

## 5.120 Could SO<sub>2</sub> emission cuts from coal and ships be accentuating climate warming?.

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Abstract:

Sulfate aerosols offset a substantial portion of greenhouse warming. They cool the climate both directly by scattering sunlight, and indirectly by influencing cloud albedo, depth, and lifetime. Most emission scenarios project dramatic reductions in SO<sub>2</sub> emissions over the course of this century. Less widely known is that SO<sub>2</sub> emissions have already dropped dramatically over regions where coal combustion has been controlled and where sulfur limits have been imposed on ship fuel. In particular, ship sulfur limits were cut by 90% within Emission Control Areas (ECAs) off the coasts of North America and Europe in January 2015, and by other amounts and deadlines in some port regions of Asia. Meanwhile, OMI satellite observations show ongoing sharp downward trends in SO<sub>2</sub> over eastern China in recent years as control policies have been tightened.

This talk will present evidence both supporting and refuting the hypothesis that these SO<sub>2</sub> emission trends are already impacting climate. Specifically, the January 2015 ship fuel sulfur rule coincided with a 0.3C spurt in Northern Hemisphere temperatures from Q4 2014 to Q1 2015; this came as Southern Hemisphere temperatures were unchanged, and several months before El Nino intensified. The North American ECA coincided with some of the warmest sea surface temperature anomalies of 2015 outside of the El Nino-influence equatorial Pacific. However, the gap between T<sub>max</sub> and T<sub>min</sub> was unchanged over shipping ECAs and China, inconsistent with a sulfate signal. More research into the links between sulfur and climate are important not only for attribution, but also to anticipate the impacts of continued reductions in coal SO<sub>2</sub> emissions and pending plans to cut ship fuel sulfur limits globally.