PHYSICS UPDATE

Water is Earth's principal greenhouse molecule: It's responsible for well over half of the atmosphere's absorption of solar and terrestrial radiation.

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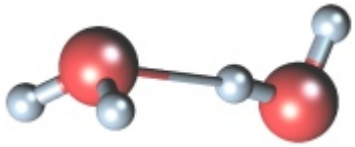

Researchers have long suspected that a portion of that absorption is due to water dimers: pairs of water molecules bound by weak hydrogen bonds, as shown in the figure. But despite decades of effort, the dimers had never been spectroscopically observed at ambient temperatures, so their atmospheric abundance could not be directly measured. As an important step in that direction, Mikhail Tretyakov and colleagues, of the Institute of Applied Physics of the Russian Academy of Sciences in Nizhniy Novgorod, have measured the water dimer's room-temperature microwave spectrum to reveal its rotational transitions. Key to their advance was their development of a microwave resonator spectrometer based on a Fabry–Perot cavity. An absorbing sample placed within the cavity reduces the cavity's Q factor. By measuring changes in the factor, the researchers can record microwave spectra with unprecedented sensitivity. In the spectrum of low-pressure water vapor, they saw four equally spaced absorption peaks, exactly where theory and low-temperature experiments predicted they would be. The next step for the researchers is to measure the spectrum under different temperatures, pressures, and wavelengths—information that they need before they can begin to

quantitatively investigate the dimer's involvement in the atmosphere. (M. Y. Tretyakov et al., Phys. Rev. Lett. **110**, 093001, 2013.)—Johanna Miller

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