ABSTRACT: Biomass burning, whether wildland fires, prescribed burning, burning as part of agricultural practices, cooking with biomass, or even the burning of waste, emits significant amounts of trace gases and particulate matter to the atmosphere. These emissions can cause poor air quality and affect climate, and ultimately can have detrimental impacts on public health, agriculture productivity, and ecosystem services. Biomass burning emissions are ubiquitous in the atmosphere and have been identified at all scales, from the indoor environment to the stratosphere. Many valuable efforts have been put forth to estimate the emissions from open burning, ranging from event-specific and local scales, to regional and global scales. The results from these efforts are extremely valuable, since the inclusion of open burning events is essential to models that simulate air quality, chemistry, and climate. This presentation will detail efforts to identify and quantify biomass burning emissions across scales, from indoor cooking activities to global open burning. The impacts of these emissions will be highlighted through examples of recent studies. Future efforts continue to work towards constraining emissions from various natural and anthropogenic sources, particularly as technologies evolve, economies develop, and climate changes.