## Leipziger Meteorologisches Kolloquium

## Donnerstag, 19.10.2023, 16.00 Uhr, Stephanstraße 3a, Bjerknes Lecture Hall und

online <a href="https://uni-leipzig.zoom.us/i/65299290142?pwd=cldKRFIzMUhZTkVGLzdJd3dzYjAzQT09">https://uni-leipzig.zoom.us/i/65299290142?pwd=cldKRFIzMUhZTkVGLzdJd3dzYjAzQT09</a>

## Prof. Dr. Robert Pincus (Columbia University, USA)

## Insights into radiative cooling: why trade-wind clouds are organized in space and why more rain falls in warmer climates

Radiation - sunlight and earthshine - set the earth's mean temperature and drive most of the horizontal and vertical circulations than make the earth system so interesting. The basic physics that underlies radiation has been understood for more than 100 years. Much progress during the last decades has relied on increasingly sophisticated measurements and computations to provide increasingly accurate calculations. The last five years, however, have seen a flowering of interest in finding simplifications that provide deeper insight into the emergent behavior by which radiation interacts the climate system, explaining topics as diverse as why outgoing longwave radiation is linear in temperature and why radiation cools the troposphere quasi-uniformly in height.

This talk will explain how careful simplifications of radiation explain two particular phenomena. One is sharp peaks of cooling in trade wind regimes, which are widely observable once you know where to look, and which seem to be linked to the tendency of shallow clouds to self-organize into patterns with distinct textures. The second is "hydrologic sensitivity" - the increase in global-mean precipitation with warming. We'll show how each of these phenomena ultimately derive from the characteristics of water vapor, especially the relationship between vapor content and temperature and the distribution of opacity with wavelength.