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How water shapes climate

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Abstract: Water shapes climate much more than most people realize. It is at the root of all four of the dominant fast global climate feedbacks. Besides its unique thermodynamical properties, the reason for its importance is its strong interaction with radiation. Together with carbon dioxide, water vapor shapes Earth's clear-sky outgoing longwave radiation spectrum, creating large spectral areas of near-neutral radiative feedback.

But our knowledge of the water vapor absorption spectrum is imperfect, in particular in the spectral windows far from strong absorption lines, where we need empirical corrections to achieve a good match between observations and simple line-by-line absorption calculations. The Liebe model was among the first to address this from a practical point of view, specifically for the microwave spectrum region, by adding a continuum term to the line spectrum.

The talk will discuss the climate implications of the water vapor spectrum, including continua, from a broad perspective, with most emphasis on the thermal infrared and far infrared spectral regions.



Biography: Prof. Buehler's group began in the 1990s at the University of Bremen in the Institute for Environmental Physics. Between 2006 and 2013 the group was at Luleå University of Technology, Department of Computer Science, Electrical and Space Engineering - Division of Space Technology in Kiruna, Sweden. In 2013, it moved to the Meteorological Institute and the Centre for Earth System and Sustainability Research at the University of Hamburg. Together with Prof. Patrick Eriksson of Chalmers University, Gothenburg, and with

numerous other important contributors over the years, Prof. Buehler, has developed the radiative transfer model ARTS, which is freely available and has worldwide users. ARTS simulates the

propagation of radiation through the atmosphere, including absorption and scattering, and is used both for remote sensing and for calculating energy fluxes. He has used existing satellite datasets to study the role of water vapor and clouds in the climate system. He has also been instrumental in developing concepts for new satellites, including the "Ice Cloud Imager" ICI, an instrument that will be flown on the next European weather satellite METOP-SG. Prof. Buehler currently works on the upcoming ESA satellite mission FORUM, which will make the first spectrally resolved measurements of Earth's outgoing longwave radiation in the far-infrared range, and on fundamental topics of radiation and climate, such as radiative convective equilibrium and Earth's spectral radiative feedback.