For first time, entire thermal infrared spectrum observed

June 15 2012

The driving mechanism of the greenhouse effect, and the underpinning of modern anthropogenic warming, is the absorption, emission, and transmission of infrared radiation by atmospheric gases. The heat-trapping ability of a gas depends on its chemical composition, and each type of gas absorbs infrared radiation of different energies.

The amount of infrared radiation that escapes into space depends on the net effect of the myriad gases in the atmosphere, with water vapor being the primary gaseous absorber of infrared radiation. Water vapor absorbs a wide range of infrared radiation, masking the effects of other gases.

In fact, in many spectral regions (or infrared radiation energy bands), water vapor is so strongly absorbing that it makes testing the accuracy of infrared radiation absorption parameterizations used in general circulation models difficult.

To surmount this obstacle, Turner et al. headed to a 5.3-kilometer (3.3-mile) altitude site in the Atacama Desert in northern Chile, where the air is extremely dry. Using a broad suite of spectroscopic equipment, they produce the first ground-based measurement of the entire atmospheric infrared radiation absorption spectrum-from 3.3 to 1000 micrometers-including spectral regions that are usually obscured by strong water vapor absorption and emission.

Though the data collected will likely be valuable for a broad range of uses, the authors use their measurements to verify the water vapor

absorption parameterizations used in the current generation of climate models.

More information: Ground-based high spectral resolution observations of the entire terrestrial spectrum under extremely dry conditions, *Geophysical Research Letters*, doi:10.1029/2012GL051542 , 2012

Provided by American Geophysical Union