

## Science News

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### Water Vapor Feedback Is Rapidly Warming Europe

*ScienceDaily* (Nov. 9, 2005) — A new report indicates that the vast majority of the rapid temperature increase recently observed in Europe is likely due to an unexpected greenhouse gas: water vapor. Elevated surface temperatures due to other greenhouse gases have enhanced water evaporation and contributed to a cycle that stimulates further surface temperature increases, according to a report in *Geophysical Research Letters*. The research could help to answer a long-debated Earth science question about whether the water cycle could strongly enhance greenhouse warming.

#### See Also:

#### Earth & Climate

- Environmental Issues
- Global Warming
- Water
- Weather
- Climate
- Atmosphere

#### Reference

- Consensus of scientists regarding global warming
- Greenhouse effect
- Climate model
- Scientific opinion on climate change

Swiss researchers examined surface radiation measurements from 1995 to 2002 over the Alps in Central Europe and show strongly increasing total surface absorbed radiation, concurrent with rapidly increasing temperature. The authors, led by Rolf Philipona of the World Radiation Center in Davos, show experimentally that 70 percent of the rapid temperature increase is very likely caused by water vapor feedback. They indicate that remaining 30 percent is likely due to increasing manmade greenhouse gases.

The researchers analyzed temperature and humidity changes over Europe, which jumped nearly three times above the levels predicted by general circulation models in the past two decades.

They provide observational evidence that large-scale weather patterns in Europe influence annual average temperatures uniformly, but weakly. They suggest that their combined observations indicate that the region is experiencing an increasing greenhouse effect and that the dominant part of the rising heat emitted from the Earth's atmosphere (longwave radiation) is due to water vapor increase.

After examining increased cloud cover to the north of the Alps and decreased cover to the south, the authors report that both sides of the mountain range experienced clear warming over the 1995-2002 period. While clouds are not entirely responsible for the warming, such findings correspond with previous cloud investigations showing that for midlatitudes, annual mean cloud cooling from the Sun (shortwave radiation) is roughly canceled by cloud warming caused by heat emitted by longwave radiation from the surface.

The strong increase of longwave radiation is shown in the study to be due to increasing cloudiness, rising temperature, rising water vapor, and above all to long-lived manmade greenhouse gases. The scientists' radiation measurements in the Alps show that the various inputs, or forcings, can be separated and that manmade greenhouse forcing is measurable at Earth's surface. Above all, their measurements demonstrate strong water vapor feedback that rapidly warms Central and Northeastern Europe, where sufficient water is available from plants and the surface, known as evapotranspiration.

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The research was supported by the framework of the National Center of Competence in Research on Climate (NCCR Climate), an initiative funded by the Swiss National Science

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