



ATS/CIRA Colloquium

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Hosted by Jeff Pierce

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ATS 101

Seeing Human Impacts on the Environment Through Satellite Lenses

The growth in the global population and economy has increased the demand for resources, leading to environmental degradation across scales. Our generation faces two key challenges regarding the carbon and water cycles: 1) mitigating anthropogenic emissions while enhancing carbon sequestration and 2) ensuring food security while coping with water scarcity. Effectively addressing these challenges requires monitoring human-induced changes in carbon and water fluxes in a consistent, unbiased, and timely manner. Fortunately, innovative space-based sensors offer a promising solution.

Here I focus on urban and agricultural land, which respectively account for ~70% of the energy-related CO₂ emissions and freshwater withdrawals globally. I present the impacts of urban combustion and irrigation on carbon, pollution, and water fluxes from the global to kilometer scale. Specific research questions include:

- 1) How much fossil fuel CO₂ do cities produce? Do some cities emit more than others?
- 2) Can emissions associated with specific sectors be revealed from space?
- 3) How much irrigation water is used on crop ranches in the Central Valley?

To approach these questions, I leveraged satellite observations of atmospheric trace gases and land surface properties and developed modeling tools to interpret the data. As human management plans are being increasingly implemented, my goal is to evaluate their effectiveness in the context of carbon, pollution, and water cycles with observational data as a crucial constraint.