

CGD SEMINAR



DATE: Tuesday 12 November, 2019

TIME: 11 am – 12 pm

LOCATION: NCAR, Table Mesa Drive Main Seminar Room

TITLE: **Getting the water cycle right: the case for isotopic tracers**

SPEAKER: **Adriana Raudzens Bailey, NCAR**

Getting the water cycle “right” is critical not only for assessing risks associated with climate variability but also for predicting future climate changes accurately. Yet, traditional measurement approaches often fall short of enabling us to estimate moisture flow and to describe moisture exchange processes with sufficient accuracy. Spatiotemporal heterogeneity in precipitation and evaporation, for example, make it difficult to obtain regionally representative estimates of these major moisture fluxes, which has cascading effects on our ability to quantify and forecast moisture transport and regional hydrologic balance. This high variability also makes it challenging to identify the time at which climate change signals emerge.

Water cycle processes related to cloud and storm formation also contribute some of the greatest uncertainties to predictions of future climate. For example, how efficiently precipitation forms and falls to the ground affects not only cloudiness but also the vertical distribution of atmospheric humidity. The resultant patterns of clouds and water vapor influence regional radiative balances and can modify convective development. However, there are significant technical challenges associated with measuring moisture exchange between clouds, or raindrops, and their environment using traditional methods.

Water isotope ratios offer an alternate—and sometimes more tenable—means to quantify the bulk exchange of water between reservoirs in the atmosphere—and other components of the Earth System—while also providing a way to link moisture back to its hydrological source. Moreover, tracing water cycle processes with isotope ratios is becoming easier as in situ isotopic measurements become increasingly widespread and isotopic tracers are incorporated systematically into IPCC-class general circulation models (GCMs).

With the Research Aviation Facility’s recent investment in two flight-ready water isotopic analyzers and continuing efforts to incorporate water isotopic tracers in recent versions of CESM, NCAR is well poised to leverage isotopic information to reduce critical, remaining uncertainties about the water cycle and its role in climate. This presentation highlights a number of key examples of how water isotopic information has improved and can continue to accelerate our understanding of moisture exchange processes on scales ranging from cloud systems to the globe and reduce biases in the representation of these processes in GCMS.

Live webcast: <https://www.ucar.edu/live>

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