."

CloudSat is just one of a constellation of five satellites orbiting earth, separated apart by only seconds. "That is an incredible kind of engineering feat to tightly fly these space crafts around the earth, maintaining this fifteen second separation within two seconds of each other," Dr. Stephens says.

Called the "A-Train" because the first satellite and last satellite in the "train" both start with the letter "A," the A-Train's most important discovery so far? The arctic is losing cloud cover. Some meteorologists say that is contributing to global warming.

"What we've discovered is the clouds ... more than half of the clouds disappeared over the arctic," Dr. Stephens says. "And what that effectively has done is like opening up the blinds, letting the sunlight, in warming the ocean surface." Sure enough, Arctic surface waters warmed four degrees last year. Meteorologists say this is only the tip of the iceberg for A-Train discoveries.

Life expectancy of the A-Train satellites is less than ten years, so scientists are trying to accumulate as much data as possible now, before any one of the satellites fails.

ABOUT GLOBAL WARMING: Global warming refers to an increase in the earth's average temperature -- which has risen about 1 degree F over the past 100 years. A warmer earth may lead to changes in rainfall patterns, and a rise in sea level, for example, as polar glaciers melt.

Some of this rise is due to the greenhouse effect: certain gases in the atmosphere trap energy from the sun so that heat can't escape back into space. Without the greenhouse effect, the earth would be too cold for humans to survive, but if it becomes too strong, the earth could become much warmer than usual, causing problems for humans, plants and animals.

TYPES OF CLOUDS: Most clouds are a combination or variation of three basic types. Stratus clouds are horizontal layered clouds that stretch out across the sky like a blanket. They often form at the boundary where a layer of warm moist air passes over a layer of cool air, causing the warm air to cool. If the warm air cools below the dew point, the excess water vapor condenses to form the blanket-like layer of stratus clouds. Cumulus clouds are puffy and look like

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