Using Carbonyl Sulfide to Explore Coastal Fog and Coast Redwood Interdependence

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Carbonyl sulfide (OCS) has received much attention as a tracer for global and continental photosynthetic carbon dioxide uptake. Here we demonstrate its utility to understand regional scale land-sea-atmosphere interactions that affect coastal fog. Lining the foggy coast of Northern California, coast redwoods (Sequoia sempervirens) are iconic for being the tallest living trees on Earth. Despite redwoods' widespread recognition, surprisingly little is known about the degree of interdependence between coastal redwoods and coastal fog. Are redwoods relatively primitive trees whose leaves transpire water at an unchanged rate regardless of the surrounding moisture, or are they more sophisticated, controlling their stomatal conductance in response to changing atmospheric conditions in their canopy? Here we present model simulations that demonstrate feedbacks between coastal land cover and coastal fog, showing impacts on frequency of coastal fog surprisingly far away from the redwood forests. This links the questions surrounding redwood transpiration to larger-scale regional coastal fog frequency. With coastal fog frequency expected to decline with changing climate and increasing urbanization this question gains urgency. We also present preliminary redwood canopy OCS measurements which we will use to investigate these redwood transpiration--coastal fog feedbacks.

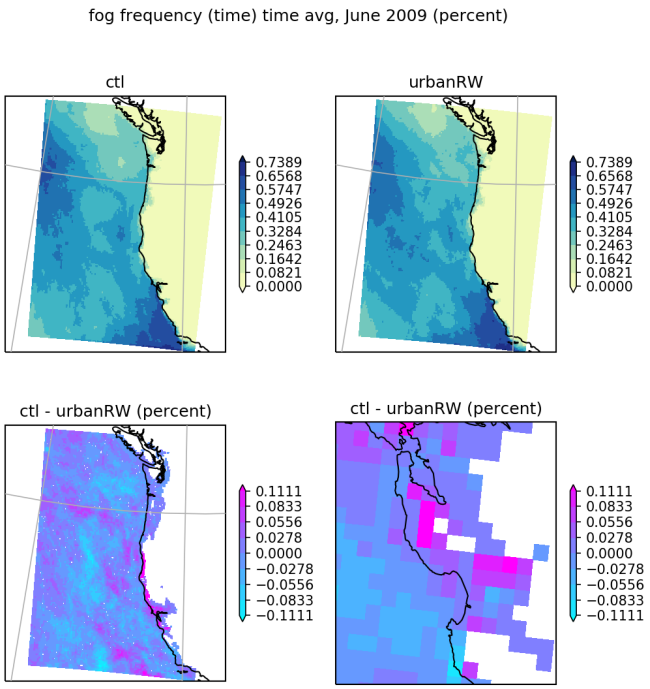

Figure 1. WRF-ARW simulated fog frequency change in urbanized redwood range experiment.

Figure 2. OCS sampling equipment deployed in redwood canopy.